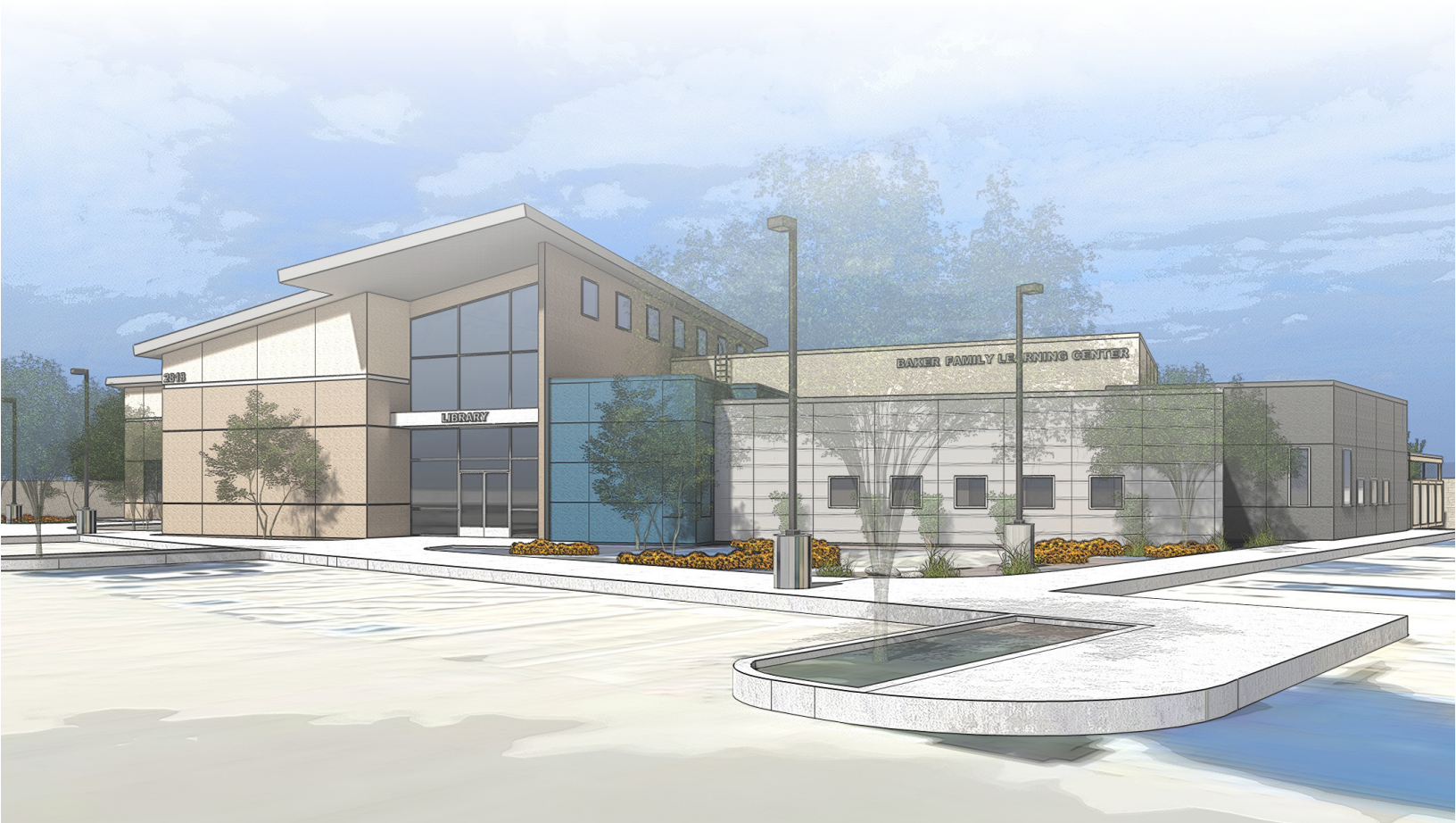
SPECIFICATIONS BOOK

BAKER FAMILY LEARNING CENTER REMODEL & ADDITION

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1 GENERAL PROVISIONS

1.1 Basic Definitions

1.1.1 Acceleration Proposal Request. County's written request to Contractor to submit an itemized proposal for Extraordinary Measures in order to achieve early completion of all or a portion of the Work when the need for such measures is not due to the fault of the Contractor.

1.1.2 Addenda. The Addenda or Addendum consist of the written clarifications of the Bid Documents issued by the County prior to the execution of the Contract.

1.1.3 Applicable Law. State, federal and local laws, statutes, ordinances, building codes, rules and regulations relating to the Work.

1.1.4 Architect. – The firm hired by the County to design the Project.

1.1.5 As-Builts. The Contractor's daily, current and complete on-site set of Plans and Specifications showing all changes, modifications and revisions performed during the progress of the Project construction.

1.1.6 Chief of Project Management. The Chief of Project Management of the Project and Facilities Management Department – Project Management.

1.1.7 Board. The Board of Supervisors for San Bernardino County.

1.1.8 Bid Documents. The documents contained in the bid packages including, but not limited to, advertisement for bids, instructions to bidders, bid proposal, non-collusion declaration, sample standard contract, contractor's affidavit and final release, sample bond forms, State wage determinations, general conditions, special conditions, technical specifications and Project drawings/plans.

1.1.9 Change Order. A Change Order is a written document prepared by the County reflecting the agreement between the County and Contractor for: a change in the terms or conditions of the Contract, if any; a specific Scope Change in the Work; the amount of the adjustment, if any, in the Contract Sum; and the extent of the adjustment, if any, in the Contract Time. The Change Order must be signed by an authorized representative of the County and Contractor.

1.1.10 Change Order Request (COR). As more specifically described herein below, a Change Order Request is a written document originated by the Contractor, which describes an instruction(s) issued by the County after the effective date of the Contract, which Contractor believes to be a Scope Change that may result in changes to the

Contract Sum or Contract Time or, which describes the need for or desirability of a change in the Work proposed by Contractor.

1.1.11 Construction Change Directive. A Construction Change Directive is a unilateral written order prepared and signed by the County, directing Contractor to perform a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both.

1.1.12 Contract. The Contract Documents form the Contract ("Contract" or "Agreement").

1.1.13 Contract Documents. The Contract Documents consist of the documents enumerated as such in the Contract between County and Contractor, including, but not limited to, all Addenda issued prior to and Modifications issued after the effective date of the Contract, Plans/drawings, Specifications, request for qualifications, instructions to bidders, general conditions, special conditions and bonds.

1.1.14 Contract Sum. The term "Contract Sum" means the amount of compensation stated in the Contract for the performance of the Work. The Contract Sum may be adjusted only by Change Order, Construction Change Directive, or written amendment to the Contract.

1.1.15 Contractor. The individual, partnership, corporation, joint venture, or other legal entity entering into the Contract with the County to perform the Work.

1.1.16 County. San Bernardino County.

1.1.17 Date of Commencement. The date for commencement of the Work fixed by County in a Notice to Proceed to Contractor.

1.1.18 Day(s). The terms "day" or "days" mean calendar days unless otherwise specifically designated in the Contract Documents. The term "Work Day" or "Working Day" shall mean any calendar day except Saturdays, Sundays and County recognized legal holidays.

1.1.19 Defective Work. Any or all of the Work, which is unsatisfactory, faulty, omitted, incomplete or deficient, in material, workmanship or operation, or which does not conform to the requirements of the Contract Documents, directives of the County, applicable code requirements, or the requirements of any inspection, reference standard, test, or approval specified in the Contract Documents.

1.1.20 Department. The San Bernardino County Project and Facilities Management Department.

1.1.21 Director. The Director of the Project and Facilities Management Department.

1.1.22 Division. The San Bernardino County Project and Facilities Management Department – Project Management. The Project Management is represented by the Director or Chief of Project Management.

1.1.23 Extraordinary Measures. Measures implemented by Contractor at County's direction to expedite the progress of construction of all or a portion of the Work, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) submitting a recovery schedule for resequencing performance of the Work or other similar measures, as more specifically described in Paragraph 2.8.

1.1.24 Final Completion. The term Final Completion is the date, evidenced by the County's approval of Contractor's Final Application for Payment, when the Work has been completed and the requirements for Project closeout set forth in the Contract Documents including, but not limited to, those set forth in Paragraph 9.8 below, have been satisfactorily completed. May be demonstrated by the recording of a Notice of Completion by the County.

1.1.25 Final Payment. County's payment of the Contract Sum due to Contractor for the entire Work, less only the sums which County is specifically allowed to withhold under the terms of the Contract Documents and Applicable Law.

1.1.26 Modifications. A Modification is (i) a written amendment to the Contract signed by duly authorized representatives of the Parties, (ii) a Change Order, or (iii) a Construction Change Directive.

1.1.27 Notice of Completion. Document that is submitted by the County to the County Recorder for filing and recordation when all Work called for in the Construction Documents has been completed.

1.1.28 Notice to Proceed. The Notice to Proceed is a document issued by the County fixing the Date of Commencement for the Work. The Contract Time for Contractor's performance of the Work is measured in calendar days (not Work Days).

1.1.29 Owner. The San Bernardino County or its duly authorized representative.

1.1.30 Parties. The County and Contractor may be referred to collectively in the Contract Documents from time to time as the Parties.

1.1.31 Plans/Drawings. The Drawings, profiles, cross-sections, working drawings, and supplemental drawings or reproductions thereof, reviewed by the County or its authorized agent, which show the locations, character, dimensions, or details of the Work.

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

1.1.33 Project Manager. County's Project Manager, identified by County in writing, is the County's Project Representative, who interprets and defines the County's policies, renders decisions with respect to Contractor's performance of the Work, approves Contractor's Applications for Payment, reviews and approves Contractor's schedules and submittals, reviews and approves Change Order Requests and Change Orders and Construction Change Directives, reviews all quantity calculations related to pay quantities, reviews and approves changes in the Contract Time, concurs in any defective Work notification, and reviews and determines Substantial Completion of the Work and Final Completion of the Work. The extent and limits of the authority of any designee of the County's Project Manager shall be set forth in writing. Contractor shall be entitled to rely on the decisions and information provided by such written designee subject to the limitations of authority set forth in writing. All correspondence and electronic communication shall flow through the Project Manager. The Project Manager does not have the authority to approve a Change Order, written amendment to the Contract or Change Order Directive on behalf of the County. Contractor acknowledges that all Change Orders, Change Order Requests, Construction Change Directives, and amendments to the written Contract require the approval of the Director, or his/her designee, and may also require the approval of the Board.

1.1.34 Project Representative. Those individuals designated by the Parties in writing with authority to render decisions in connection with the Work and the Contract.

1.1.35 Scope Change. A Scope Change is Work that is not reasonably inferable from the Contract Documents upon which the Contract Sum is based, by a Contractor with the skill, experience, and expertise necessary for the proper, timely, and orderly completion of the Work, and is (i) materially inconsistent with, or (ii) a material change in the quantity, quality, or other substantial deviation in, the Contract Documents upon which the Contract Sum is based; and are necessary to correct an error, omission or defect in the Contract Documents, which cannot reasonably be corrected in the construction process.

1.1.36 Separate Contractors. The term Separate Contractors means licensed contractors performing a portion of the Project under separate contracts with the County.

1.1.37 Site. The physical area designated in the Contract Documents for Contractor's performance of the Work.

1.1.38 Specifications. The portion of the Contract Documents consisting of the written requirements for labor, materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services, including all Work

and services defined in the Standard specifications, reference specifications, technical specifications, special provisions, General Conditions, and specifications in supplemental agreements between the County and Contractor.

1.1.38.1 Article, Paragraph, and Subparagraph titles and other identifications of subject matter in the Specifications are intended as an aid in locating and recognizing the various requirements in the Specifications. Except where the titling forms a part of the text, such as beginning words of a sentence or where the title establishes the subject, the titles are subordinate to and do not define, limit, or restrict the Specification text. Underlining or capitalizing of any words in the text does not signify or mean that such words convey special or unique meanings having a precedence over any other part of the Contract Documents. Specification text shall govern over titling and shall be understood to be and interpreted as a whole. The listings of various Sections of the Specifications are for convenience only and do not control the Contractor in dividing the Work among the subcontractors or establish the extent of the Work to be performed or provided by any Subcontractor or trade. **Contractor is solely responsible for providing the complete Work without respect to where or how the various parts of the Work may be indicated or specified.**

1.1.39 Subcontractor. A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the Site. The term "Subcontractor" does not include a Separate Contractor or subcontractors of a Separate Contractor.

1.1.40 Sub-subcontractor. A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the Site.

1.1.41 Substantial Completion. Substantial Completion is defined to mean the state in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents as determined by the County so that the County can occupy and utilize the Work for its intended use and as further defined in the Contract.

1.1.42 Work. The term "Work" means the construction and other services required by, and reasonably inferable from, the Contract Documents as amended by Contract Modifications, whether completed or partially completed, and includes all labor, materials, equipment, tools, and services provided or to be provided by Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project, and includes products purchased by Contractor from third parties, and thereafter sold to County by Contractor.

1.1.43 Written Amendment to Contract – An amendment to the Contract which may change the Contract Sum or Contract Time, as necessary, due to unforeseen

circumstances at the Project, additional Work required as a result of changes in Applicable Laws, or other appropriate facts necessitating a Contract amendment.

1.2 Correlation and Intent of the Contract Documents

1.2.1 Complementary Documents. 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. All Work mentioned or indicated in the Contract Documents, and all Work reasonably inferable from them, shall be performed by the Contractor as part of the Contract unless it is specifically indicated in the Contract Documents that such work is to be done by others.

1.2.2 Order of Precedence. In the event of conflict between any of the Contract Documents the provision placing a more stringent requirement on the Contractor shall prevail. The Contractor shall provide the better quality or greater quantity of Work and/or materials unless otherwise directed by County in writing. In the event none of the Contract Documents place a more stringent requirement or greater burden on the Contractor, the controlling provision shall be that which is found in the document with higher precedence. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following order of precedence, with "(1)" being the highest:

(1) Permits;
(2) Modifications;
(3) Specifications;
(4) Detailed Plans/Drawings;
(5) Large Scale Plans/Drawings;
(6) Small Scale Plans/Drawings;
(7) The Contract, including all exhibits, and Addenda with later Addenda having priority over earlier Addenda;
(8) Special Conditions, if any;
(9) General Conditions; and
(10) Bid Documents.

1.2.2.1 Nothing herein shall relieve the Contractor of its obligation to notify the County of any inconsistencies in the Contract Documents. Should it appear that the Work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the County in writing for such further written explanations as may be necessary.

1.2.2.2 In the case of conflict or inconsistency in the Contract Documents, the conflict or inconsistency must be brought to the attention of the County for written clarification obtained from the County before proceeding with the Work affected by the conflict or inconsistencies. Failure to obtain such written clarification from the County will constitute waiver of any claim by Contractor related to such conflict or inconsistency.

1.2.2.3 All Work shall conform to the Contract Documents. No change therefrom shall be made without review and written acceptance by County.

1.2.3 Organization. Organization of the Specifications into divisions, sections, and articles, and sequential order of Plans/Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed.

1.2.4 Well-Known Terms. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.5 Contractor Deviations. No deviations by the Contractor from the Contract Documents relating to any portion of the services, materials, labor, or equipment required for the Work shall be construed to set a precedent with respect to subsequent interpretation of the Contract Documents or performance of the Work unless such a deviation is memorialized in a Modification to the Contract.

1.2.6 Complete Agreement. The Contract Documents constitute the full and complete understanding of the Parties and supersede any previous agreements or understandings, oral or written, with respect to the subject matter hereof. The Contract may be modified only by a written instrument signed by both Parties or pursuant to Article 7.

1.3 Capitalization

Terms capitalized in these General Conditions include those which are (i) specifically defined, (ii) the titles of numbered articles, and identified references to paragraphs, subparagraphs and clauses in the document or (iii) titles of other Contract Documents or forms.

1.4 Interpretation

1.4.1 Omitted Articles. In the interest of brevity, the Contract Documents frequently omit articles such as “the” and “an”, but the fact that an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement. The use of the word “including,” when following any general statement, shall not be construed to limit such statement to specific items or matters set forth immediately following such word or to similar items or matters whether or not non-limiting language (such as “without limitation, “but not limit to,” or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement.

1.4.2 References to Contract Documents. Where "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to any one of the Contract Documents.

1.4.3 Severability. In the event any article, section, sub-article, paragraph, subparagraph, sentence, clause, or phrase contained in the Contract Documents shall be determined, declared, or adjudged invalid, illegal, unconstitutional, or otherwise unenforceable such determination, declaration, or adjudication shall in no manner affect the other articles, sections, sub-articles, paragraphs, subparagraphs, sentences, clauses, or phrases of the Contract Documents, which shall remain in full force and effect as if the article, section, sub-article, paragraph, subparagraph, sentence, clause, or phrase declared, determined, or adjudged invalid, illegal, unconstitutional, or otherwise unenforceable was not originally contained in the Contract Documents.

1.4.4 Provisions Deemed Inserted. Each and every provision and clause required by law to be inserted in the Contract Documents shall be deemed to be inserted herein and the Contract Documents shall be read and enforced as though such provision or clause is included herein and, if through mistake or otherwise, any such provision is not inserted or not correctly inserted, then upon application of either Party, the Contract Documents shall forthwith be physically amended to make such insertion or correction.

1.4.5 Headings Not Controlling. The various headings contained in the Contract Documents are inserted for convenience only and shall not affect the meaning or interpretation of the Contract or any provision thereof.

1.4.6 Singular/Plural/Gender Terms. Whenever the context so requires, the use of the singular number shall be deemed to include the plural and vice versa. Each gender shall be deemed to include any other gender, and each shall include corporation, partnership, trust, or other legal entity whenever the context so requires.

1.4.7 Technical/Non-Technical Words. Unless otherwise stated in the Contract Documents, technical words and abbreviations contained in the Contract Documents are used in accordance with commonly understood construction industry meanings; and non-technical words and abbreviations are used in accordance with their commonly understood meanings.

1.4.8 Referenced Standards. Bulletins, standards, rules, methods of analysis or test, and specification of other agencies, engineering societies or industrial associations may be referred to in the Contract Documents. Reference may also be made to applicable ordinances, codes or regulations of any political subdivision having jurisdiction. These refer to the latest edition, including amendments in effect and published at the time of advertising the Project for bid, unless specifically referred to by edition, volume or date.

1.5 Execution of Contract Documents

1.5.1 Signatures. The Contract shall be signed by the authorized representatives of the County and Contractor.

1.5.2 Contractor Representations Concerning Contract Documents and Site Investigation. By executing the Contract, Contractor represents and warrants that: (i) the Contract Documents are sufficiently detailed to enable Contractor to determine the cost of the Work within the Contract Sum and Contract Time; (ii) it has visited the Project Site, familiarized itself with the local conditions under which the Work is to be performed including, without limitation, the conditions contained in any test results and/or reports provided to or obtained by Contractor, and the conditions reflected on any Site surveys provided to or obtained by the Contractor; (iii) it is fully experienced, qualified and competent to perform the Work set forth in the Contract Documents; (iv) it is properly equipped, organized and financed to perform the Work; (v) it is properly permitted and licensed by California and all other governmental entities to perform the Work required by the Contract and that it will retain only properly licensed Subcontractors to perform the Work of the Contract; (vi) it has familiarized itself with all conditions bearing upon transportation, disposal, handling, and storage of materials; (vii) it has familiarized itself with the availability of labor, water, electric power, and roads; (viii) it has familiarized itself with uncertainties of weather or similar observable physical conditions at the Project Site; (ix) it has familiarized itself with the character of equipment and facilities needed during performance of the Work; (x) it has familiarized itself with the staging and material storage constraints of the Project Site and surrounding buildings and will confine its staging and storage operations to approved areas; (xi) it shall maintain the immediate surrounding areas of the Project Site in a clean and safe manner at all times; (xii) it will coordinate its construction activities with County's Separate Contractors, if any, performing work on the Project Site; (xiii) it will adhere to the assigned transit route identified by the County; and (xiv) it will adhere to and be bound by conditions set forth in the Contract Documents and any regulatory agency, utility, or governmental entity with jurisdiction over the Project. In addition, and without limiting the foregoing warranties, Contractor represents and warrants to County that prior to executing the Contract:

(1) Contractor has familiarized itself and will continuously familiarize itself throughout performance of the Work with the nature and extent of the Contract Documents, the Work, the Project Site, the identified existing conditions of the Project Site and locality, and all laws, rules, ordinances, and regulations of all government authorities and utilities having jurisdiction over the Project that may affect costs, progress, performance, or furnishing of the Work;

(2) Contractor has reviewed and carefully studied all examinations, investigations, explorations, tests, reports and studies provided to Contractor by County which pertain to the physical conditions at or

contiguous to the Project Site or conditions which otherwise may affect the cost, progress, performance or furnishing of the Work, within the Contract Time and Construction Schedule. Contractor may rely upon the accuracy of the technical data contained in such documents but not upon nontechnical data, interpretations, opinions or conditional statements contained therein;

(3) Contractor has reviewed all information and data shown or indicated on the Contract Documents with respect to existing underground facilities at or contiguous to the Project Site;

(4) As of the effective date of the Contract, Contractor has no knowledge of any conflicts, errors, or discrepancies in the Contract Documents other than those which Contractor has notified County of in writing prior to executing the Contract; and

(5) Contractor is experienced and competent in the interpretation and use of Specifications and Drawings, and in the use of materials, equipment and construction techniques as are required to successfully complete the Project. Contractor shall, at its own expense, employ any and all experts necessary to successfully complete the Work required by the Contract Documents.

1.6 Ownership and Use of Drawings, Specifications and Other Instruments of Service

1.6.1 Ownership of Contract Documents. All Drawings, Specification, plans, sketches and other documents, including copies thereof, furnished by the County are and shall remain the property of the County and may be required to be returned to the County at the Contractor's expense. They are to be used only with respect to this Project and are not to be used on any other project. 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 the County's common law copyright or other reserved rights.

1.6.2 Contractor's Assignment of Copyrights. Project related documents created, prepared, or issued by Contractor, or its Subcontractors, including any Drawings, Specifications, and electronic data are "work for hire", and shall become the property of the County when prepared and shall be delivered to County whenever requested. The Contractor hereby assigns to the County, without reservation, all copyrights to all Project related documents, models, photographs, and other written expressions created by the Contractor.

1.6.3 Submissions to County. A copy of every technical memorandum and report prepared by Contractor shall be submitted to the County to demonstrate progress toward completion of Work. In the event County rejects or has comments on any such

work product, County shall identify specific requirements for satisfactory completion by Contractor. Contractor shall provide County with Project related documents in reproducible or electronic format, upon County's written request. All Project related documents shall be turned over to County upon termination of this Agreement or Final Completion, whichever occurs first.

1.7 Publicity

The Contractor, its agents, employees, subcontractors and suppliers shall not engage in any communication or correspondence with persons not directly involved in the construction of the Project, concerning any aspect of the construction of the Project, without the express written consent of County. All communications to the media, or in response to inquiries made by private citizens, shall be issued solely through the County.

2 SAN BERNARDINO COUNTY'S DUTIES AND RESPONSIBILITIES

2.1 General

The County shall designate the Project Manager(s) defined in Paragraphs 4.1 below, in writing. Whenever the Contract Documents require or permit the County to take or request an action or approve or disapprove of an action or request made by another Party, the reference to "County" shall mean the County's Project Manager unless the Contract Documents or context make it clear that another person is authorized to act as the County's Project Manager. All communications to the County shall be made through the County's Project Manager. The Contractor shall not be entitled to rely on directions (nor shall it be required to follow the directions) from anyone outside the scope of that person's authority as set forth in written authorization pursuant to the Contract. Direction and decisions made by the County's Project Manager shall be binding on San Bernardino County. Contractor acknowledges that all Change Orders, Change Order Requests, Construction Change Directives and amendments to the written Contract require the approval of the Director, or his/her designee, and may also require the approval of the Board.

2.2 Reserved

2.3 Information and Services Required of the County

2.3.1 Approvals for Permanent Structures. Except for the permits, fees, and other such items set forth under Subparagraph 3.7.1, that are the responsibility of the Contractor under the Contract Documents, the County shall pay for necessary assessments and charges reasonably required for construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

2.3.2 Existing Utilities: Removal, Relocation and Protection. In accordance with California Government Code Section 4215, the County shall assume the responsibility

for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the Project Site which are not identified in the Contract Documents provided by County. Contractor shall be compensated for the costs of locating, repairing damage not due to the Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Contract Documents with reasonable accuracy, and for equipment on the Project Site necessarily idled during such work. Contractor shall not be assessed Liquidated Damages for delay in completion of the Work when such delay is caused by the failure of the County or the utility provider to provide for removal or relocation of such utility facilities. Nothing in this Paragraph shall be deemed to require the County to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Project Site can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the Project Site. If the Contractor encounters utility facilities not identified by the County in the Contract Documents, the Contractor shall immediately notify, in writing, the County. In the event that such utility facilities are owned by a public utility, the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a price determined in accordance with Article 7 herein.

2.3.3 Surveys. Contractor shall be responsible for locating, and shall locate prior to performing any Work, all utility lines, including telephone, cable, television, and fiber optic lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables, and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines.

2.3.4 Time for Furnishing. Information or services required of the County by the Contract Documents shall be furnished by the County with reasonable promptness.

2.4 County's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or fails to carry out Work in accordance with the Contract Documents, the County may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the County to stop the Work shall not give rise to a duty on the part of the County to exercise this right for the benefit of the Contractor or any other person or entity. The County's right to stop the Work is in addition to and without prejudice to any other rights or remedies of the County.

2.5 County's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a forty-eight (48) hour period after receipt of written notice from the County to commence and continue correction of such default or neglect with diligence and

promptness, the County may after such forty-eight (48) hour period give the Contractor a second written notice to correct such deficiencies within a second forty-eight (48) hour period. If the Contractor within such second forty-eight (48) hour period after receipt of such second notice fails to commence and continue to correct any deficiencies, the County, without prejudice to other remedies the County may have, may correct such deficiencies. In such case an appropriate Construction Change Directive shall be issued deducting from payments then or thereafter due the Contractor, the cost of correcting such deficiencies, including compensation for any additional design services and expenses made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the County. The County's right to carry out the Work is in addition to and without prejudice to any other rights or remedies of the County.

2.6 Suspensions of Operations

In addition to the County's right to stop the Work set forth in these General Conditions, the Contractor shall, upon receipt of County's written notice and within the time stated therein, suspend shipment and delivery of material and stop any part or all of the Work and operations under the Contract for such period or periods of time as the County may deem advisable and designate in said notice. Upon receipt of such notice to suspend operations, the Contractor shall immediately confer with the County concerning the probable duration of such suspension and stoppage, delays, and extensions of time resulting therefrom as well as the reduction and possible elimination of the Contractor's field cost and such other costs and expenses as may result directly from such Work stoppage. Upon written notice from the County to resume operations, the Contractor shall promptly resume all or any part of the Work and operations including securing of materials required by said resumption notice. Contractor shall be compensated for suspension in accordance with Article 13 herein.

2.7 Prohibited Interests

No official of the County who is authorized in such capacity and on behalf of County to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting or approving any County structural, engineering, inspection, construction or material supply contract or any subcontract in connection with construction of the Project, shall become directly or indirectly interested financially in this Contract or in any part thereof. No officer, employee, attorney, engineer or inspector of or for County who is authorized in such capacity and on behalf of County to exercise any executive, supervisory or other similar functions in connection with construction of Project shall become directly or indirectly interested financially in this Contract in any part thereof. Contractor shall receive no compensation and shall repay County for any compensation received by Contractor hereunder, should Contractor aid, abet or knowingly participate in violation of this Section.

2.8 County's Right to Order Extraordinary Measures

2.8.1 Non-Compensable Extraordinary Measures. In the event the County determines that the performance of the Work, or any portion thereof, has not progressed or reached the level of completion required by the Contract Documents due to causes within the control of Contractor, the County shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities and (iii) submitting a recovery schedule for re-sequencing performance of the Work or other similar measures as defined as Extraordinary Measures in Paragraph 1.1 above. Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion as required by the Contract Documents. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with the Extraordinary Measures required by the County under or pursuant to this section. The County may exercise the rights furnished the County under or pursuant to this section as frequently as the County deems necessary to ensure that the Contractor's performance of the Work will comply with the Contract Time or interim completion dates set forth in the Contract Documents. If Contractor or its Subcontractors fail to implement or commence Extraordinary Measures within ten (10) calendar days of County's written demand, County may, without prejudice to other remedies take corrective action at the expense of the Contractor and shall reduce the Contract Sum.

2.8.2 Compensable Extraordinary Measures. County, in its discretion, may issue a written request to the Contractor asking Contractor to submit an itemized proposal for Extraordinary Measures in order to achieve early completion of all or a portion of the Work, due to no fault of the Contractor, in a form acceptable to County within ten (10) calendar days after County's issuance of the Acceleration Proposal Request.

2.9 Authority of the Department and Division

2.9.1 The Division shall represent the County and shall decide, within the provisions of the Specifications and Drawings, all questions which may arise concerning the quality or acceptability of materials furnished and Work performed.

2.9.2 All questions concerning substitutions, selections, materials, colors and textures shall be submitted to the Division for approval.

2.9.3 In all cases requiring interpretation of the Drawings and/or Specifications, the decision of the Division shall be final.

2.9.4 Final determination of the acceptable fulfillment of the Contract on the part of the Contractor shall be made by the Department.

2.9.5 The Director is authorized to represent the County regarding any suspension or termination of this Contract. The Board must approve any assignment of this Contract.

2.10 Authority of Board

The Board has the final authority in all matters affecting the Work.

2.11 Materials Furnished by County.

2.11.1 Materials furnished by the County will be available at locations designed in the Contract Documents, or if not designated in the Contract Documents, they will be delivered to a single location of County's choice within the Project area. They shall be hauled to the site of installation by the Contractor at its expense, including any necessary loading and unloading that may be involved. The cost of handling and placing materials furnished by the County shall be considered as included in the Contract Sum.

2.11.2 The Contractor will be held responsible for all materials furnished to it, and it shall pay all demurrage and storage charges. Furnished materials, after delivery to Contractor, lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the County for the cost of replacing lost or damaged furnished material and such costs may be deducted from any monies due or to become due the Contractor.

3 CONTRACTOR'S DUTIES AND RESPONSIBILITIES

3.1 General

The Contractor shall perform the Work in accordance with the Contract Documents. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the County, or of the County's Separate Contractors, in their administration of the Contract, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.2 Request for Information ("RFI")

If the Contractor encounters any condition which the Contractor believes, in good faith and with reasonable basis, is the result of an ambiguity, conflict, error or omission in the Contract Documents (collectively the "Conditions"), it shall be the affirmative obligation of the Contractor to timely notify the County, in writing, of the Conditions encountered and to request information from the County necessary to address and resolve any such Conditions. If the Contractor fails to timely notify the County in writing of any Conditions encountered and the Contractor proceeds to perform any portion of the Work containing or affected by such Conditions, the Contractor shall bear all costs associated with or required to correct, remove, or otherwise remedy any portion of the Work affected thereby without adjustment of the Contract Time or the Contract Sum. The Contract Time shall not be subject to adjustment in the event that the Contractor fails to timely request information from the County.

3.3 Supervision and Construction Procedures

3.3.1 Contractor's Means and Methods. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention, and provide sufficient supervision to assure proper coordination and timely completion of Project. The methods and means adopted by the Contractor shall be such as to secure a quality of Work satisfactory to the County and to enable the Contractor to complete the Work by the Contract Time. The Contractor shall be responsible for and have control over construction means, methods, techniques, sequences, and procedures for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences, or procedures may not be safe, the Contractor shall give timely written notice within ten (10) calendar days to the County, such notice shall include proposed changes by Contractor, and Contractor shall not proceed with that portion of the Work without further instructions from the County. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences, or procedures without acceptance of changes proposed by the Contractor, the County shall be solely responsible for any resulting loss or damage.

3.3.2 Contractor's Vicarious Liability. Contractor shall be responsible to County for acts and omissions of Contractor's employees, Consultants, Subcontractors, Sub-subcontractors, and their agents and employees, and any other persons or entities performing any of the Work under a direct or indirect contract (or other arrangement) with the Contractor.

3.3.3 Property Lines and Encroachments. If required by County, prior to the commencement of the Work on the Project Site, County shall have all property corners and benchmarks verified and established by a State licensed land surveyor, shall locate the Project, together with all grades, lines, and levels necessary for the Work, on the Project Site, establishing necessary reference marks from which the Work can progress accurately and shall furnish Contractor with reasonable evidence of such verification, noting any errors, inconsistencies, or omissions discovered during such verification. The Contractor shall not disturb survey monuments, lot stakes (tagged), or bench marks without the consent of the County. The Contractor shall bear the expense of replacing any that may be disturbed without permission. Replacement shall be done only under the direction of a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying within California. After all lines are staked out and before foundation Work is commenced, Contractor shall review with County the placement of all buildings and other permanent facilities to be constructed on the Site. Any encroachments resulting from the Contractor's locating or constructing the Work on adjacent properties to the Project Site as revealed by a survey of the foundations or an

"as-built" survey, except for encroachments arising from errors or omissions not reasonably discoverable by Contractor in the Contract Documents, shall be the sole responsibility of Contractor, and Contractor shall commence the remedy of such encroachments within thirty (30) calendar days after discovery thereof (unless circumstances require a more rapid response), at Contractor's sole cost and expense, either by the removal of the encroaching improvement (and the subsequent reconstruction of such improvement on the Project Site) or by agreement with the owner of the adjacent property, in a form and substance satisfactory to County in its sole discretion, providing a permanent easement for such encroachment.

3.3.4 Inspection of Work In Place. The Contractor shall be responsible for the inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.3.5 Contractor's Representative. Contractor shall employ competent Project Staff as deemed necessary by Contractor. Any Project Staff member and any replacement member shall be subject to the approval of the County. Upon notice from the County requesting replacement of any Project Staff member who is unsatisfactory to the County, Contractor shall in a timely manner, but in no event longer than twenty-four (24) hours after notification, replace such member with a competent member satisfactory to the County.

3.3.5.1 Superintendent. The Contractor shall provide an onsite full-time superintendent to assure proper coordination and timely completion.

3.4 Labor and Materials

3.4.1 Coordination. The Contractor shall coordinate its Work with that of all others on the Project including deliveries, storage, installations, and construction utilities. The Contractor shall be responsible for the space requirements, locations, and staging of its equipment in areas and locations approved by County. Where the proper and most effective space requirements, locations, and routing cannot be made as indicated in the Contract Documents, the Contractor shall meet with all others involved before installation to plan the most effective and efficient method of overall installation.

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

3.4.3 Labor Discipline. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks

assigned to them. Contractor shall not permit the possession or use of alcohol or illegal drugs on the jobsite nor shall the Contractor allow an employee, Subcontractor, material man, or any other person under the influence of alcohol or illegal drugs, or who is otherwise incapacitated to work on the Project.

3.4.4 Skilled Labor. None but skilled workmen shall be employed on any portion of the Work. When required in writing by the County, the Contractor, Subcontractor or Sub-Subcontractor shall discharge any person who is, in the reasonable opinion of the County, incompetent, unfaithful, disorderly or otherwise unsatisfactory, and shall not again employ such discharged person on the Work except with the written consent of the County. Such discharge shall not be the basis of any claim for compensation or damages against the County or any of its officers or agents.

3.4.5 Procurement and Installation of Materials and Equipment. Contractor shall: (i) place orders for all materials and equipment, taking into account current market and delivery conditions necessary to meet the Construction Schedule; (ii) purchase and expedite the procurement of long lead time items to obtain their delivery by the required dates; and (iii) arrange for alternate sources for the supply of critical materials and equipment to maintain the schedule. Should Contractor fail in this duty, County reserves the right to order such materials and equipment as the County may deem advisable to maintain the schedule for the Work or the Contract Time and all expenses shall be charged to and paid for by Contractor within the Contract Sum. Contractor shall keep the County informed of the status of procurement and shall promptly notify County in writing of any materials or equipment which may not be available within the time scheduled or necessary for the Project. The Contractor shall be responsible for the space requirements, locations, and routing of its equipment. In areas and locations where the proper and most effective space requirements, locations and routing cannot be made as indicated, the Contractor shall meet with all others involved, including, but not limited to, County, Architect, and Subcontractors before installation, to plan the most effective and efficient method of overall installation.

3.4.6 Substitution of Materials, Process or Equipment.

3.4.6.1 Whenever any particular material, process, or equipment is indicated in the Contract Documents by patent, proprietary, manufacturer or brand name, with or without the words “or equal”, only such items shall be provided unless the County’s prior written approval is obtained for the substitution. The burden of proving the quality of any material, process, or equipment proposed for substitution shall rest with the Contractor.

3.4.6.2 If any substitution request offered by the Contractor is not found to be equivalent or cannot be delivered to the Site in compliance with the Project Schedule, Contractor shall furnish and install the material specified in the Contract Documents.

3.4.6.3 Proposals for substitutions shall be submitted to the County using an approved format. Unless otherwise approved in writing by County, no substitution will be considered or allowed by the County without Contractor's delivery of the following to County:

(1) A full explanation of the proposed substitution and submittal of all supporting data including technical information, complete manufacturers catalogs, brochures, drawings, samples, warranties, certified copies of test results, installation instructions, operating procedures, and other descriptive information to substantiate Contractor's claim of equivalent quality and necessary for a complete evaluation of the proposal;

(2) A complete description of the difference between the requirements of the Contract Documents and the proposed substitution, the comparative advantages and disadvantages of each, and the reasons the substitution is advantageous and necessary, including the benefits of the County and the Work in the event the substitution is acceptable;

(3) A description of aspects of the Contract Documents affected by the proposal;

(4) The adjustment, if any, in the Contract Sum in the event the substitution is acceptable;

(5) The adjustment, if any, in the Contract Time and impact to the Construction Schedule;

(6) The estimated cost of any engineering, design, or agency fees required for Work of all trades directly or indirectly affected by the substitution;

(7) A list of projects, to the extent known, where the subject of the request was used and the results; and

(8) Other information reasonably necessary to fully evaluate the substitution request.

3.4.6.4 By submitting a substitution request, Contractor will be deemed to certify to the County that (i) the proposed substitution is equal to or exceeds all requirements of the pertinent Contract Documents as reasonably determined by Contractor; (ii) Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified; (iii) the cost data presented is complete and includes all related costs under Contract; (iv) Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects; (v) Contractor waives all

Claims for additional costs related to the substitution which subsequently become apparent; and (vi) Contractor accepts all responsibility for direct or indirect costs and/or time impacts as result of the substitution.

3.4.6.5 Contractor shall submit to County, or its designated representative (i.e. Architect) all requests for substitutions, including products to be reviewed as an approved equal, together with substantiating data, within 20 days after the award of the Contract, or as otherwise stated in the Contract Documents. Following commencement of construction, substitutions requested by the Contractor will be considered only when one or more of the following conditions are met and documented by Contractor:

(1) Specified item fails to comply with regulatory requirements; or

(2) Specified item has been discontinued by the manufacturer; or

(3) Specified item, through no fault of the Contractor, is unavailable in the time frame required to meet the Project Schedule; or

(4) Specified item, through subsequent information disclosure, will not perform properly or fit in designated space; or

(5) Manufacturer declares specified product to be unsuitable for intended use or refuses to warrant installation of product.

3.4.6.6 The County has reviewed the technical and aesthetic qualities of materials specified, and in no case will the County accept a substitution of a product with a lower cost which does not extend credit to the County.

3.4.6.7 No incomplete request for substitution will be considered by the County, and products for which insufficient information is submitted will be disapproved by the County for lack of substantiating data.

3.4.6.8 Failure of the Contractor to submit proposed substitutions for approval in the manner described may be deemed sufficient cause for disapproval by the County of any substitution otherwise proposed.

3.4.6.9 Contractor shall proceed with performance of the Work as required by the Contract Documents and shall not modify such requirements in accordance with any substitution request unless the County approves such request in a written order. In the event County approves a substitution request and Contractor furnishes a material, process or article more expensive than that specified, the difference in cost shall be borne entirely by Contractor. Any engineering, design fees or agency fees required to make adjustments in material or work of all trades directly or indirectly affected by the approved substituted item shall be borne entirely by Contractor.

3.4.7 Reference Standards. Any material specified by reference to the number, symbol, or title of a standard such as that of the American Society for Testing Materials ("ASTM"), Underwriters Laboratories, Factory Mutual, a product or commercial standard, or similar standards, shall comply with the requirements of the latest revisions thereof and any supplement or amendment thereto in effect on the date of the Contract. The standards referred to, except as specifically modified in the Specifications, shall have the same force as if they were printed in full within the Contract Documents. Whenever a product is specified in accordance with such a Reference Standard, the Contractor shall present a certification from the manufacturer and test data to substantiate compliance, when requested by the County or required by the Specifications, certifying that the product complies with the particular standard or specification.

3.4.8 Manufacturer's Instruction. Where it is required in the Contract Documents that materials, products, processes, equipment or the like be installed or applied in accordance with manufacturer's instructions, directions or specifications or words to this effect, it shall be construed to mean that said application or installation shall be in strict accord with current printed instructions furnished by the manufacturer of the material concerned for use under conditions similar to those at the jobsite. If there is a conflict between manufacturer's instructions and Applicable Law or the Contract Documents, Contractor shall notify County in writing to request clarification.

3.4.9 Workmanship, Materials and Manufactured Items. All workmanship, equipment, materials, and articles incorporated in the Work are to be of the most suitable grade of their respective kinds for the purpose; and equipment, materials, and parts shall be new, best quality, undamaged, and free from defects.

3.4.9.1 All materials to be incorporated in the Work shall be protected from damage during shipping, delivery, storage, and handling, and after installation until acceptance of the Work.

3.4.9.2 Material and work quality shall be subject to the Project Manager's approval.

3.4.9.3 Materials and work quality not conforming to the requirements of the Contract Documents shall be considered defective and will be subject to rejection.

3.4.9.4 Defective work or material, whether in place or not, shall be removed immediately from the Site by the Contractor, at its expense, when so directed by the Project Manager.

3.4.9.5 If the Contractor fails to replace any defective or damaged work or material after reasonable notice, the Project Manager may cause such work or

materials to be replaced. The replacement expense will be deducted from the amount to be paid to the Contractor.

3.5 Warranty and Correction

3.5.1 Warranty. The Contractor warrants to the County that: (i) materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents; (ii) the Work will be of good quality and free from defects; (iii) the Work will conform to the requirements of the Contract Documents; and (iv) Contractor will deliver a Project free of stop notice claims. Work not conforming to these requirements, including substitutions not properly approved by the County, shall be deemed defective. Contractor warranty excludes improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the County, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 12.2 herein.

3.5.2 Commencement of Correction Periods. In accordance with Paragraph 12.2 herein, in addition to warranties required elsewhere in the Contract Documents, Contractor shall, and hereby does, warrant all Work for a period of one (1) year commencing from the date of Final Completion of the Work and shall repair or replace any and all such Work, together with any other Work which may be displaced in so doing, that may prove defective in workmanship and/or materials, without expense whatsoever to County.

3.5.2.1 This paragraph does not in any way limit the warranty on any items for which a longer guarantee is specified, or on any items for which a manufacturer gives a warranty for a longer period.

3.5.3 No Limitation. Nothing contained in this Section shall be construed to establish a period of limitation with respect to other obligations that the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligation other than specifically to correct the Work. Neither the making of Final Payment nor the use or occupancy of the work, in whole or in part, by County shall constitute acceptance of Work not in accordance with the Contract Documents or relieve the Contractor from liability for faulty or defective Work.

3.5.4 Overlap. Where any warranties provided under the Contract Documents overlap, conflict, or are duplicative, Contractor shall be bound by the more stringent requirements.

3.5.5 County's Right to Correct. If Contractor fails to commence corrections within forty-eight (48) hours after receipt of written notice, County, under the provisions of Article 12 herein, will proceed to have defects repaired and made good at the expense

of Contractor and its performance bond surety, plus fifteen percent (15%) for County's overhead and administrative expense. County may charge such costs against any payment due Contractor. If, in the opinion of the County, defective work creates a dangerous or hazardous condition or requires immediate correction or attention to prevent further loss to the County or to prevent interruption of operations of the County, the County may take immediate action, give notice, make such correction, or provide such attention and the cost of such correction or attention shall be charged against the Contractor. Such action by the County will not relieve the Contractor of the warranties provided in this Section or elsewhere in the Contract Documents.

3.5.6 Procurement and Assignment of Warranties. Contractor shall obtain in the name of County, or transfer or assign to County or County's designee prior to the time of Final Completion of the Work, any and all warranties or guarantees which Contractor is required to obtain pursuant to the Contract Documents and which Contractor obtained from any other person or entity other than Contractor including, but not limited to, Subcontractors and manufacturers, and further agrees to perform the Work in such a manner so as to preserve any and all such warranties. Contractor shall secure written warranties from all Subcontractors in the form approved by County. Contractor and its Subcontractors shall offer any warranty upgrades or extensions that are offered by manufacturers of any equipment or system in the Project to the County.

3.5.7 Survival of Warranties. The provisions of this Paragraph 3.5 shall survive Contractor's completion of the Work or termination of Contractor's performance of the Work.

3.6 Taxes

3.6.1 Payment. The Contractor shall pay all applicable sales, consumer, use, and similar taxes for the Work provided by the Contractor and such taxes shall be included in the Contract Sum.

3.6.2 Liability for Employee Payments. Contractor accepts full liability for the payment of any and all contributions, deductions, or taxes for social security, unemployment insurance, old age and survivor's benefits, medical and health benefits, or for any other purpose not or hereafter imposed under any Applicable Law measured by the wages, salary or other remuneration paid to persons employed by or on behalf of Contractor for the Work. Contractor covenants and agrees to observe and fully comply with all Applicable Law, including procurement of any necessary occupational licenses, permits and inspection certificates.

3.7 Permits, Fees and Notices

3.7.1 Responsibility for Permits and Fees. Except for the permits, approvals, government fees, licenses and inspections which have been identified and designated elsewhere in the Contract Documents to be provided by the County, Contractor shall

identify and obtain all permits, certificates, licenses, fees, approvals and inspections necessary or required for the proper execution and completion of the Work, or which are customarily secured after execution of the Contract and shall submit to County copies of receipts for reimbursement within the Contract Sum. All such permits, licenses and certificates shall be delivered to the County before Contractor submits a final Application for Payment. Unless stated otherwise in the Contract Documents, the County will pay connection fees directly to the utilities for all permanent water and electrical connections.

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

3.7.3 Bonds. The Contractor shall procure and pay for all bonds required of the County by any public or private entity with jurisdiction over the project. Contractor shall prepare all applications, supply all necessary backup material, and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closings, traffic regulation, parking meter removal, and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

3.7.4 Compliance with Applicable Law.

3.7.4.1 Contractor is responsible to perform all Work in accordance with the requirements of local agencies and inspectors having jurisdiction over the Work. If the Contractor observes that any portions of the Contract Documents are at variance with Applicable Law, Contractor shall promptly notify the County in writing.

3.7.4.2 If the Contractor performs any Work when the Contractor knows or should have reasonably known it would be contrary to Applicable Law, Contractor shall assume full responsibility therefore and shall bear all costs (within the Contract Sum) directly or indirectly attributable to the correction of the Work. If Contractor fails to comply with any such codes, laws, ordinances, rules, and regulations, County may (without prejudice to any of its other rights or remedies) issue an order suspending all or any part of the Work.

3.8 Allowances

Contractor shall include in the Contract Sum and Schedule of Values all Allowances provided for in the Contract Documents. Items covered by Allowances shall be supplied for such amounts approved by Owner. All expenditures for Allowances shall be separately itemized in each Application for Payment and are subject to County's prior approval. County shall not reimburse Contractor for Allowance costs in excess of the amounts specified in the Schedule of Values without County's prior written approval of such costs.

3.9 Contractor's Key Personnel and Subcontractors

3.9.1 Contractor's Project Manager. The Contractor's Project Manager, as designated in the Agreement or as otherwise approved in writing by County, shall: (i) be present at the Project Site at all times that any Work is in progress and at any time that any Subcontractor or employee of Contractor is present at the Site; (ii) attend all job meetings; (iii) be actively involved throughout all phases of construction of the Project; (iv) maintain oversight of the Project at all times; (v) have full authority to represent and act on behalf of the Contractor for all purposes under this Agreement; (vi) supervise and direct the Work using his or her best skill and attention; (vii) be responsible for the means, methods, techniques, sequences, and procedures used for the Work; (viii) adequately coordinate all portions of the Work; and (ix) act as the principal contact with County and all Subcontractors and inspectors on the Project. A biography or resume of Contractor's Project Manager, or any proposed designee, shall be submitted to the County at the preconstruction meeting.

3.9.2 Contractor's Key Personnel. In addition to its designated Project Manager, Contractor represents to County that certain additional key personnel, designated in the Agreement or as otherwise approved in writing by County, including but not limited to, the superintendent, will perform services required by the Contract Documents. County may at any time elect to add job categories to the Contractor's key personnel list.

3.9.3 Changes in Contractor's Project Manager, Key Personnel and Subcontractors. Contractor shall not make changes to its Project Manager, key personnel or Subcontractors, or reduce their responsibilities for this Project without the prior written approval of the County. Prior to making any changes to the Project Manager, key personnel, or Subcontractors, the Contractor shall submit the qualifications and experience of the Contractor's proposed replacement for the County's approval. If County determines, in its sole discretion, that the performance of any person or entity employed by Contractor is unsatisfactory, then at the written request of County, Contractor shall remove, reassign, or replace such individual or entity without increase in the Contract Sum and such individual or entity shall not be reemployed on the Project without the prior written approval of County.

3.9.4 Qualifications and Licenses. Work furnished by or on behalf of Contractor shall be performed by persons: (i) qualified to perform the Work assigned to them; and (ii) licensed to practice their respective trades or professions where required by Applicable Law in the State where the Project is located. Contractor's Project Manager, key personnel, and Subcontractors shall be experienced in projects of similar nature and complexity to the Project and must provide County with resumes of education, training, and relevant experience whenever requested and shall be approved by County prior to their assignment to the Project.

3.10 Documents and Samples at the Site

3.10.1 As-Built and Record Documents. Contractor shall maintain at the Project Site and shall make available to County, one copy of the Contract Documents, Addenda, requests for information, bulletins, Change Orders and other Modifications to the Contract Documents, approved Construction Documents, Shop Drawings, Product Data, Samples and mock-ups, permits, inspection reports, test results, daily logs, schedules, subcontracts, and purchase orders in good order (the "Record Documents"). The Record Documents shall include a set of As-Built Construction Documents, which shall be continuously updated during the prosecution of the Work. The prints for As-Built Construction Documents will be a set of blackline prints produced by Contractor and approved by County at the start of construction. Contractor shall maintain said set in good condition and shall use colored pencils to mark-up said set with "record information" in a legible manner to show; (i) deviations from the County-approved Construction Documents made during construction; (ii) details in the Work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing Construction Documents; (iv) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings, and stubouts; and (v) such other information as County may reasonably request.

3.10.2 Condition to Payment. Contractor's obligation to keep Record Documents current, including As-Built Construction Documents, and to make them available to County is a condition precedent to County's duty to process Applications for Payment. The Contractor shall provide a written certification of this monthly review, signed by the County's Project Manager, and attach same to each Application for Payment. Within thirty (30) calendar days after Substantial Completion or earlier termination of the Agreement and as a condition precedent to Final Payment, Contractor shall provide final approved Record Documents including, but not limited to, As-Built Construction Documents and approved Shop Drawings. Contractor's obligations under Paragraph 3.10 shall survive completion of the Work or termination of Contractor's performance of the Work.

3.10.3 Daily Logs. Contractor shall maintain a daily log containing a record of weather, Contractor's own forces working on Site, Subcontractors working on the Site, number of workers for each Subcontractor on Site, materials delivered, Work accomplished, problems encountered and other similar relevant data as the County may reasonably require. The daily log shall be signed by Contractor's Superintendent, submitted within 24 hours (next working day) to County's Project Manager and shall be made available to others as directed by County.

3.11 Shop Drawings, Product Data and Samples

3.11.1 Shop Drawings. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor, Subcontractor, Sub-

subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

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

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

3.11.4 Purpose. Shop Drawings, Product Data, Samples, and similar submittals ("Submittals") are not Contract Documents. The list of required Submittals is designated in the Specifications. The purpose of these Submittals is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents, the way by which the Contractor proposes to conform to the information given and expressed in the Contract Documents.

3.11.5 Contractor's Submittals.

3.11.5.1 Prompt Submittals. The Contractor shall review for compliance with the Contract Documents, confirm, and deliver to the County, Submittals within the timeframes required by the Contract Documents and with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the County or of separate Contractors. Contractor's complete and timely submission of submittals in conformity with the Submittal Schedule (identified in the Specifications) is a material consideration of the Contract. In the event that the County reasonably determines that all or any portion of any Submittal fails to comply with the requirements of the Contract Documents and/or such Submittals are not otherwise complete and accurate so as to require re-submission more than one time, Contractor shall bear all costs (within the Contract Sum) associated with the review and approval of such resubmitted Submittals. No adjustment to the Contract Time or the Contract Sum shall be granted by the County to the Contractor on account of Contractor's failure to make timely submission of any Submittals.

3.11.5.2 Contractor's Confirmation of Submittals. After checking and verifying all field measurements and after complying with applicable procedures specified in the Specifications, Contractor shall submit to County in compliance with the Submittal Schedule for review and approval, or for other appropriate action, one (1) reproducible transparency (sepia) and four (4) opaque prints (unless otherwise specified in the Specifications) of all Shop Drawings and other Submittals, which shall bear a stamp or specific written indication that Contractor has satisfied Contractor's responsibilities under the Contract Documents with respect to the review of the Submittal. All Submittals will be identified as the County may reasonably require and shall include at a minimum the name of the Project, name of the Contractor, be numbered consecutively and referenced to the Project Drawings

or Specification section affected. Submittals shall be combined for singular assemblies, items or materials. The data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data in order to enable County to review the information as required.

(1) Before submission of each Submittal, Contractor shall have determined and verified quantities and dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed and coordinated each Submittal with other Submittals and with the requirements of the Work and the Contract Documents.

(2) Shop Drawings shall show in detail the size, sections, and dimensions of all members; the arrangement and construction of all connections and joints, and other pertinent details; also, all holds, straps, and other fittings required by other contractors for attaching their work. When required by the County, engineering computations shall be submitted. The Contractor shall be responsible for delivering copies of Shop Drawings to all other persons whose work is dependent thereon.

(3) At the time of each submission, Contractor shall give County specific written notice of each variation that the Submittal may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Submittal submitted to County for review and approval of each such variation.

(4) If the Shop Drawings or manufacturer's data show variations from the Contract Document requirements because of standard shop practice or other reason, the Contractor shall make specific mention of such variations in its letter of transmittal.

(5) By reviewing and submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and conditions related thereto, and has checked and coordinated the information contained within such Submittals with the requirements of the Work, of the Contract Documents and of the Shop Drawings for related Work.

3.11.6 Review by County. Unless Contractor is notified in writing of a specific need for an extended period of time due to the nature or extent of the Shop Drawings being submitted, County shall utilize its best efforts to complete Shop Drawing review within a maximum of ten (10) calendar days. Submittals made by Contractor which are not required by the Contract Documents may be returned without action by the County.

County's review and approval will be general and for compliance with design intent and information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents). Review of Shop Drawings shall not relieve the Contractor from the responsibility for proper fitting and construction of the Work, nor from furnishing materials and work required by the Contractor which may not be indicated on the reviewed Shop Drawings. 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 County, and shall return the required number of corrected copies of Submittals and submit as required new Submittals for review and approval. Contractor shall direct specific attention in writing to any and all revisions other than the corrections called for by County on previous Submittals.

3.11.7 Performance. The Contractor shall perform no portion of the Work requiring review of Submittals until the County has reviewed the respective Submittal. Such Work shall be in accordance with the approved Submittals and the Contract Documents, and no Work shall be started without obtaining prior written approval from the County.

3.11.8 Approved Submittals. The Work shall be performed in accordance with approved Submittals and the Contractor shall not be relieved of responsibility for variations from requirements of the Contract Documents by the County's approval of Shop Drawings, Product Data, Samples, or similar submittals unless the Contractor has specifically informed the County in writing of such deviation at the time of submittal and a Change Order or Construction Change Directive has been issued, authorizing the variations. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the County's approval thereof.

3.11.9 Resubmission. Contractor shall direct specific attention, in writing, on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those required by the County on previous submittals. In the absence of such written notice the County's approval of a resubmission shall not apply to such revisions.

3.11.10 Conflicts, Errors or Omissions. If Contractor discovers any conflicts, omissions, or errors in Shop Drawings or other submittals, Contractor shall notify the County and receive written instruction before proceeding with the affected Work.

3.11.11 Maintenance at Site. The Contractor shall maintain at the Site of the Project, at all times, a complete file of County reviewed Shop Drawings and manufacturers' data of his own and all Subcontractors.

3.12 Site Conditions

3.12.1 The Contractor represents that it has taken the necessary steps to ascertain the nature, location and extent of the Work, and that it has investigated and satisfied itself as to the general and local conditions which are applicable to the Work, such as:

(1) conditions bearing on transportation, disposal and storage of materials;
(2) the availability of labor, water, power and roads;
(3) normal weather conditions;
(4) physical conditions at the Site;
(5) the conditions of the ground;
(6) the character of equipment and facilities needed prior to and during the performance of Work

3.12.2 To the extent the Contractor encounters subsurface conditions or hazardous materials which differ materially from that actually known by the Contractor, or from those ordinarily known to exist or contained in information about the Site made available to Contractor prior to the deadline to submit bids, or generally recognized as inherent in the area, then notice by the Contractor shall be immediately given to the County, before conditions are disturbed, and in no event later than two (2) business days after the first observance of the conditions. If such conditions could not have been reasonably identified by Contractor's Site investigations and available existing data, and the Contractor incurs an increase or decrease in costs or delays as a result of such concealed conditions, such conditions may be subject to a Change Order.

Should any existing utilities or services be disturbed, disconnected or damaged during construction, the Contractor shall be responsible, at no additional cost or time to the County, for all expenses and consequential damages of whatever nature arising from such disturbance or the replacement or repair thereof and shall repair such items as required to maintain continuing service, including emergency repairs.

3.12.3 The Contractor is responsible for foreseeable site conditions and toxic materials to the extent described in the Contract Documents and/or could be reasonably inferred by the Contractor based on its experience and expertise on similar projects.

3.12.4 Reserved.

3.12.5 The Contractor shall verify the location and depth (elevation of all existing utilities and services before performing excavation Work.

3.13 Use of Site

3.13.1 Site Constraints. Prior to mobilization on the Project Site, the Contractor shall submit to the County for approval a Site Constraint Plan including layout drawings to scale as required to fully describe the proposed locations of all temporary construction facilities and controls. This plan shall show the proposed activities in each portion of the Work area and identify the areas of limited use or nonuse. This plan shall also show

proposed vehicle access routes and traffic control. Contractor shall confine operations at the Project to the areas designated in the Contract Documents and the approved Site Constraint Plan and within the hours permitted by codes, laws, ordinances, permits, or the County, and shall not unreasonably encumber the Project Site or the adjoining sidewalks, streets, and alleyways with any material, equipment, or debris. In that regard, Contractor shall keep the Site and surroundings clean and in a safe condition in accordance with Paragraph 3.15 herein and the Specifications. Contractor shall use only those locations designated on the approve Site Construction Plan for locating Contractor's trailers, staging areas, lay-down areas, and other construction operations. The Contractor shall not unreasonably encumber the Site with any materials or equipment, nor permit any persons on the Site, or any activity at the Site, except as the presence of those persons, or that activity, is directly related to the Project. The Contractor shall be liable for any and all damage cause by it to the County premises.

3.13.2 Coordination. Contractor expressly acknowledges that County, its own forces, and County's Separate Contractors may be working simultaneously with Contractor on the Project during certain periods of time in certain portions of the Project Site. Contractor and County will take all steps necessary in connection with the construction Work not to interfere with the use and occupancy of the Project Site by County's Separate Contractors and personnel to minimize any interruption of services to such person, including, without limitation, utilities, ingress and egress, and parking. Contractor further agrees to coordinate its construction activities with all others performing work on the Project Site, including deliveries, storage, and installation. Contractor shall meet and consult with County from time to time at County's request to insure that Contractor and County are fully advised of all other construction activities on the Project Site, and Contractor shall take such steps as are reasonably necessary at County's request to coordinate its Work with the Work of County's Separate Contractors on the Project Site.

3.13.3 Security. The Contractor shall be responsible for providing security at the Site of the Work with all such costs included in the Contract Sum. A temporary fence shall surround the Project Site unless otherwise required by County. All security provided by Contractor shall be coordinated with County's existing security personnel, if any. In addition, the Contractor shall take all necessary precautions and provide enclosures, barricades, security guards, signs, notices, shoring, bracing, passageways, lights, and such other materials, equipment, and services as may be required (including, without limitation, such protections as may be required by Applicable Laws) for the protection of: (i) all person who may be on the Project Site or in other areas affected by the Contractor's operations; and (ii) the County's and any third party's personal and real property. Contractor shall execute all repairs to land, roadways, structures, utilities, sidewalks, parkways and alleys damaged by the operations under this Contract.

3.13.4 Utility Interruption. When it is necessary to interrupt any existing utility service, a minimum of fourteen (14) calendar days advance written request for interruption of services shall be given by the Contractor to the County. Interruption of

these services shall be of the shortest possible duration and shall be approved by the County in advance of such interruption. In the event that such notices and approvals are not secured prior to interruption in utility services the Contractor shall be financially liable for any and all damages suffered by the County and third parties due to unauthorized interruption.

3.13.5 Parking. The Contractor shall coordinate and obtain all construction related parking. The cost of all Contractor parking shall be included in the Contract Sum.

3.14 Cutting and Patching

3.14.1 Responsibility. Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

3.14.2 Separate Contractors. Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the County or County's Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. Contractor shall not cut or otherwise alter such construction by the County or a Separate Contractor except with written consent of the County.

3.14.3 Finish Surfaces. Cutting, drilling or other mechanical change to surfaces constituting final finish, including but not limited to, glass, marble, tile mosaic, finish wood, finish metals, etc., necessary for the fastening, installation, securing, and/or insertion of any devices, equipment, and/or materials shall be accomplished with special care. If requested by the County, Contractor shall submit procedures for finish changes to be done by any trades other than the one installing the specific finish material. Failure to obtain County approval shall place full responsibility upon the Contractor for any extra cost occasioned by unacceptable finish-surface.

3.15 Cleaning Up

3.15.1 Continuous Obligations. The Contractor shall keep the Project Site and surrounding area free from accumulation of waste materials or rubbish at all times. As construction is completed on a daily basis, paved surfaces adjoining the Project shall be broomed clean and other surfaces of the Project Site raked clean. If the Contractor defaults or neglects to maintain the Project free from accumulation of waste and rubbish as set forth above, and fails within a twenty-four (24) hour period after receipt of oral notice, subsequently confirmed in writing, to commence and continue correction of such default or neglect with diligence and promptness, the County may after such twenty-four (24) hour period, immediately, without prejudice to other remedies the County may have, correct such deficiencies. In such case, an appropriate Construction Change Directive shall be issued deducting from payments then and thereafter due the Contractor the cost of correcting such deficiencies. If payment then and thereafter due the Contractor is not sufficient to cover such amounts, the Contractor shall pay the difference to the County on demand.

3.15.2 Cleaning and Environmental Controls.

(1) Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
(2) Remove waste materials, debris and rubbish from site and dispose off site legally.
(3) The Contractor shall take appropriate action to insure that no dust originates from the Project Site.
(4) Spoil sites shall not be located where spoil shall be washed back into a street gutter, storm drain, runoff conveyance or ocean.
(5) Water containing mud, silt, or other pollutants from activities, shall not be allowed to enter the ocean or placed in locations that may be subject to storm runoff.

3.15.3 Water Pollution Control. Contractor must comply with all requirements of the California State Water Resources Control Board, including the statewide General Permit for Discharges of Storm Waters Associated with Construction Sites (See Order No. 2009-0009-DWQ). This includes, but is not limited to, paying all appropriate fees, filing all required documentation, and complying with all the regulations of the State Water Resources Control Board.

As part of the County's Storm Water Management Program, implementation of minimum Best Management Practices (BMPs) is required for this Contract. The Contractor is directed to comply with applicable requirements of the BMPs that are specified under this section to reduce pollutants from entering the storm drain system.

The Contractor shall maintain copies of these BMP fact sheets (guidance paper) at the Project Site and shall make these fact sheets available during construction activities. Best Management Practices shall be defined as any program, technology, progress, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution. These BMPs have been selected from the California Storm Water Best Management Practice Handbook, Municipal Industrial, and Construction Volumes (May 1993). These handbooks contain a full description of each BMP and provide for its implementation. Copies of the handbook may be obtained from:

San Bernardino County
Environmental Management Division
825 East Third Street – Room 201
San Bernardino, CA 92415-0835
Telephone No. (909) 387-8112

As a minimum, the Contractor shall implement the following BMPs in conjunction with all its activities construction operations:

B.1. Site Planning Consideration
Preservation of Existing Vegetation (ESC02)
B.2. Construction Practices
Structure Construction and Painting (CA03)
Spill Prevention and Control (CA12)
Dust Control (ESC21)
Storm Drain Inlet Protection (ESC54)

B.3. Vehicle & Equipment Management
Vehicle & Equipment Cleaning (CA30)
Vehicle & Equipment Maintenance (CA32)
B.4. Material Management
Solid Waste Management (CA20)
Concrete Waste Management (CA23)
Sanitary/Septic Waste Management (CA24)

3.15.3.1 Additional BMPs. Contractor may be required to implement additional BMPs as a result of a change in actual field conditions, Contractor activities, or construction operations. When more than one BMP is listed under each category, the Contractor shall select the appropriate and necessary BMPs in order to achieve the BMP objective.

3.15.3.2 Enforcement. The County, as a permittee, is subject to enforcement actions by the Regional Water Quality Control Board, U.S. Environmental Protection Agency, environmental groups and private citizens. The Contractor shall be responsible for the costs and for any liability imposed by law as a result of the Contractor's failure to comply and/or less than complete implementation with the requirement set forth in this section "Water Pollution Control". Cost and liabilities include, but are not limited to, fines, penalties and damages whether assessed against the County or the Contractor. In addition to any remedy authorized by law, so much of the money due to the Contractor under the Contract that shall be considered necessary by the County may be retained by the County until disposition has been made of the costs and liabilities.

3.15.3.3 Maintenance. Contractor shall ensure the proper implementation and functioning of BMPs control measures, and shall regularly inspect and maintain the construction site for the BMPs identified in Section 3.15.3 above. The Contractor shall identify corrective actions and time frames to address any damaged measures or reinitiate any BMPs that have been discontinued.

3.15.4 Final Completion. In order to achieve Final Completion of the Work, the Contractor must remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials as well as the requirements set forth in the Contract Documents. In addition to the general cleaning, the Contractor must perform the following special cleaning requirements:

(1) Remove putty stains from glazing, then wash and polish glazing;
(2) Remove marks, stains, fingerprints, and other soil or dirt from glass, painted, stained, or decorated work;
(3) Remove temporary protection and clean and polish floors and waxed surfaces;
(4) Clean and polish hardware and plumbing trim; remove stains, dust, dirt, plaster, and paint;

(5) Remove spots, soil, plaster, and paint from tile work, and wash tile;
(6) Clean all fixtures and equipment, remove excess lubrication, clean light fixtures and lamps, polish metal surfaces;
(7) Vacuum-clean carpeted surfaces and remove any stains; and
(8) Remove debris from roofs, downspout, and drainage system.

3.16 Access to Work

The Contractor shall provide the County and its respective Project Managers, Consultants, and other persons authorized by the County, access to the Work in preparation and progress wherever located. Contractor shall provide safe and proper facilities for such access and for inspection.

3.17 Royalties, Patents and Copyrights

3.17.1 Contractor Must Secure Rights. The Contractor shall secure in writing from all patentees, copyright holders, and assignees of all Project-related documents, all copyrights, assignments, and licenses related to such expression (e.g., designs, drawings, Contract Documents, specifications, documents in computer form, etc.) as necessary to allow the County the full, unlimited, and unencumbered use of that expression for the execution, operation, maintenance, modernization or expansion of the Project. The Contractor shall immediately convey all such copyrights, assignments, and licenses to the County without reservation. In the case of products, materials, systems, etc., protected by patent, the Contractor shall not specify or cause to be specified any infringing use of a patent. The Contractor shall pay all royalties and license fees.

3.17.2 Infringement. Should the Contractor become aware of or receive notice of potential infringement of any intellectual property right related to the Project, regardless of the source of that awareness or notice, in addition to its indemnity obligation, the Contractor shall (a) immediately cease the copying and any other activity which is the potential source of infringement; and within seven (7) calendar days (b) investigate the potential infringement; (c) submit to the County copies of all documents relating to that awareness, the notice, or the object thereof; and (d) issue to the County a complete written response and analysis of the potential infringement and the course of action recommended by the Contractor. The Contractor shall submit to the County a supplement of the initial report within seven (7) calendar days of the Contractor's receipt of, or awareness of, additional related information. Nothing in this Agreement shall be deemed to relieve the Contractor of its obligations under this Article, nor shall the County's receipt of the information indicated in this Article give rise to any duty or obligation on the part of County.

3.17.3 Assignment of Rights. The Contractor offers and agrees to assign to the County all rights, title and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act [Chapter

2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code of the State of California], arising from purchases of goods, services or materials pursuant to the performance of the Work. This assignment will be made and become effective at the time the County tenders Final Payment to the Contractor, without further acknowledgement by the Parties.

3.18 Indemnification

To the fullest extent possible permitted by law, Contractor assumes liability for and agrees, at the Contractor's sole cost and expense, to promptly and fully indemnify, defend (with counsel reasonably approved by County) (even if the allegations are false, fraudulent, or groundless), and hold harmless the County and its authorized officers, employees, agents and volunteers (Indemnitees) from and against any and all claims (including claims against the County seeking compensation for labor performed or materials used or furnished to be used in the work or alleged to have been furnished on the project, including all incidental or consequential damages resulting to the County from such claims), allegations, actions, suits, arbitrations, administrative proceedings, regulatory proceedings, or other legal proceedings, demands, losses, costs, damages, judgments, liens, stop notices, penalties, anticipated losses of revenue and/or liability, and expenses (including, but not limited to, any fees of accountants, attorneys, experts or other professionals, or investigation expenses) arising out of, resulting from, or in any way (either directly or indirectly) related to the contract, the work, the project or any breach of the Contract by Contractor (or any of its officers, agents, employees, subcontractors, or any person performing any of the work, or from any cause whatsoever, including the acts, errors or omissions of any person and for any costs or expenses incurred by the Indemnitees on account of any claim except where such indemnification is prohibited by law. This indemnification provision shall apply regardless of the existence or degree of fault of indemnitees. The Contractor's indemnification obligation applies to the Indemnitee's "passive" negligence but does not apply to the Indemnitee's "sole" or "active" negligence or "willful misconduct" within the meaning of Civil Code section 2782 provided such "active" negligence or "willful misconduct" is determined by agreement of the parties or by findings of a court. In instances where an Indemnitee's "active" negligence accounts for only a percentage of the liability for the claim involved, the obligation of the Contractor will be for that entire percentage of liability for the claim not attributable to the "active" negligence or "willful misconduct" of the Indemnitees. The County shall be consulted with regard to any proposed settlement.

The duty of the Contractor to indemnify and hold harmless the Indemnitees includes the separate and independent duty to defend the Indemnitees, which duty arises immediately upon receipt by Contractor of the tender of any claim from the County. The Contractor's obligation to defend the County shall be at Contractor's sole expense, and not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determines that the Contractor is not liable. The duty to defend shall apply whether or not a claim has merit or is meritless, or which involves claims or allegations that any or all of the Indemnitees were actively, passively, or concurrently negligent, or which otherwise asserts that the Indemnitees are responsible, in whole or in part, for any claim. The Contractor shall

respond within thirty (30) calendar days to the tender of any claim for defense and/or indemnity by the County, unless the County agrees in writing to an extension of this time. The defense provided to the Indemnitees by Contractor shall be by well qualified, adequately insured, and experienced legal counsel acceptable to the County Counsel.

It is the intent of the parties to the Contract that the Contractor and its subcontractors of all tiers shall provide the Indemnitees with the broadest defense and indemnity permitted by law. In the event that any of the defense, indemnity, or hold harmless provisions are found to be ambiguous, or in conflict with one another, it is the parties' intent that the broadest and most expansive interpretation in favor of providing defense and/or indemnity to the Indemnitees be given effect.

Contractor shall ensure, by written subcontract agreement, that each of Contractor's subcontractors of every tier shall protect, defend, indemnify and hold harmless the Indemnitees with respect to all claims arising out, in connection with, or in any way related to each such subcontractor's work in the same manner in which Contractor is required to protect, defend, indemnify, and hold the Indemnitees harmless. In the event Contractor fails to obtain such defense and indemnity obligations from its subcontractors as required herein, Contractor agrees to be fully responsible to the Indemnitees according to the terms of this Section.

Contractor's indemnification and defense obligations set for in this Section are separate and independent from the insurance requirements and do not limit, in any way, the applicability, scope, or obligations set forth in such insurance requirements. The purchase of insurance by the Contractor with respect to the obligations required herein shall in no event be construed as fulfillment or discharge of such obligations.

Contractor's obligations under this Section are binding on Contractor's and its subcontractors' successors, heirs and assigns and shall survive the completion of the work or termination of the Contractor's performance of the work.

3.19 Signs and Advertising

Contractor shall not place or maintain any advertising signs, bills, or posters, nor shall it allow the same to be placed in or about the Project Site, or on any structure, fence, or barricade located on the Project Site, except as may be specified herein or approved in writing by the County, which approval shall not be unreasonably withheld, delayed, or conditioned. County shall have the right to reasonably approve the size, style, text, and location of any Contractor sign placed on the Project Site or on any structure, fence, or barricade located at the Project Site. Notwithstanding any other provision of the Contract Documents, County shall have complete discretion with respect to placement of Subcontractor and Sub-subcontractor signs on the Project Site.

3.20 Coordination with Neighboring Property

Contractor shall coordinate with adjoining property businesses, tenants, and their customers and contractors to provide access to neighboring property and shall implement measures to minimize disruption to operations and occupancy of neighboring property businesses, tenants, and their customers and contractors.

3.21 Nondiscrimination

During the term of the Contract, Contractor shall not discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, sexual orientation, age, or military and veteran status. Contractor shall comply with Executive Orders 11246, 11375, 11625, 12138, 12432, 12250, 13672, Title VII of the Civil Rights Act of 1964, the California Fair Housing and Employment Act and other applicable Federal, State and County laws and regulations and policies relating to equal employment and contracting opportunities, including laws and regulations hereafter enacted.

Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

3.22 Mandatory Provisions in Specifications

Any mention in the sections of the Specifications or indication on the Drawings of articles, materials, operations, or methods requires that the Contractor provide each item mentioned or indicated, or quality or subject or qualifications noted. The Contractor shall perform according to conditions stated each operation prescribed; and provide therefore all necessary labor, equipment, transportation and incidentals, even though such mention of articles, materials, operations, methods, quality, qualifications or conditions is not expressed in complete sentences.

3.23 Plans and Specifications

3.23.1 Unless otherwise provided in the Contract Documents, the County will furnish the Plans and Specifications to the successful Contractor on electronic media (CD) at no cost. If the successful Contractor requires a paper copy of the Plans and Specifications the Division will provide one copy without charge. Any additional paper copies will be provided by the Division to Contractor at $0.10 per page.

3.23.2 Familiarity with Plans and Specifications.

3.23.2.1 Contractor shall carefully examine the Contract Documents, all applicable codes and the Site. The submission of a bid shall be conclusive evidence that the Contractor has investigated and has personal knowledge of the conditions to be encountered as to character, quality, scope of Work to be performed, and quantities of materials to be furnished. Submission of a bid also infers that the Contractor has

knowledge of the use to which the Work is to be put, and the climatological conditions to which it shall be exposed. Any uncertainties by the Contractor shall be submitted to the County in writing at least eight (8) days (or within the time designated in the Advertisement for Bids, Instructions to Bidders, or otherwise in Bid Documents) prior to the opening of bids, and failure to do so constitutes a waiver of any future claim.

3.23.2.2 It shall be the responsibility of Contractor to be so thoroughly familiar with all details of the Project, including all Contractor and Subcontractor work, that the following shall be brought to the attention of the County for clarification in sufficient time to give the County time to respond before an error is made in the bid or in construction:

(1) Errors and omissions in the Drawings and Specifications;

(2) Work shown on the Drawings or in the Specifications which, if so constructed, would result in confusion or interference with other work or the work of other trades, including the location of fixtures and equipment.

(3) Any noted violations of applicable codes.

3.23.2.3 Changes to the Contract Sum will not be approved for the cost of correction work where such work could have been avoided by proper examination of the Drawings and Specifications by the Contractor, and the Work will be held in abeyance pending instructions from the County.

3.23.3 Interpretation of Plans and Specifications.

3.23.3.1 In general, the Drawings will show dimensions, positions, and kind of construction; and the Specifications will define materials, quantities, and methods. Any Work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both. Work not particularly detailed, marked or specified, shall be the same as similar parts that are detailed, marked or specified.

3.23.3.2 Every part of the Work, as shown on the Drawings and described in the Specifications, must be complete and finished. No deviations are to be made from the Drawings or Specifications without previously obtaining written authorization from the County. Failure to obtain such written clarification from the County will constitute waiver of any claim by Contractor related to such conflict or inconsistency.

3.23.3.3 The Drawings shall be accurately followed as to scale, except where figures are given to determine dimensions, which in all cases shall be calculated from figures shown on the Drawings and take preference to scale measurements. Large scale details take precedence over small drawings in all cases, full-scale drawings have preference. Obvious discrepancies between scale and figured

dimensions, not marked "not to scale," must be brought to the County's attention before proceeding with the Work affected by the discrepancy. Failure to submit any such discrepancies in writing shall constitute a waiver of future claims.

3.23.3.4 Architectural and structural Drawings take precedence over electrical and mechanical Drawings in regard to location and arrangement of fixtures, outlets, and equipment. Electrical and mechanical Drawings take precedence in describing and specifying equipment and in describing the diagrammatic requirements. If the Contractor has any question regarding precedence noted in this Paragraph, a written clarification shall be obtained from the County, and the failure to do so constitutes a waiver of any claim.

3.23.3.5 Should an error or inconsistency be found in the Specifications or Drawings, or in the Work done by others affecting Contractor's Work, the Contractor shall notify the County at once, and the County will issue instructions as to procedure. If the Contractor proceeds with the Work so affected without such instructions, it will make good any resulting damage or defects in his or adjacent work. This includes typographical errors in the Specifications and notational errors on the Drawings where doubtful of interpretation.

3.23.3.6 The general character of the detailed Work is shown on the Drawings, but minor modifications may be made in details when needed to more fully explain the Work and the same shall be considered part of the Contract. Should any detail submitted after award of Contract, in the opinion of the Contractor, be more elaborate than the scale Drawings and the Specifications indicate, written notice thereof shall be given to the County prior to the performing the Work pursuant to Article 7. The claim will then be considered and, if justified, said detail drawings will be amended or the extra work authorized. Contractor's failure to provide the County with the required notice shall relieve the County of any claim.

3.23.3.7 Where on any Drawing a portion of the Work is drawn out and the remainder is indicated in outline, the drawn-out parts shall apply also to all other like portions of the Work. Where ornament or other detail is indicated on starting only, such detail shall be continued throughout the course of parts in which it occurs and shall also apply to all other similar parts in the Work unless otherwise indicated.

3.23.4 Accuracy of Plans and Specifications

3.23.4.1 Omissions from the Plans and Specifications shall not relieve the Contractor from the responsibility of furnishing, making, or installing all items required by law or code or usually furnished, made or installed in a project of the scope and general character indicated by the Plans and Specifications.

3.23.4.2 The topography of Site and existence and location of utilities indicated on Plans are in accordance with the best information obtainable, but cannot be

guaranteed. They shall be investigated and verified at the Site by the Contractor before starting the Work. The Contractor shall be held responsible for any damage to, and for maintenance and protection of, existing utilities, fences and remaining structures.

3.23.5 Division of Specifications.

For convenience, the Specifications are arranged in various trade sections, but such segregation shall not be considered as limiting the Work of any Subcontractor or trade. The Contractor shall be solely responsible for all Subcontractor arrangements of the Work regardless of the location or provision in the Specifications.

3.24 Contractor Responsibility

The Contractor shall be responsible for all acts and omissions of Contractor's agents, employees, and Subcontractors and their respective agents and employees.

3.25 Meetings

Construction meetings shall be held at the jobsite as scheduled by the County's Project Manager or as requested by the Contractor. Details regarding jobsite meetings will be arranged at the pre-construction conference.

3.26 Sanitation and Power Supply

3.26.1 Sanitation.

Adequate sanitary conveniences of an approved type for the use of persons employed on the Site, and properly secluded from the public observation, shall be provided and maintained by the Contractor in such a manner and at such points as shall be required by the County. These conveniences shall be maintained at all times without nuisance and their use shall be strictly enforced. Upon completion of the Work, they shall be removed from the premises, leaving the premises clean and free from nuisance.

3.26.2 Power Supply.

All electrical power required for construction uses or other purposes shall be provided by the Contractor at Contractor's expense.

3.27 Clean Air Act, Clean Water Act, Environmental Protection Agency, Energy Efficiency, and California State Water Resources Control Board

During the performance of this contract, the Contractor and all Subcontractors shall:

3.27.1 Comply with all applicable standards, orders, or requirements issued under the Clean Air Act of 1970 (including section 306), including all amendments, and all regulations implementing the Clean Air Act.

3.27.2 Comply with all applicable standards, orders, or requirements issued under the Clean Water Act of 1972 (including section 508), including all amendments, and all regulations implementing the Clean Water Act.

3.27.3 Comply with all applicable standards, orders, or requirements issued under Environmental Protection Agency regulations.

3.27.4 Comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163), including all amendments, and all regulations implementing the Energy Policy and Conservation Act.

3.27.5 Comply with all requirements of the California State Water Resources Control Board, including the statewide General Permit for Discharges of Storm Waters Associated with Construction Sites (See Order No. 2009-009-DWQ). This includes, but is not limited to, paying all appropriate fees, filing all required documentation, and complying with all the regulations of the State Water Resources Control Board.

3.28 Travel Management Policy

Contractor shall adhere to the County's Travel Management Policy (08-02 and 08-02SP1) when travel is pursuant to this Contract and for which reimbursement is sought from the County. In addition, Contractor is encouraged to utilize local transportation services, including but not limited to, the Ontario International Airport.

3.29 California Air Resources Board (CARB) In-Use Off-Road Diesel-Fueled Fleets Regulation Compliance Certification

This Project is subject to the California Air Resources Board (CARB) approved amendments relating to In-Use Off Road Diesel-Fueled Fleets found at California Code of Regulations Title 13, sections 2449, 2449.1, and 2449.2 (the "Regulations"). The Regulations require a Prime Contractor, bidding on a public works project to be awarded by any public works awarding body, to certify that the Contractors off-road diesel-fueled fleets comply with CARB regulations. Section 2249(b) includes a list of off-road diesel-fueled fleets subject to these regulations. It is the responsibility of the Contractor to verify if their fleet is subject to these regulations.

Contractor is required to obtain and submit Certificates of Reported Compliance from all subcontractors that are listed in the bid submission.

Contractor shall provide the County its CARB compliance certificates, unless the Contractor confirms that no equipment subject to the regulation will be used to execute the Contract Work. By executing the Contract, Contractor hereby certifies that it is aware of the requirements set forth in Sections 2449, 2449.1, and 2449.2, Title 13, California Code of Regulations and Contractorand its subcontractors shall comply with sections 2449, 2449.1, 2449.2 of Title 13 of the California Code of Regulations, including by providing Certificate(s) of Reported

Compliance for In-Use Off-Road Diesel-Fueled Fleets for the fleet selected for the contract and their listed subcontractors, if applicable.

Contractor shall not enter into a contract with a fleet for which it does not have a valid Certificate of Reported Compliance for the fleet and Contractor's listed subcontractors, if applicable, prior to entering into a new or renewed contract with that fleet. Contractor shall only allow fleets with valid Certificates of Reported Compliance on Contractor's job sites. The Certificates of Reported Compliance received by the Contractor for this Project must be retained for three (3) years after the Project's completion. Upon request by CARB, these records must be provided to CARB within five (5) business days of the request. Between March 1 and June 1 of each year, Contractor must collect new valid Certificates of Reported Compliance for the current compliance year, as defined in Regulation Section 2449(n), from all fleets that have an ongoing contract with the Contractor as of March 1 of that year. Contractor must not write contracts to evade this requirement.

If Contractor discovers that any fleet intending to operate vehicles subject to the Regulation for Contractor does not have a valid Certificate of Reported Compliance, as defined in Regulation section 2449(n), or if Contractor observes any noncompliant vehicles subject to the Regulation on Contractor's job site, then Contractor must report the required information to CARB within the time period contained in in the Regulations.

Upon request by CARB, Contractor must immediately disclose to CARB the name and contact information of each responsible party for all vehicles subject to the Regulation operating at the job site or for Contractor. If applicable, Contractor shall prominently display signage for any project where vehicles subject to the Regulation as provided and within the time period contained in the Regulation.

Situations in which prime contractors or public works awarding bodies, as applicable, are contracting for projects that are considered emergency operations, as defined in section 2449(c)(18), are exempt from the requirements in section 2449(i)(1)-(3), but must still retain records verifying vehicles subject to the regulation that are operating on the emergency operations project are actually being operated on the project for emergency operations only. These records must include a description of the emergency, the address or a description of the specific location of the emergency, the dates on which the emergency operations were performed, and an attestation by the fleet that the vehicles are operated on the project for emergency operations only.

Contractor shall complete and return the "California Air Resources Board (CARB) In-Use Off-Road Diesel-Fueled Fleets Certification of Compliance" form included with the Project Documents.

4 ADMINISTRATION OF THE CONTRACT

4.1 County's Project Representative

The County's Project Manager identified by the County in writing is the County's Project Representative. The County's Project Manager shall serve as a single point transmission of County's instructions and approvals, and receive all information required to be provided by Contractor. County's Project Manager shall be on-site on an as-needed basis to monitor progress, quality of work, and Contract and schedule compliance.

4.2 Administration of the Contract

4.2.1 Site Visits. The County's Project Manager will visit the Site at intervals appropriate to the stage of the Contractor's operations to become familiar with the progress and quality of the portion of the Work completed and to determine if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents.

4.2.2 No Estoppel. Neither the County nor its Project Manager will be responsible for Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The County and its Project Manager will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. Approval and/or acceptance of all or any portion of the Work shall in no way relieve the Contractor from its obligation to construct each portion of the Work in accordance with the Contract Documents and the County shall not be estopped or otherwise prevented from asserting any claim it might have against the Contractor as a result of any such acceptance or approval.

4.2.3 Determination of Payment Amounts by Project Manager. The County's Project Manager will review Contractor’s Application for Payment and determine the amount of payment due Contractor.

4.2.4 Rejection of Work Testing and Inspection. The County has the authority to reject Work that does not conform to the Contract Documents. Whenever the County considers it necessary or advisable, it will require inspection or testing of the Work in accordance with Paragraph 15.5 below, whether or not such Work is fabricated, installed or completed. However, neither this authority nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the County to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

4.2.5 Submittal Review. The County will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data, and Samples.

4.2.6 Contract Modifications. The County's Project Manager will prepare Change Orders, Construction Change Directives, and written amendments to the Contract. All

Change Orders, Construction Change Directives, and written amendments to the Contract involving changes in the Contract Sum or Contract Time require approval by Director and/or Board.

4.2.7 Substantial Completion and Project Closeout. The County's Project Manager will conduct inspections to determine the date or dates of Substantial Completion and the date of Final Completion, review written warranties and related close-out documents required by the Contract and assembled by the Contractor, and will issue a final authorization for payment upon Contractor's satisfaction of the requirements of the Contract Documents.

4.3 Claims and Disputes

4.3.1 Definitions. The term "Claim" or "Claims" shall mean a separate demand by the Contractor for: (i) a time extension (ii) payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to this Contract and payment of which is not otherwise expressly provided or the Contractor is not otherwise entitled to; or (iii) an amount the payment of which is disputed by the County.

4.3.2 Notification of Third-Party Claims. County shall provide Contractor with prompt written notice upon County's receipt of any third party claim relating to the Contract.

4.3.3 Notice and Time Limits on Claims. If the Contractor wishes to make a Claim for an increase in the Contract Sum or an extension of the Contract Time, the Contractor shall give the County written notice thereof within ten (10) calendar days after the occurrence of the event giving rise to such Claim. The written notice must comply with the requirements of this Article 4 and Article 8, if applicable, herein. This notice shall be given by the Contractor before proceeding to execute Work affected by the event, except in an emergency endangering life or property, in which case the Contractor shall proceed in accordance with Article 10 below.

4.3.4 Resolution. The County will issue a Change Order, a Construction Change Directive, or a written amendment to the Contract, to Contractor within a reasonable period of time after County's approval of any Claim, specifying the additional cost and/or time, if any, approved by County.

4.3.5 Continuing Contract Performance. Contractor shall not delay or postpone any Work pending resolution of any disputes or disagreements, except as the County and Contractor may otherwise agree in writing. Pending final resolution of a Claim, the Contractor shall proceed diligently with performance of the Contract and the County shall continue to make payments for undisputed Work in accordance with the Contract Documents. In the event of disputed work, County shall have the right to unilaterally issue a Construction Change Directive and Contractor shall continue performance pending resolution of the dispute and shall maintain the accounting and cost data described in Paragraph 7.4 herein.

4.3.6 Claims for Concealed or Unknown Conditions. The Contractor shall promptly, and before the following conditions are disturbed, notify the County, in writing, of any:

(1) Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
(2) Subsurface or latent physical conditions at the Site differing from those indicated by information about the Site made available to bidders prior to the deadline for submitting bids.
(3) Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

4.3.6.1 The County shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order or written amendment to the Contract, under the procedures described in the Contract.

4.3.6.2 In the event that a dispute arises between the County and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

4.3.7 Claims for Additional Cost and/or Time.

4.3.7.1 General. If Contractor wishes to make a Claim for an increase in the Contract Sum and/or Contract Time, Contractor shall provide written notice within ten (10) calendar days, as provided in Paragraph 4.3.3 herein, before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Article 10. If the Contractor believes additional cost is involved for reasons including, but not limited to: (i) any written interpretation; (ii) a Verbal Change in the Work as more specifically described in Subparagraph 7.5.2 below; (iii) failure of payment by the County; or (iv) any order by the County to stop Work where the Contractor was not at fault, Contractor shall file Claims in accordance with the procedures established herein. Compliance with the notice and Claim submission procedures described in this Paragraph is a condition precedent to the right to commence litigation, file a Government Code Claim, or commence any other legal action. No claim or issues not raised in a timely notice

and timely Claim submitted under this Paragraph may be asserted in any Government Code Claim, subsequent litigation, or legal action.

4.3.7.1.1 The provisions of Section 4.3 and 4.4 constitute a non-judicial claim settlement procedure, and also step one of a two step claim presentment procedure by agreement under Section 930.2 of the California Government Code. Specifically, step one is compliance with this contract claims procedure and filing/administering timely contract claims in accordance with the Contract Documents. Step two is filing a timely Government Code Section 910 claim in accordance with the California Government Code. Any Government Code Section 910 claims shall be presented in accordance with the Government Code and shall affirmatively indicate Contractor's prior compliance with the claims procedure herein and previous dispositions under the claims procedure. These provisions shall survive termination, breach or completion of the Contract. Contractor shall bear all costs incurred in the preparation and submission of a claim.

4.3.7.2 Certification of Claim.

(1) Contractor, under penalty of perjury under the laws of the State of California, shall submit with the Claim its and its Subcontractors' certification that:

(a) The Claim is made in good faith;

(b) Supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and

(c) The amount requested accurately reflects the Contract adjustment for which the Contractor believes the County is liable.

(2) The certification shall be executed by an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

(3) If a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, California Government Code Sections 12650 et seq.) the County will be entitled to the remedies set forth in the California False Claims Act in addition to all other remedies provided by law. The Contractor may be subject to criminal prosecution.

(4) In regard to any Claim or portion of a Claim for Subcontractor work, the Contractor shall fully review said Claim and certify said Claim, under penalty of perjury under the laws of the State of California, to have been made in good faith and in accordance with this Contract.

(5) Failure to furnish certification as required hereinbefore will result in the Contractor waiving its rights to the subject Claim.

4.3.7.3 Content of Written Notice. Contractor shall waive all rights to assert a Claim for Additional Cost and/or Time unless such notice is given as required in this Section. The written notice shall set forth:

(1) The date of the event or occurrence giving rise to the claim and, if applicable, the date when the event ceased;

(2) The nature of the event or occurrence and reasons for which the Contractor believes additional cost and/or time will or may be due;

(3) The quantification of the costs involved together with the accounting and cost data described in Section 7.4 herein;

(4) A Critical Path Method ("CPM") schedule analysis supporting any request for any additional time; and

(5) Contractor's plan for mitigating such costs and/or delay.

4.3.7.4 Back-up Documentation. In addition to the initial ten (10) day written notice required herein, Contractor shall submit detailed backup documentation for its Claim including, but not limited to, contract provisions, specifications, drawings, Request for Information, correspondence, meeting minutes, and the like, within thirty (30) calendar days from Contractor's initial written notice. Failure to provide either this backup documentation or an explanation acceptable to the County for the cause of the Contractor's delay in submitting this documentation as herein indicated shall constitute Contractor's waiver of any and all rights associated with the Claim. Except where provided by law, the County shall not be liable for special or consequential damages, and claims shall not include special or consequential damages.

4.3.7.5 Remedies Related to Delays.

(1) For Claims relating to extensions of Contract Time, due to Compensable County-Caused delays, as described in Article 8 herein, Contractor may be entitled to an equitable adjustment of the Contract Sum and Contract Time provided Contractor otherwise complies with this Paragraph 4.3.

(2) For Claims relating to extensions of Contract Time due to Non-Compensable Force Majeure events, as described in Article 8 herein, Contractor may be entitled to an equitable adjustment of the Contract Time, subject to the limitations set forth in Article 8 below, but shall not be entitled to adjustment of the Contract Sum.

(3) For Claims relating to extensions of the Contract Time due to rain delays/inclement weather, Contractor shall not be entitled to adjustment of the Contract Time unless and until the number of unworkable days due to the effects of rain/inclement weather exceed the number of days set forth in Subparagraph 8.4.1.3 below. In such event, the Contract Time shall be equitably adjusted, but Contractor shall not be entitled to adjustment of the Contract Sum.

4.4 Dispute Resolution

4.4.1 Claims between the County and the Contractor of $375,000.00 or less shall be resolved in accordance with the procedures established in Part 3, Chapter 1, Article 1.5 of the California Public Contract Code Sections 20104 et seq.; provided however that California Public Contract Code Section 20104.2(a) shall not supersede the requirements of the Contract Documents with respect to the Contractor's notification to the County of such claim or extend the time for giving of such notice as provided in the Contract Documents.

4.4.1.1 Pursuant to Public Contract Code Section 20104(c), the current provisions of Article 1.5 of Chapter 1 of Part 3 of the Public Contract code (commencing with Section 20104) dealing with the mediation and arbitration of public works claims are incorporated herein and applicable provisions are set forth below.

Public Contract Code Section 20104 (a)(1): This article applies to all public works claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a contractor and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b)(1) “Public work” means “public works contract” as defined in Section 1101 but does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) “Claim” means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

Public Contract Code Section 20104.2: For any claim subject to this article, the following requirements apply:

(a) The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

(b)(1) For claims of less than fifty thousand dollars ($50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

(c)(1) For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

(d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

(f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.

Public Contract Code Section 20104.4: The following procedures are established for all civil actions filed to resolve claims subject to this article:

(a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

(b)(1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act (Title 4 (commencing with Section 2016.010) of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in

addition to payment of costs and fees under that chapter, pay the attorney's fees of the other party arising out of the trial de novo.

(c) The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

Public Contract Code Section 20104.6: (a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

4.4.1.2 Pursuant to Assembly Bill 626 (2015-2016 Reg. Sess.) the text of Public Contract Code section 9204 is included as follows:

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:
(1) “Claim” means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:
(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.
(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.
(C) Payment of an amount that is disputed by the public entity.
(2) “Contractor” means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.
(3) (A) “Public entity” means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city,

including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High–Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45–day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written

statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with

regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

4.4.2 Except as provided for in Subparagraph 4.4.1, any other claims, disputes or other matters in controversy shall be resolved as follows. In lieu of, or prior to litigation, the Parties shall endeavor to settle disputes by mediation in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently

in effect unless the Parties mutually agree otherwise to a different method of alternative dispute resolution. Mediation shall be non-binding and utilize services of a mediator mutually acceptable to the Parties. If the Parties cannot agree on a mediator, then the American Arbitration Association shall appoint a mediator trained in construction industry disputes.

4.4.3 Any dispute which cannot be resolved between the Parties shall be resolved through litigation in a court of competent jurisdiction of the State of California. Venue for any such litigation concerning this Project or Agreement shall be in the Superior Court of California, San Bernardino County, San Bernardino District and Contractor agrees to incorporate this provision into all subcontracts.

4.4.3.1 Each Party hereby waives any law or rule of court that would allow them to request or demand a change of venue. If any third party brings an action or claim concerning this Contract, the Parties hereto agree to use their best efforts to obtain a change of venue to the Superior Court of California, San Bernardino County, San Bernardino District.

5 SUBCONTRACTORS

5.1 Award of Subcontracts

5.1.1 Subcontractor Listing. The Contractor shall list its Subcontractors, and shall make no substitution except in accordance with Public Contract Code Sections 4100 et seq. ("Subcontractor Listing Law").

5.1.1.1 Substitution Process. Any request of the Contractor to substitute a listed Subcontractor will be considered by the County only if such request is in strict conformity with this Paragraph 5.1 and Chapter 4 of the California Public Contract Code (commencing with Section 4100). All costs and fees, including all costs of the hearing, incurred by the County in the review and evaluation of a request to substitute a listed Subcontractor shall be borne by the Contactor; such costs and fees may be deducted by the County from the Contract Sum then or thereafter due the Contractor. For purposes of a hearing for the substitution of subcontractors (pursuant to the Public Contract Code commencing with Section 4100) the awarding authority shall be the Director of the Project and Facilities Management Department, or his/her designee.

5.1.1.2 Responsibilities of Contractor upon Substitution of Subcontractor. Neither the substitution nor the County's consent to Contractor's substitution of a listed Subcontractor shall relieve Contractor from its obligation to complete the Work within the Contract Time and for the Contract Sum. In the event that the County determines that revised or additional Submittals are required of the newly substituted Subcontractor, the County shall promptly notify the Contractor, in writing, of such requirement and the time for Submittal. In the event that the revised or additional Submittals are not submitted by Contractor within the time specified, Contractor shall

be solely responsible for delays in the Work arising from the untimely Submittal. Contractor shall reimburse the County for all fees and costs incurred or associated with the processing, review and evaluation of any revised or additional Submittals required pursuant to this paragraph; the County may deduct such fees and costs from any portion of the Contract Sum then or thereafter due the Contractor. In the event that additional or revised Submittals are required pursuant to this paragraph, such requirement shall not result in an increase to the Contract Time or the Contract Sum.

5.2 Subcontractor Relations

5.2.1 Agreements. By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by Contract Documents, assumes toward the County. Each such agreement shall preserve and protect the rights of the County under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the County. The Contractor shall require each Subcontractor to enter into similar agreements with their Sub-subcontractors. The Contractor shall make available to each Subcontractor, prior to the execution of the agreement, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph. At a minimum, each agreement shall:

(1) Require that the Work being performed pursuant to such agreement, as the case may be, be performed in accordance with the requirements and intent of the Contract Documents and provide no less than five percent (5%) retainage unless otherwise indicated in Agreement between the County and Contractor;

(2) Require submissions of Applications for Payment in the form required by the Contract Documents, together with invoices and billings supporting such applications and conditional and unconditional lien releases in the form required by the Contract Documents completed by it and by its Sub-Subcontractors as a condition to the disbursement of any progress payment next due and owing to it;

(3) Require the Subcontractor, Sub-Subcontractor or supplier, as the case may be, to maintain insurance coverage as provided in the Contract Documents and to file required certificates of such coverage and additional insured endorsements with County, and, upon County’s request, to provide copies of such insurance policies to County.

(4) Require each Subcontractor, Sub-Subcontractor, and supplier to furnish to Contractor or the applicable Subcontractor, as the case may be, in a timely fashion all information necessary for transmittal of Submittals and the reports required herein;

(5) Require that each Subcontractor and supplier continue to perform under its subcontract if the Contract is terminated and if County takes an assignment of the subcontract or supply agreement and requests the Subcontractor or supplier to continue such performance;

(6) Require each Subcontractor, Sub-Subcontractor, and supplier to remove all debris created by its activities;

(7) Provide that in the event that County accepts the conditional assignment of the subcontract, County shall only be responsible to the Subcontractor for those obligations that accrue subsequent to County's acceptance of the assignment;

(8) Require the Subcontractor to resolve all disputes involving County according to the dispute resolution procedure established in Paragraph 4.4 herein;

(9) Contractor shall cause each subcontract to expressly include the following requirement:

"The County and entities and agencies designated by the County shall have access to and the right to audit and the right to copy at the County's cost all of Subcontractor's and supplier's books, records, contracts, correspondence, instructions, Drawings, receipts, vouchers, purchase orders, and memoranda relating to the Work. Subcontractor shall preserve all such records and other items for a period of at least five (5) years after Final Completion." and

(10) Require the Subcontractor engaged upon the Site to arrange the storage of materials and equipment and performance of his Work so as to interfere as little as possible with other persons engaged in Work for the County upon the same Site.

5.2.2 Precedence. If any provision of any Subcontractor supply agreement is inconsistent with any provision of the Contract Documents or the intent of the Contract Documents, then the Contract Documents shall control.

5.2.3 Payments. Contractor shall make payment to Subcontractor within seven (7) days of receipt of each progress payment, in accordance with Public Contract Code Section 10262 and Business and Professions Code Section 7108.5. County hereby reserves the right, upon written notice to Contractor, to make, at any time, and from

time-to-time, payments directly to each Subcontractor, and, if such rights shall be exercised by County, then such amount shall be credited against the Contract Sum due to Contractor hereunder and County shall be relieved and released from the obligation to make such payment to Contractor and Contractor shall be relieved and released as to County from the obligation to make such payments to each Subcontractor paid by County, but not from any of the other obligations and responsibilities of Contractor to County under the Contract Documents.

5.2.4 Contractor Responsibility. The Contractor shall be responsible for all acts and omissions of Subcontractors and for all Contract Work regardless of any subcontracts. All interest of the County in the Subcontractor's work shall be coordinated through the Contractor.

5.3 Contingent Assignment of Subcontractor and Material Supply Agreements

Each Subcontractor and supplier agreement for a portion of the Work is assigned by the Contractor to the County provided that:

(1) Assignment is effective only after termination of the Contract by the County only for those subcontracts which the County accepts by notifying the Subcontractor or supplier, and Contractor in writing;

(2) Assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract; and

(3) Upon exercise of this right of assignment, County has the right to reassign the agreement.

6 CONSTRUCTION BY COUNTY OR BY SEPARATE CONTRACTORS

6.1 County's Right to Perform Construction and to Award Separate Contracts

6.1.1 County's Right to Perform. The County reserves the right to perform construction or operations related to the Project with the County's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the Site. If the Contractor claims that delay or additional cost is involved because of such action by the County, the Contractor shall make such Claim as provided in Paragraph 4.3 herein.

6.1.2 Reserved.

6.1.3 Coordination. The County shall provide for coordination of the activities of the County's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other Separate Contractors and the County in reviewing their construction schedules when directed to

do so. The Contractor shall make any revisions to the Construction Schedule deemed necessary after a joint review and mutual agreement. Upon County's written approval, the revised Construction Schedule shall then constitute the schedule to be used by the Contractor, Separate Contractors, and the County until subsequently revised and approved by County.

6.1.4 Cooperation. Each Contractor or Subcontractor engaged upon the Site shall arrange the storage of materials and equipment and performance of his work so as to interfere as little as possible with other persons engaged in work for the County upon the same Site.

6.2 County's Right to Clean Up

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

6.3 Independent Testing

6.3.1 County Testing. The County will employ and pay for services of an independent testing laboratory to perform services specifically required by the governing code authority, as detailed in the Specification, and as additionally requested by County.

6.3.2 Contractor Duties. The Contractor shall:

(1) Notify the County and the testing laboratory sufficiently in advance of the required test to allow for its assignment of personnel and scheduling of tests;

(2) Cooperate with testing and inspection personnel provide access to the Work and to offsite fabrication facilities;

(3) Furnish copies and records of mill test reports;

(4) Employ and pay for services of the same independent testing laboratory to perform additional inspections, sampling, and testing required when initial tests indicate Work does not comply with Contract requirements;

(5) Be responsible for all scheduling of inspections and tests; and

(6) Not proceed with Work requiring inspection if the appropriate inspector is absent.

6.3.3 Material testing. All material testing which conforms to or meets specified standards in the following categories shall be paid for by the County. Material tests in

the following categories which fail to meet specified standard shall be paid for by the Contractor:

(1) Soil density tests

(2) Concrete compression tests

(3) Grout compression tests

(4) Mortar compression tests

(5) Testing of masonry units

(6) Testing of reinforcing steel

(7) Structural steel

(8) Anchors and fasteners

Unless stated otherwise in the Contract Documents, any other required or specified tests shall be paid by the Contractor and shall be performed by a qualified testing laboratory approved by the County.

7 CHANGES IN THE WORK

7.1 General

7.1.1 County's Right to Order Changes. The County, without invalidating the Contract, may authorize changes in the Work consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly, if necessary. All such changes in the Work shall be authorized by Change Order, Construction Change Directive, or Written Amendment to Contract, and Contractor shall perform such changes in the Work according to the applicable requirements of the Contract Documents. The County is not required to provide notice to Contractor's sureties of Change Orders, Contract Change Directives or Written Amendment to Contract.

7.1.2 Basis for Agreement. A Change Order or Written Amendment to Contract shall be based upon agreement between the County and Contractor. A Construction Change Directive may or may not be agreed to by the Contractor.

7.1.3 No Estoppel. Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with the change, unless otherwise provided in the Change Order, Construction Change Directive, or Written Amendment to Contract. A change in the Contract Sum or the Contract Time shall be accomplished only by Change Order, Construction Change

Directive, or Written Amendment to Contract. Accordingly, no course of conduct or dealings between the Parties, nor express or implied acceptance of alterations or additions to the Work and no Claim that the Contract has been abandoned or the County has been unjustly enriched by any alteration or addition to the Work shall be the basis of any Claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

7.1.4 Change in Work. The County may at any time make any change, modification or addition to the Work by written Change Order, Construction Change Directive, or Written Amendment to Contract, including but not limited to changes:

(1) in the Specifications or Drawings;

(2) in the sequence, method or manner of performance of the Work;

(3) in the County furnished facilities, equipment, materials, services or Site; or

(4) directing acceleration in the performance of the Work.

7.2 Change Orders

7.2.1 Computation. Methods used in determining adjustments to the Contract Sum by Change Order or Written Amendment to Contract may include those listed in Paragraph 7.4 below.

7.2.2 Accord and Satisfaction. Agreement on any Change Order or Written Amendment to Contract shall be a full compromise and settlement of all adjustments to Contract Time and Contract Sum, and compensation for any and all delay, extended or additional field and home office overhead, disruption, acceleration, inefficiencies, lost labor or equipment productivity, differing site conditions, construction interferences and other extraordinary or consequential damages (hereinafter called "Impacts"), including any ripple or cumulative effect of said Impacts on the overall Work under the Contract arising directly or indirectly from the performance of Work described in the Change Order or Written Amendment to Contract. By execution of any Change Order or Written Amendment to Contract, Contractor agrees that the Change Order or Written Amendment to Contract constitutes a complete accord and satisfaction with respect to all claims for schedule extension, Impacts, or any costs of whatsoever nature, character or kind arising out of or incidental to the Change Order or Written Amendment to Contract. No action, conduct, omission, product failure or course of dealing by the County shall act to waive, modify, change, or alter the requirement that (i) Change Orders, Construction Change Directive, or Written Amendment to Contract must be in writing, signed by the County and Contractor and; (ii) that such written Change Orders, Construction Change Directives, or Written Amendment to Contract are the exclusive method for effectuating any change to the Contract Sum and/or Contract Time.

7.3 Construction Change Directives

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

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

7.3.3 Disagreement. If the Contractor does not promptly indicate its disagreement with the method of pricing provided in the Construction Change Directive, Contractor shall be deemed to agree with the method of pricing the change. If the Contractor indicates it disagreement with the method of pricing or if no method of pricing is provided in the Construction Change Directive, the increase in cost or credit to the Contract Sum for the change shall be determined by cost in accordance with Subparagraph 7.4.1(3) and the provisions of Subparagraphs 7.4.2, 7.4.3 and 7.4.4 shall apply to the change.

7.3.4 Agreement. A Construction Change Directive is effective immediately whether or not it is signed by the Contractor. If the Contractor signs a Construction Change Directive such agreement shall be effective immediately and shall be recorded as a Change Order.

7.4 Computation of Cost or Credit for Changes

7.4.1 Cost or Credit. The cost or credit to the County resulting from a change in the Work shall be determined by County by one or more of the following methods:

(1) Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

(2) Unit prices stated in the Contract Documents or subsequently agreed upon;

(3) By cost, as defined in (a), (b), (c) and (d) below, properly itemized and supported by sufficient substantiating data to permit evaluation, plus agreed to markup for overhead and profit as defined in (e) below. Such costs shall be itemized by craft directly allocable to the change in the Work:

(a) Cost of materials, including cost of transportation and delivery;

(b) Cost of labor, including social security, and unemployment insurance, and fringe benefits required by agreement and Workers' Compensation insurance;

(c) Rental value of equipment and machinery, exclusive of hand tools;

(d) Sales tax; insurance; permit costs and bond premiums;

(e) Mark-up to Contractor, Subcontractors, and Sub-subcontractor for overhead, profit and other expenses which are not specifically included in (a) through (d) above shall not exceed the following amounts:

(i) Fifteen (15%) of the cost of that portion of the Extra Work to be performed by the Contractor with its own forces.

(ii) Fifteen percent (15%) of the cost of that portion of the Work to be performed by a Subcontractor or Sub-subcontractor with its own forces, plus 5% for the Contractor. Total combined Contractor, Subcontractor, and Sub-subcontractor fee shall not exceed 20%.

(f) Cost of Extra Work shall not include any of the following:

(i) Superintendent(s)

(ii) Assistant Superintendent(s)

(iii) Project Engineer(s)

(iv) Project Manager(s)

(v) Scheduler(s)

(vi) Estimator(s)

(vii) Incidental Drafting or Detailing

(viii) Small tools (Replacement value does not exceed $300)

(ix) Office expenses including staff, materials and supplies

(x) On-Site or off-site trailer and storage rental and expenses

(xi) Site fencing

(xii) Utilities including gas, electric, sewer, water, telephone, facsimile, copier equipment

(xiii) Data processing personnel and equipment

(xiv) Federal, state, or local business income and franchise taxes

7.4.2 Credits. The amount of credit to be allowed by the Contractor to the County for a deletion or change, which results in a net decrease in the Contract Sum, shall be actual net cost as determined herein. The amount of deduct/credit for liquidated damages shall be in accordance with the Agreement. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase/decrease, if any, with respect to that change.

7.4.3 Contractor Maintenance of Records. In the event that Contractor is directed to perform any changes to the Work, or should Contractor encounter conditions which the Contractor believes would obligate the County to adjust the Contract Sum and/or the Contract Time, Contractor shall maintain detailed records of the cost of such changes on a daily basis. Such records shall include without limitation hourly records for labor and construction equipment and itemized records of materials and equipment used each day in connection with the performance of any change to the Work. In the event that more than one change to the Work is performed by the Contractor in a calendar day, Contractor shall maintain separate records of labor, construction equipment, materials, and equipment for each such change. In the event that any Subcontractor or Sub-subcontractor, of any tier, shall provide or perform any portion of any change to the Work, Contractor shall require that each such Subcontractor and Sub-subcontractor maintain records in accordance with this Article. Each daily record maintained hereunder shall be signed by Contractor's Project Representative; such signature shall be deemed Contractor’s representation and warranty that all information contained therein is true, accurate, complete, and relates only to the change referenced therein. All records maintained by a Subcontractor and Sub-subcontractor, of any tier, relating to the costs of a change in the Work shall be signed by such Subcontractor's authorized Project Manager or Superintendent. Such records shall be forwarded to County's Project Manager on the day the Work is performed (same day) for independent verification. In the event that Contractor shall fail or refuse, for any reason, to maintain or make available for inspection, review, and/or reproduction such records, adjustments to the Contract Sum or Contract Time, if any, on account of any change to the Work shall be determined by County which shall be binding upon Contractor. Contractor's obligation to maintain records hereunder is in addition to, and not in lieu of, any other Contractor obligation under the Contract Documents with respect to changes to the Work.

7.4.4 Payment of Undisputed Amounts. Pending final determination of the total cost of a Change, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by an approved Change Order, Construction Change Directive or Written Amendment to Contract, indicating the Parties’ agreement with part or all of such costs.

7.5 Authority to Approve Changes

7.5.1 County's Project Manager's Authority. The County's Project Manager must authorize any change in the Work. Such changes shall be effected by written order approved by the Director or San Bernardino County Board of Supervisors and shall be binding on the Contractor.

7.5.2 Verbal Changes. Any oral order, direction, instruction, interpretation, or determination from the County (collectively "Verbal Change") which, in the opinion of the Contractor, causes a Scope Change in the Work, or otherwise requires an adjustment to the Contract Sum or the Contract Time, shall be treated as a Change Order Request only if the Contractor gives the County written notice within ten (10) calendar days of the Verbal Change and prior to acting in accordance therewith. Time is of the essence in Contractor's written notice pursuant to the preceding sentence, so that the County can promptly investigate and consider alternative measures to address the Verbal Change giving rise to Contractor's notice. Accordingly, Contractor acknowledges that its failure, for any reason, to give written notice within ten (10) calendar days of such Verbal Change shall be deemed Contractor's waiver of any right to assert or Claim any entitlement to an adjustment of the Contract Time or the Contract Sum on account of such Verbal Change. The written notice shall state the date, circumstances, extent of adjustment to the Contract Sum or the Contract Time, if any, requested and the source of the Verbal Change. Any such Verbal Change shall not be treated as a change and the Contractor hereby waives any Claim for any adjustment to the Contract Sum or the Contract Time on account thereof.

7.5.3 Unauthorized Work. Any Work performed by the Contractor not indicated on the Contract Documents or any changes in the Work performed or provided by the Contractor without notice to the County and written approval by County, shall be considered unauthorized by the County and performed at the sole expense of the Contractor. Unauthorized work so performed will not be measured or paid for and no extension of Contract Time will be granted on account thereof. Any such unauthorized work may be ordered removed at the Contractor's sole cost and expense. The failure of the County to direct or order removal of such unauthorized work shall not constitute acceptance or approval of such work nor relieve the Contractor from any liability on account thereof.

7.6 County Originated Proposal Request

County may issue a request, in writing, to Contractor, describing a proposed change to the Work and requesting the Contractor submit an itemized proposal in a format acceptable to County within ten (10) calendar days after County issues the request. The Contractor's proposal shall include an analysis of impacts to Contract Sum and Contract Time, if any, to perform additional work, or delete Work, as applicable, including the effects and impacts, if any, on unchanged Work, estimates of costs (broken down by the cost categories listed in the Agreement and/or Paragraph 7.4 herein), and Contractor's proposed methods to minimize costs, delay, and disruption to the performance of the Work. If Contractor fails to submit a

written proposal within such period of time, it shall be presumed that the change described in the County's original proposal request will not result in an increase to the Contract Sum or Contract Time and the change shall be performed by Contractor without additional compensation. County's proposal request does not authorize the Contractor to commence performance of the change, unless otherwise specified in writing. If County desires that the proposed change be performed, the Work shall be authorized according to the Change Order or Construction Change Directive procedures set forth above.

7.7 Contractor Originated Change Order Request (COR)

If the Contractor alleges that instructions issued by the County after the effective date of the Contract may result in changes to the Contract Sum or Contract Time or if the Contractor otherwise becomes aware of the need for or desirability of a change in the Work, Contractor may submit a written Change Order Request ("COR") to the County in writing, in a format acceptable to County and in accordance with the notice provisions and other requirements of Paragraph 4.3 above for Claims. The COR must specify the reasons for the proposed change, cost impacts and relevant circumstances and impacts on the Construction Schedule. The document shall be complete in its description of the Work, its material and labor quantities and detail, and must support and justify the Costs and credits claimed by the Contractor. A CPM schedule fragnet is required to support and justify any additional Contract Time of performance requested by the Contractor. The County will not review any COR which is incomplete. The Contractor may request additional compensation and/or time through a COR but not for instances that occurred more than ten (10) calendar days prior to the notice date. Contractor's failure to initiate a COR within this ten-day period or to provide detailed back-up documentation to substantiate the COR within thirty (30) calendar days of the initial written notice shall be deemed a waiver of the right to adjustment of the Contract Sum or the Contract Time for the alleged change. Any COR that is approved by the County will be incorporated in a Change Order, Construction Change Directive or Written Amendment to Contract. If the COR is denied by the County, the Contractor shall not proceed with the Work described in the COR.

7.8 Audit Rights

With respect to any Change Order, Construction Change Directive or Written Amendment to Contract resulting in an increase in the Contract Sum, the Contractor shall afford (and shall require its Subcontractors to afford) access to the County at all reasonable times to any books, correspondence, instructions, receipts, vouchers, memoranda and records of any kind relating thereto, all of which shall be maintained by the appropriate parties for a period of at least five (5) years from and after the date the County makes payment on account of such Change Order, Construction Change Directive or Written Amendment to Contract. The Contractor authorizes the County (and shall requires its Subcontractors to authorize the County) to check directly with any suppliers of labor and material with respect to any item chargeable to the County, to confirm balances due and to obtain sworn statements and waiver of liens, all if the County so elects.

8 SCHEDULE AND EXTENSIONS OF TIME

8.1 Definitions

8.1.1 Contract Time. The Contract Time is the period of time allocated in the Contract Documents from the date of commencement provided in County's Notice to Proceed for Final Completion of the Work.

8.1.2 Commencement. The Date of Commencement of the Work is the date provided in County's Notice to Proceed.

8.1.3 Substantial Completion. The date of Substantial Completion is the date determined by County and certified by the County in accordance with Paragraph 9.6 below and the terms of this Agreement.

8.2 Progress and Completion

8.2.1 Time is of the Essence. Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement and any Modifications relating to Substantial Completion or Contract Time the Contractor agrees and confirms that the Contract Time is a reasonable period for performing the Work and that Contractor is able to complete the Work by that date.

8.2.2 Commencement. The Contractor shall not knowingly prematurely commence operations on the Site or elsewhere prior to the effective date of insurance and bonds required to be furnished by the Contractor to County as specified in the Agreement. The Date of Commencement of the Work shall not be changed by the effective date of such insurance and bonds.

8.2.3 Completion. The Contractor shall proceed expeditiously with adequate labor and supervision to achieve Final Completion within the Contract Time.

8.2.4 Notice to Proceed. The Contract shall commence the Work required by this Contract within ten (10) calendar days of the date specified in the notice from the County to proceed with the Work.

8.2.5 Expeditious Work. Contractor shall proceed expeditiously with adequate forces and shall complete the Work by the date specified in the Contract Documents. If Contractor is not diligently proceeding with the prosecution of the Work as scheduled, Contractor shall, immediately and at no additional cost to the County, take measures necessary, including working such overtime, and additional shifts as may be required to correct such delays.

8.3 Contractor’s Schedules

8.3.1 Project Schedule. Unless otherwise provided in the Agreement or Technical Specifications, within fourteen (14) calendar days after the Date of Commencement, Contractor shall submit a baseline Project Schedule for the Work for comment and approval by County. The baseline Project Schedule shall include, but not be limited to:

(1) A CPM format that incorporates all activities with descriptions, sequence, logic relationships, duration estimates, resource-loading, and other information required for all pre-construction and construction activities.

(2) Activities to be integrated and shown in the CPM network shall include all milestones representing the Contractor's submittal dates and activities representing the County's review period of each submittal (which review period shall in no case be scheduled for less than 15 working days); Contractor's procurement of materials and equipment; submittals; manufacture and/or fabrication, testing and delivery to the jobsite of special material and major equipment; equipment installation and preliminary, final and performance testing of equipment or systems.

(3) Activities showing the start and finish dates for all temporary works; all construction of mock-ups, and prototypes and/or samples.

(4) Activities showing start and finish dates of owner-furnished items and interface requirements dates with other contractors; regulatory agency approvals; and permits required for the performance of the work.

(5) Activities showing start and finish of tenant programming (as appropriate), modular furniture, tenant improvement work and phased occupancy.

(6) Close-out activities.

(7) The schedule shall consider all foreseeable factors or risks affecting or which may affect the performance of the work, including historical and predicted weather conditions, Applicable Laws, regulations or collective bargaining agreements pertaining to labor, transportation, traffic, air quality, noise and any other applicable regulatory requirements.

(8) The Contractor shall attach a narrative report which explains assumptions used for activity durations, its assumptions regarding crew sizes, equipment requirements and production rates, any potential areas of concern or specific areas requiring coordination it may have identified and any long-lead time materials or equipment.

(9) Time units for all schedules shall be in calendar days, and no construction activity shall have a duration greater than 30 calendar days without County approval.

Upon the County's approval, the Project Schedule shall be deemed to be a Contract Document. Any revisions or updates to the Project Schedule are subject to review and approval by County.

8.3.1.1 The County's review of the form and general content of the baseline Project Schedule is for the purpose of determining, in its judgment, whether the following requirements are satisfied:

(1) Schedules are suitable for monitoring progress of the Work;

(2) Schedules provide necessary data about the timing of the County's decisions on the County furnished items, including furniture, equipment and occupancy;

(3) Schedules are in sufficient detail to demonstrate adequate planning for the Work; and

(4) Schedules represent a practical plan to complete the Work within the Contract Time.

8.3.1.2 Contractor shall plan, develop, supervise, control, and coordinate the performance of the Work so that the progress and the sequence and timing of Work activities conform to the current accepted Project Schedule. Contractor shall continuously obtain from Subcontractors information and dates about the planning for and progress of the Work, the ordering and fabrication of materials, required Submittals, and the delivery of equipment, shall coordinate and integrate such information and data into updated Project Schedules and "As-Built" Drawings and specifications, and shall monitor the progress of the Work and the delivery of equipment. Contractor shall act as the expeditor of potential and actual delays, interruptions, hindrances, or disruptions for its own forces and those forces of Subcontractors, regardless of tier. Contractor shall cooperate with the County in the development of the Project Schedule and updated Project Schedules.

8.3.1.3 The County's acceptance of or its review comments about any Project Schedule or scheduling data shall not relieve Contractor from its sole responsibility to plan for, perform, and complete the Work by the Contract Time. Acceptance of or review comments about any Project Schedule shall not transfer responsibility for any Project Schedule to the County nor imply their agreement with (1) any assumption upon which such schedule is based on or (2) any matter underlying or contained in such schedule.

8.3.1.4 Failure of the County to discover errors or omissions in schedules that it has reviewed, or to inform Contractor that Contractor, Subcontractors, or others are behind schedule, or to direct or enforce procedures for complying with the Project Schedule shall not relieve Contractor from its sole responsibility to perform and complete the Work by the Contract Time and shall not be a cause for an adjustment of Contract Time or the Contract Sum.

8.3.2 Format. Unless otherwise provided in the Agreement or Technical Specifications, the Project Schedule shall be in a detailed precedence CPM or Microsoft type format satisfactory to the County, which shall also: (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and maintenance; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as Milestone Dates). At a minimum the Project Schedule shall depict the schedule for Work on a discipline by discipline and trade by trade basis and tasks within each discipline and trade. The Project Schedule shall include: (i) proposed activity sequences and durations; (ii) Milestone Dates for receipt and approval of pertinent information, including County-supplied information and approvals by public authorities having jurisdiction over the Project; (iii) dates for preparation and processing of Shop Drawings, Product Data, and Samples; (iv) dates for delivery of materials or equipment requiring long-lead time procurement; (v) County's occupancy/use requirements showing portions of the Project having occupancy priority; (vi) the estimated date of Substantial Completion and Final Completion; and (vii) other information reasonably required by County. Upon review and acceptance by the County of the baseline Project Schedule, the baseline Project Schedule shall be deemed part of the Contract Documents. If not accepted, the baseline Project Schedule shall be promptly revised by the Contractor in accordance with the recommendations of the County and re-submitted for acceptance.

8.3.3 Updates. With each Application for Payment submitted by Contractor (other than the Final Application for Payment), the Contractor shall submit to the County an updated Project Schedule revised to include, at a minimum:

8.3.3.1 Monthly update/status of electronic database shall include recording of all Actual Start Dates and Actual Finish Dates and status of activities in progress.

8.3.3.2 Review of “planned” versus “actual” work force allocations and progress for the preceding month.

8.3.3.3 Reviews of revisions, added or deleted work and how those activities are being integrated into the Contractor’s work plan.

8.3.3.4 Review of the Contractor’s interface and coordination with other work on the Project.

8.3.3.5 Review of all impacts to the Work during the preceding month and to date, Contractor evaluation of those impacts and any recovery plans or remedial actions required to comply with the contract schedule.

If the Contractor does not submit an updated Project Schedule with an Application for Payment, County may withhold payment, in whole or in part. In the event any update to the Project Schedule indicates any delays to the Contract Time that are the fault of Contractor or others for whom Contractor is responsible, the Contractor shall propose

an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any Project Schedule Update constitute an adjustment in the Contract Time, any deadline, or the Contract Sum unless any such adjustment is agreed to by the County and authorized pursuant to Change Order, Construction Change Directive, or Written Amendment to Contract.

8.3.4 Extraordinary Measures. In the event the County determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the County shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, the Extraordinary Measures as provided in Paragraph 2.8 herein.

8.3.5 Early Completion. While the Contractor may schedule completion of the Project earlier than the date established by the Contract Documents, no additional compensation shall become due the Contractor for the use of float time between the Contractor's projected early completion date and the date for Final Completion established by the Contract Documents except any bonus or penalty provisions set forth in the Contract Documents, which would take precedence over and supersede this Paragraph.

8.3.6 Schedule of Submittals. Unless otherwise provided in the Agreement or Technical Specifications, within ten (10) calendar days after the Date of Commencement, the Contractor shall prepare and keep current, for the County's review and approval, a Schedule of Submittals for Shop Drawings, Product Data, Samples, and similar submittals, coordinated with the baseline Project Schedule and allowing the County reasonable time to review. Contractor shall be solely responsible for any delay, disruption, impact, loss of efficiency or other loss, arising directly or indirectly from Contractor's failure to manage submittals properly.

8.3.7 Procurement Schedule. Unless otherwise provided in the Agreement or Technical Specifications, within ten (10) calendar days after the Date of Commencement, Contractor shall prepare and keep current, for County's approval, a schedule for procurement of materials and equipment which is coordinated with the baseline Project Schedule and allows the County reasonable time to review. Contractor is solely responsible for any delay, disruption, impact, loss of efficiency, or other loss arising directly or indirectly from Contractor's failure to properly manage procurement of equipment and materials.

8.3.8 Performance. The Contractor shall perform the Work in accordance with the most recent Project Schedule and Schedule of Submittals approved by the County. The Contractor shall monitor the progress of the Work for conformance with the requirements of the Project Schedule and shall promptly advise the County of any delays or potential delays.

8.4 Delays and Extensions of Time

8.4.1 Non-Compensable Force Majeure Events.

8.4.1.1 Definition. "Force Majeure" shall mean any of the following events, which materially and adversely affect Contractor's obligations hereunder and which event could not have been avoided or prevented by due diligence and use of reasonable efforts by Contractor: earthquake, fire, flood, epidemic, blockade, rebellion, war, terrorism, riot, act of sabotage, or civil commotion; discovery of any archaeological, paleontological or cultural resources; spill of hazardous substances by a third party at or near the Site which is required to be reported to the Federal or California Environmental Protection Agency, Toxic Substances Control; or discovery at, near, or on the Site of any species listed as "threatened" or "endangered" under the Federal or California Endangered Species Act.

8.4.1.2 Remedies. If the critical path of the Work is delayed by Force Majeure events, provided that the aforesaid causes were not foreseeable and did not result from the acts of the Contractor, and provided further that the Contractor has taken reasonable precautions to prevent further delays owing to such causes, then the Contractor may pursue remedies for adjustment of the Contract Time in accordance with Paragraph 4.3 above. Unless the Force Majeure event damages the Work at the Project Site, Contractor will not be entitled to an adjustment in the Contract Sum.

8.4.1.3 Rain Days/Inclement Weather. For purposes of granting time extensions pursuant to this subparagraph and in accordance with the Claims procedures set forth in Paragraph 4.3 herein, resulting from unworkable days due to rain/inclement weather which were not reasonably foreseeable, the Contractor and County agree that the impact of rainfall/inclement weather for which the Contractor is not entitled to a time extension is a total of ten (10) Work Days per year ("Rain Days"). The Contractor shall account for the above number of Work Days for which the effects of rainfall/inclement weather are expected to prevent Work in the Project Schedule as set forth in Subparagraph 8.3 herein and shall obtain County's approval of Contractor's use of each Rain Day before requesting extension of the Contract Time.

8.4.2 Compensable County-Caused Delays. If the date for Final Completion of the Work is delayed as a result of the wrongful acts or negligence of the County or anyone for whom County is legally liable and the delays are unforeseeable and are unreasonable under the circumstances involved, the Contractor shall be entitled to an equitable adjustment of the Contract Time and/or compensation for reasonable additional costs directly resulting from such delays, but not for any additional home office overhead, profit or fee, subject to the requirements of Article 8 herein, and further provided Contractor complies with the notice and procedural requirements of Articles 4 and 7 herein.

8.4.3 Concurrent Delays. To the extent the Contractor is entitled to an extension of Contract Time due to an excusable delay, but the performance of the critical path of the Work would have been otherwise suspended, delayed, or interrupted by the fault or neglect of the Contractor or by an inexcusable delay, the Contractor shall not be entitled to any additional cost during the period of such concurrent delay.

8.4.4 Float. Critical Work activities are defined as Work activities which, if delayed or extended, will delay the scheduled completion of the milestones and/or time of completion. All other Work activities are defined as non-critical Work activities and are considered to have float. Float is defined as the time that a non-critical Work activity can be delayed or extended without delaying the scheduled completion of the milestones and/or time of completion. Float is considered a Project resource available to either party or both parties as needed. Once identified, Contractor shall monitor, account for, and maintain float in accordance with Critical Path Methodology.

Delays of any non-critical Work shall not be the basis for an extension of Contract Time until the delays consume all float associated with that non-critical Work activity and cause the Work activity to become critical.

It is acknowledged that County-caused time savings (i.e., critical path submittal reviews returned in less time than allowed by the Contract Documents, approval of substitution requests which result in a savings of time for Contractor, etc.) create shared float. Accordingly, County-caused delays may be offset by County-caused time savings.

8.4.5 Shortage of Material. An extension of time will not be granted by the County for a delay caused by a shortage of materials, except County-furnished materials, unless the Contractor furnishes to the County documented proof that the Contractor has made every effort to obtain such materials from every known source within reasonable reach of the Work. The Contractor shall also submit proof, in the form of network analysis data that the inability to obtain such materials when originally planned did, in fact, cause a delay in Final Completion of the Work which could not be compensated for by revising the sequence of operations. County will consider only the physical shortage of material as a cause for extension of time. The County will not consider any claim that material could not be obtained at a reasonable, practical, or economical cost, unless it is shown to the satisfaction of the County that such material could have been obtained only at exorbitant prices, entirely inconsistent with current rates taking into account the quantities involved and the usual practices in obtaining such quantities and that such fact could not have been known or anticipated at the time the Contract was entered into.

8.4.6 Utility and Agency Delays. Contractor is aware that governmental agencies, gas companies, electrical utility companies, water districts, and other utilities and agencies may be required to approve a proposed installation. Contractor has endeavored and will continue to use its best efforts to include the cost of such anticipated delays and related costs which may be caused by such utilities and agencies in the Contract Sum. Thus, Contractor is not entitled to make claim upon the County for damages or delays arising from the delays caused by such utilities and

agencies. Furthermore, the Contractor has included time periods for such governmental approval in the Project Schedule and is not entitled to an extension of time for delays caused by governmental agencies from which Contractor must obtain approvals.

8.4.7 Contractor Fault. No extension of time will be granted under this Article 8 for any delay to the extent: (i) that performance was so delayed by any Contractor induced causes, including but not limited to the fault or negligence of the Contractor or its Subcontractors; or (ii) for which any remedies are provided for or excluded by any other provision of the Contract.

8.4.8 Contract Modification. A Change Order, Construction Change Directive, or Written Amendment to Contract will be issued by the County to the Contractor within a reasonable period of time after approval of a request for extension of time, specifying the number of days allowed, if any, and the new date or number of calendar days after the date of commencement for completion of the Work or specified portions of the Work.

8.4.9 No Release of Surety. An extension of time granted shall not release the Contractor's surety from its obligations. Work shall continue and be carried on in accordance with all the provisions of the Contract and said Contract shall be and shall remain in full force and effect during the continuance and until the completion and Final Acceptance of the Work covered by the Contract unless formally suspended or annulled in accordance with the terms of the Contract.

8.4.10 No Waiver. Neither the grant of an extension of time beyond the date fixed for Final Completion of the Work, nor the performance and acceptance of any part of the Work or materials specified by the Contract after the time specified for Final Completion of the Work, shall be deemed to be a grant of any future extensions, a wavier by the County of the County's right to abrogate this Contract for abandonment or failure to complete within the time specified, or to impose and deduct damages as may be provided in the Contract Documents.

8.5 Liquidated Damages

8.5.1 County and Contractor recognize that time is of the essence in this Agreement and that the County may suffer financial loss in the form of lost grant funds, additional contract administration expenses, and loss of public use if the Work is not completed within the Contract Time, including any extensions thereof allowed in accordance with the Contract Documents.

8.5.2 Contractor and County agree to liquidate damages with respect to Contractor's failure to achieve Final Completion of the Work within the Contract Time. The Parties intend for the liquidated damages set forth herein to apply to this Contract as set forth in Government Code Section 53069.85. Contractor acknowledges and agrees that the liquidated damages are intended to compensate County solely for Contractor's failure to meet the deadline for Final Completion and shall not excuse

Contractor from liability from any other breach, including any failure of the Work to conform to the requirements of the Contract Documents.

8.5.3 In the event that Contractor fails to achieve Final Completion of the Work within the Contract Time, Contractor agrees to pay County the amount per day designated in the Contract and/or Special Conditions for liquidated damages for each calendar day that Final Completion is delayed.

8.5.4 Contractor acknowledges and agrees that the foregoing liquidated damages have been set based on an evaluation by County of damages that it will incur in the event of the late completion of the Work. Contractor and County agree that because of the nature of the Project it would be impractical or extremely difficult to fix the amount of actual damages incurred by the County due to a delay in completion of the Work. Accordingly, the County and Contractor have agreed to such liquidated damages to fix Contractor's costs and to avoid later disputes. It is understood and agreed by Contractor that any liquidated damages payable pursuant to this Agreement are not a penalty and that such amounts are not manifestly unreasonable under the circumstances existing as of the effective date of this Agreement.

8.5.5 It is further mutually agreed that County shall have the right to deduct liquidated damages against progress payments or retainage and that the County will issue a unilateral Construction Change Directive and reduce the Contract Sum accordingly. In the event the remaining unpaid Contract Sum is insufficient to cover the full amount of liquidated damages, Contractor shall pay the difference to County.

9 PAYMENTS AND COMPLETION

9.1 Contract Sum

The Contract Sum, including authorized adjustments, is the total maximum amount payable by the County to the Contractor for performance of the Work under the Contract Documents.

9.2 Schedule of Values

Within fourteen (14) calendar days after the Date of Commencement, Contractor shall submit to the County a Schedule of Values allocated to various portions of the Work. The Schedule of Values shall be approved by the County in writing. The Schedule of Values shall be prepared in such a manner that each major item of Work assigned to Contractor and to each separate Subcontractor is shown as a single line item on AIA Document G703 (or other form as required by County) and supported by such data to substantiate its accuracy as the County may require. The approved Schedule of Values shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 Applications for Payment

9.3.1 Applications for Payment. The Contractor shall submit to the County an itemized Application for Payment, utilizing a form approved in writing by the County, for operations completed in accordance with the Schedule of Values and the payment

provisions of the Agreement. Such Application shall be notarized, if required by County, and supported by such data substantiating the Contractor's right to payment as the County may require, including copies of requisitions from Subcontractors and Suppliers.

9.3.1.1 Payment will be made on valuation of Work done as of the twenty-fifth of each month, and such application shall be submitted approximately five (5) days before the end of the month.

9.3.1.2 No payments made to the Contractor, nor partial or entire use or occupancy of the Work by the County, shall be acceptance of any Work or materials not in accordance with the Contract Documents.

9.3.2 Based on California Public Contract Code Section 20104.50 and the Contract Documents, each Application for Payment shall be reviewed by the County as soon as practicable after receipt for the purpose of determining that the payment request is proper. Any Application for Payment determined not to be suitable for payment shall be returned to Contractor not later than seven (7) calendar days after receipt. Any returned Application for Payment shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper. The County shall make any progress payment within 30 days after receipt of an undisputed and properly submitted Application for Payment from the Contractor.

9.3.2.1 Such Applications for Payment shall not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason, or as to which an appropriate conditional or unconditional waiver and release of rights upon payment has not been provided.

9.3.3 Documentation. As a condition precedent to County's monthly progress payment to Contractor, Contractor shall submit with each Application for Payment the following documentation:

(1) Updated Schedules of Values, invoices and requisitions from all Subcontractors, Sub-subcontractors and suppliers performing Work covered by the Application for Payment;

(2) Completed and executed form of conditional waiver and release of rights upon progress payment in accordance with California Civil Code Section 8132, from Contractor and its Subcontractors covering the amount of the current Application for Payment;

(3) Completed and executed forms of unconditional waiver and release of rights upon progress payment in accordance with California Civil Code Section 8134, from Contractor and its Subcontractors covering the amount of the previous Application for Payment (but no later than two months prior to the current Application for Payment);

(4) Reserved.

(5) At its sole discretion, the County reserves the right to request (i) an executed subcontract including bonds, insurance, certificates, and endorsements and all other exhibits and attachments for each item of material, labor and service for which a disbursement has been requested and (ii) certifications from each Subcontractor and Sub-subcontractor of any tier, that each is current in the payment of any supplemental fringe benefits required pursuant to any collective bargaining agreement to which any such Subcontractor or Sub-subcontractor is a Party or is otherwise bound; and

(6) Such other documentation as the County may reasonably request.

Any Payment made by County to Contractor in the absence of any of the preceding documents in no way relieves the Contractor from providing all these documents for the current and/or any future payment.

9.3.3.1 As a further condition precedent to County's obligation to make monthly progress payment to Contractor, Contractor must be current in its submittal of documentation required by the Contract Documents including, but not limited to the following:

(1) A Subcontractor Procurement Log listing executed subcontracts including bonds, insurance, certificates, and endorsements and all other exhibits and attachments for each item of material, labor and service for which a disbursement has been requested;

(2) Log of all licenses, leases, permits, approvals and agreements relating to the construction of the Project;

(3) Contractor’s daily logs;

(4) Record Documents and As-Built Drawings and Specifications updated with current Project information as described in Subparagraph 3.10.1 above;

(5) Updated Project Schedule;

(6) RFI Log;

(7) Change Order Request Log and Change Order Log, including a list of any Change Orders and Construction Change Directives, contemplated or under negotiation at the date of such payment request, the status, and a rough order of magnitude cost for each such change.

(8) Certified Payrolls for the time period covered in the Application for Payment.

Any payment made by County to Contractor in the absence of any of the preceding documents in no way relieves the Contractor from providing all these documents for the current and/or any future payment.

9.3.4 Initial Payment Application. Contractor shall ensure that all administrative actions, submittals, payment procedures and requirements set forth in the Contract Documents for the first Application for Payment must precede or coincide with the initial Application for Payment, including:

(1) A description of the types of Work and the amounts thereof to be provided by the Contractor (as opposed to the Subcontractors);

(2) A list of Subcontractors, principal suppliers and fabricators;

(3) A Submittal Schedule;

(4) Copies of all necessary permits;

(5) All insurance certificates and endorsements for Contractor and all Subcontractors are in place;

(6) Payment and Performance Bonds for Contractor and Subcontractors, as applicable, are in place; and

(7) Job signs have been installed.

9.3.5 Payment to Subcontractors. Within seven (7) calendar days of Contractor's receipt of payment from County for Work performed by a Subcontractor, the Contractor shall pay all Subcontractors for and on account of Work on the Contract performed by each. The Contractor shall by appropriate agreement with each Subcontractor and Supplier, require each Subcontractor to make payments to Sub-subcontractor in a similar manner. The County will, on request, furnish to a Subcontractor, Sub-subcontractor, or supplier, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the County on account of portions of the Work done by each.

9.3.6 Substantial Completion Payment Application. Following the determination of Substantial Completion by the County's Project Manager and approval thereof by County, the Contractor shall submit an Application for Payment at Substantial Completion. In addition to submittals required for all applications for progress payments, the Contractor shall complete the following administrative actions and submittals, all of which shall precede or coincide with this application:

(1) List all incomplete items of Work and the value of each item of incomplete Work;

(2) Obtain and submit all documentation necessary to enable the County's full and unrestricted use of the Work or portions thereof, and access to services and utilities, and to supply any change-over information necessary to the County's occupancy, use, operation, and maintenance;

(3) Discontinue and remove temporary facilities and services from the Site, along with construction tools and facilities, forms, and similar items except for Contractor's field office;

(4) Obtain all temporary occupancy permits and similar approvals for the use of the facilities;

(5) Inspect, test, and adjust performance of every system of facility of the Work to ensure that overall performance is in compliance with terms of the Contract Documents;

(6) Submit a report of such test results to the County;

(7) Provide instruction for the County's operating personnel on systems and equipment operational requirements;

(8) Report performance of completed installations after adjustment that appear unable to comply with the requirements of the Contract Documents; and

(9) Submit the operating manual(s) for operating and maintaining the building.

9.3.7 Warranty of Title. The Contractor warrants that title to all Work covered by an Application for Payment will pass to the County no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Applications for Payment have been previously issued and payments received from the County shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, stop notices, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, Sub-subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and/or equipment relating to the Work. This provision shall not relieve the Contractor from the responsibility for materials and Work upon which payments have been made, the restoration of damaged Work, or waive the right of the County to require the fulfillment of the terms of the Contract.

9.3.8 Cash Allowance. Whenever the Specifications provide a lump sum amount for specified Work, the Contractor shall include that amount in his bid for the designated Work, and the stated amount shall be deemed to include the full allowance. Any difference in cost to the Contractor from the supplier shall be added to or deducted from the Contract Sum.

9.3.9 Equipment or Materials. If, during the progress of the Work, the Contractor, with the written approval of the County, purchases and stores in an approved manner on the Site any equipment or materials required to complete the Work prior to the normal need of such equipment or materials, Contractor will be paid on the same basis as provided in Paragraph 9.3, except that the value of such materials or equipment shall be claimed as a separate item and so reported until it shall have been incorporated in the Work. County will not pay for the materials or equipment at the time they are ordered and will not pay for materials or equipment until they are delivered to the Site.

9.3.9.1 If required by the County, such payments shall be conditional upon submission by the Contractor of bills of sale, or such procedure as will establish the County Title to such equipment or materials, or otherwise adequately protect the County's interests.

9.3.9.2 Any equipment or materials stored and paid for by the County prior to being incorporated in the Work shall not be used for any other purpose and shall not be removed from the Site.

9.4 Decisions to Withhold Payment

9.4.1 Basis for Decision to Withhold. The County's Project Manager may withhold payment in whole or in part, to the extent reasonably necessary to protect the County. If the County's Project Manager is unable to approve payment in the amount of the Contractor's Application for Payment, the County's Project Manager will notify the Contractor of the reasons for failing to approve the payment. If the Contractor and County's Project Manager cannot agree on a revised amount, the County's Project Manager will promptly issue payment for the amount for which the County's Project Manager is able to make such representations to the County. The County's Project Manager may refuse to make payment or, because of subsequently discovered evidence, the County's Project Manager or the County may nullify the whole or a part of a payment previously issued, to such extent as may be necessary in the County's Project Manager's opinion to protect the County from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2 and 3.18 or because of:

(1) Defective work not remedied;

(2) Third party claims filed or reasonable evidence indicating probable filing of such claims, including stop notices, unless security acceptable to the County is provided by the Contractor;

(3) Failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials, services or equipment;

(4) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

(5) Damage to the County or another contractor;

(6) Reasonable evidence that the Work will not be completed within the Contract Time;

(7) Persistent failure to carry out the Work in accordance with the Contract Documents;

(8) Liquidated damages, if any, which accrued as of the date of the Application for Payment;

(9) Such other sum as the County is entitled to recover from the Contractor; and

(10) Contractor's failure to timely submit:

(a) Daily logs;

(b) Certification from County and Contractor that Record Documents and As-Built Drawings and Specifications have been updated with current Project information as described in Paragraph 3.10 above;

(c) Updated Construction Schedule;

(d) RFI logs;

(e) Change Order Log; and

(f) Certifications from each Subcontractor and Sub-subcontractor of any tier that each is current in the payment of any supplemental fringe benefits required pursuant to any collective bargaining agreement to which any such Subcontractor is a Party or is otherwise bound.

9.4.2 Withhold for Disputes. In the event of a dispute between County and Contractor, the County may withhold from payments an amount not to exceed one hundred fifty percent (150%) of the disputed amount. When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.4.3 Withhold for Stop Notice Claims.

9.4.3.1 If at any time there shall be evidence of the existence, whether or not same has been asserted, of any stop notice, or claim arising out of or in connection with the performance or default in performance of this Contract or any subcontract or supply contract entered into by Contractor to perform this Contract, and if the County might become liable for the discharge of or satisfaction of such stop notice or claim,

then the County shall have the right to retain out of any payment then due or thereafter to become due, in addition to the amounts set forth above, an amount sufficient to discharge such stop notice or satisfy such claim and to reimburse the County and the Project Manager(s) of the County for all costs and expenses in connection therewith, including attorneys' fees. Further, the County, in its sole discretion, shall have the right to discharge or satisfy such stop notice or claim and pay all costs and expenses in connection therewith if the Contractor does not have such stop notice or claim discharged or satisfied within ten (10) calendar days after receiving notice to remove the stop notice or claim from County or unless some other procedure for discharge or satisfaction of such claim is agreed between County and Contractor. If the amounts retained are insufficient for the aforesaid purposes, or if such stop notice or claim remains undischarged or unsatisfied after all payments have been made to the Contractor, then the Contractor shall refund to the County all monies that may have been paid, or need to be paid, to discharge such stop notice or satisfy such claims, including the costs, expenses, and attorney's fees in connection therewith.

9.4.3.2 The County may release any payments withheld due to a stop notice claim if the Contractor obtains a release bond that is: (i) issued by a surety acceptable to County admitted to issue surety bonds by the California Department of Insurance; (ii) is in form and substance satisfactory to the County; and (ii) is in an amount of not less than 125% of the amount of any stop notice claim.

9.5 Progress Payments

9.5.1 County Payments to Contractor. After the County's Project Manager has issued an authorization for payment, the County, subject to its rights under Paragraph 9.5 herein, shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the County's Project Manager.

9.5.2 Joint Checks or Direct Payments. Neither the County nor County's Project Manager shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law. County, however, reserves the right, in its sole discretion for reasonable cause, to make payments to Contractor in the form of checks payable jointly to Contractor and to any of Contractor's Subcontractors or suppliers or, upon notice to Contractor with the opportunity to object, payments directly to Subcontractors and suppliers, in satisfaction of County's obligation to make payments to Contractor.

9.5.3 Payment Not Acceptance of Work. An authorization for payment, a progress payment, or partial or entire use or occupancy of the Project by the County shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.5.4 Retention. From each progress payment, five percent (5%) will be deducted and retained by the County and the remainder, less the amount of all previous payments and less the amounts needed to satisfy outstanding stop notices, will be paid

to the Contractor. At no time shall the progress payments be in excess of ninety-five percent (95%) of the percentage of actual work completed plus ninety-five percent (95%) of the value of materials delivered on the ground or stored and under the control of the County.

9.5.5 The Contractor may, at the Contractor's sole cost and expense, substitute securities equivalent to any monies withheld by the County to insure performance under this Contract. Such security shall be deposited with the County or a state or federally chartered bank as escrow agent, who shall pay such monies to the Contractor upon satisfactory completion of the Contract. The Contractor shall be the beneficiary of any security substituted for monies withheld and shall receive any accrued interest thereon. Securities eligible for investment shall include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit. No such substitution shall be accepted until the Escrow Agreement, Forms of Security and any other document related to said substitution is reviewed and found acceptable by the County, nor unless the Contractor shall have notified the County of its intention to substitute securities for retainage within ten (10) days of the signing of the Agreement.

9.5.6 Payment by Electronic Fund Transfer. Contractor shall accept all payments from County via electronic funds transfer (EFT) directly deposited into the Contractor's designated checking or other bank account. Contractor shall promptly comply with directions and accurately complete forms provided by County required to process EFT payments.

9.6 Substantial Completion

9.6.1 Contractor Request for Inspection and Punch List. When the Contractor considers that the Work is substantially complete, the Contractor shall prepare and submit to the County's Project Manager and County a request for such inspection and a comprehensive Punch List of items to be completed or corrected prior to Final Payment. Failure to include an item on such Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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

9.6.3 Determination of Substantial Completion. When the Work or designated portion thereof is substantially complete, the County's Project Manager will make a determination of Substantial Completion which shall establish the date of Substantial

Completion, shall establish responsibilities of the County and Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall finish all items on the Punch List and as required in the Contract Documents.

9.6.4 County's Acceptance. The determination of Substantial Completion prepared by County's Project Manager shall be submitted to the Contractor. Upon such acceptance and consent of surety, provided the requirements for Substantial Completion Payment set forth in the Agreement are met, the County shall make payment to the Contractor for the cost of undisputed Work in place. The County's payment shall not exceed 95% of the Contract Sum until Final Completion and acceptance by County of the Work. County, however, shall be entitled to withhold retainage equaling 150% of the estimated cost of the following items until Final Completion:

(1) Punch list items;

(2) All items necessary to obtain the Final Certificate of Occupancy identified in the Contract Documents as the Work of Contractor;

(3) As-Built and Record Documents;

(4) Potential stop notice claims of individuals or entities who have not provided Conditional Waivers and Releases Upon final Payment; and

(5) Any Claims the County may have against the Contractor.

If the Contractor has not completed all items enumerated above within thirty (30) calendar days after the determination of Substantial Completion, the County shall have the right to demand completion or correction of the items within a 48-hour period. If the Contractor does not commence the requested Work within the 48-hour period or provide County with written notice of a legitimate reason why Contractor is not able to commence the Work within the 48-hour period, the County shall have the unilateral right to complete the Work and deduct the cost of completion of the Work from any money held pending Final Completion.

9.7 Partial Occupancy or Use

9.7.1 County's Rights and Allocation of Responsibility. The County may occupy or use any completed or partially completed portion of the Work at any stage provided such occupancy or use is consented to by the insurer providing builder's risk property insurance to the Project and is not prohibited by the applicable legal requirements. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the County and Contractor have agreed in writing as to the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, and insurance, and have agreed in

writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to County and County's Project Manager as provided under Subparagraph 9.7.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the County and Contractor.

9.7.2 Joint Inspection. Immediately prior to such partial occupancy or use, the County, Contractor and County's Project Manager shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.7.3 No Acceptance. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.7.4 Conditions. The Contractor agrees to County's use and partial occupancy of a portion or unit of the Project before formal acceptance by the County under the following conditions:

(1) Occupancy by the County shall not be construed by the Contractor as being an acceptance by County of that part of the Project to be occupied;

(2) Contractor shall not be held responsible for any damage to the occupied part of the Project resulting solely from the County’s occupancy;

(3) Occupancy by the County shall not be deemed to constitute a waiver of existing claims on behalf of the County or Contractor against each other;

(4) If the Project consists of more than one building, and one of the buildings is to be occupied, the County, prior to occupancy of the building, shall secure permanent property insurance on the building to be occupied and any necessary partial occupancy permits from the governmental agencies in jurisdiction. Final approval and occupancy permits from agencies in jurisdiction are still the responsibility of the Contractor, which may be required for use and occupancy;

(5) Contractor shall make available in the areas occupied, on a 24-hour day and seven-day week basis if required, any utility services, heating, and cooling as are in condition to be put in operation at the time of early occupancy. All responsibility for the operation and maintenance of said equipment shall remain with the Contractor while it is so operated. However, an itemized list of each piece of equipment so operated, with the date operation commences, shall be made and certified by the County’s Project Manager. This list shall be the basis for the commencement of

guarantee periods on the equipment being operated for the benefit of the County's early occupancy. The County shall pay for all utility costs and operational expenses which arise out of the occupancy by the County during construction;

(6) County's use and partial occupancy prior to Project acceptance does not relieve the Contractor of his responsibility to maintain all insurance and bonds required of the Contractor under the Contract until the Project is complete and the Notice of Completion is recorded by the County; and

(7) If time and/or costs are impacted by County's partial occupancy or use, Contractor may submit a Claim for such financial and/or Schedule impact in accordance with Article 4.

9.8 Final Completion and Final Payment

9.8.1 Inspection. 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 County's Project Manager will promptly make such inspection and, when the County finds the Work acceptable under the Contract Documents and the Contract fully performed, the County's Project Manager will promptly issue a final authorization for payment stating that to the best of the County's Project Manager's knowledge, information and belief, and on the basis of the County's Project Manager's on-site visits and inspections, the Work has been fully and satisfactorily completed in strict compliance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final authorization for payment is due and payable. The County's Project Manager's final authorization for payment will constitute a further representation that conditions listed in Subparagraph 9.8.2 as precedent to the Contractor's being entitled to Final Payment have been fulfilled. Warranties required by the Contract Documents shall commence on the date of Final Completion of all Work.

9.8.2 Documentation. In addition to the requirements for Final Payment set forth in the other Contract Documents, the Final Payment shall not become due until (i) Contractor has fully performed the Contract, including all Punch List work; (ii) a Final Certificate of Occupancy (or equivalent inspection sign-off) has been issued (unless failure to issue is due to circumstances beyond the control of Contractor); (iii) sixty (60) calendar days have elapsed since County's recordation of a Notice of Completion; and (iii) Contractor has submitted to the County:

(1) A full, complete and proper Final Application for Payment;

(2) A current Sworn Statement from the Contractor setting forth all Subcontractors and material suppliers with whom Contractor has subcontracted; the amount of each subcontract; the amount requested for each Subcontractor and supplier in the payment application; the balance remaining on the subcontract; and that payrolls, bills for materials and

equipment, and other indebtedness connected with the Work for which the County or the County's property might be responsible or encumbered (less amounts withheld by County) have been paid or otherwise satisfied;

(3) A current Sworn Statement from each Subcontractor setting forth all Sub-subcontractors and material suppliers with whom Subcontractor has subcontracted; the amount of each sub-subcontract; the amount requested for each Sub-subcontractor and supplier in the payment application; the balance remaining on the subcontract; and that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the County or the County's property might be responsible or encumbered (less amounts withheld by County) have been paid or otherwise satisfied;

(4) Completed and executed forms of conditional waiver and release of rights upon final payment in accordance with California Civil Code Section 8136 from Contractor and all persons eligible to record mechanics' liens and file stop notices in connection with the Work, covering the final payment period;

(5) Completed and executed forms of unconditional waiver and release of rights upon progress payment in accordance with California Civil Code Section 8134 from Contractor and all persons eligible to record mechanics' liens and file stop notices in connection with the Work, covering the previous payment period;

(6) Completed and executed affidavits from Contractor and Subcontractors, attaching certificates and endorsements evidencing that insurance required by the Contract Documents to remain in force after Final Payment, if any, is currently in effect and will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the County;

(7) A written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents;

(8) Consent of surety(ies) to Final Payment;

(9) Contractor's written assurance that identified corrective work not complete and accepted will be completed by a stated date agreeable to County;

(10) The required Record Documents and As-Built Construction Documents including, but not limited to, shop drawings and other submittals;

(11) Reasonable proof that taxes, fees and similar obligations of Contractor have been paid;

(12) A certificate in form and substance acceptable to County and signed by the County's Project Manager certifying that, to the best of its knowledge, the Work has been completed in accordance with the Contract Documents, all Applicable Laws and restrictions; that the Work, as completed, complies in all material respects with all applicable zoning, environmental, building, and land use laws which apply to the Project; that to the knowledge of the County's Project Manager, no governmental entity has issued any notice of violation or nonconformity in connection with the improvements; that direct connection has been made to all abutting gas, sewer, telephone, and electrical facilities necessary for occupancy and use of the Project; and that the Project is ready for occupancy/use;

(13) Reserved;

(14) All warranties from vendors and Subcontractors, maintenance manuals, instructions and related agreements, equipment certifications and similar documents, and maintenance and operating instructions, which shall include:

(a) Schematic piping and wiring diagrams;

(b) Valve charts and schedules;

(c) Electrical panel schedules complete and posted in panels;

(d) Lubrication charts and schedules;

(e) Guides for troubleshooting;

(f) Pertinent diagrams of equipment with main parts designated for identification;

(g) Manufacturer's data and capacity data on all equipment;

(h) Operating and maintenance instructions for all items of equipment and all control systems;

(i) Manufacturer's parts list; and

(j) Testing procedures for operating tests;

(15) Tools, spare parts and required extra materials (i.e., attic stock), and similar items;

(16) Keys and proof of the final change-over of locks. In addition, Contractor must advise the County's personnel of the change-over in security provisions;

(17) Written start-up testing performance reports of all systems after completion of start-up testing, and complete instruction of the County's operating and maintenance personnel;

(18) Proof of adherence to final cleaning requirements of the Contract Documents; and

(19) Proof of touch up and other repairs and restoration of all marred and exposed finishes.

9.8.3 Release of Stop Notices. If a Subcontractor or supplier refuses to furnish a release or waiver required by County or files a stop notice, the Contractor shall furnish a bond satisfactory to the County to release the stop notice and indemnify the County against such stop notice and County shall enforce its right under Subparagraph 9.4.3 herein.

9.8.4 Delay Not Caused by Contractor. If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting Final Completion, the County shall, upon application by the Contractor and certification by the County, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted provided, however, that the retainage amount held following such payment shall be equal to 150% of the estimated cost of completing the Work as determined by the County. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the County prior to certification of such payment. Such payment shall be made under terms and conditions governing Final Payment.

9.8.5 Contractor's Acceptance of Final Payment. Acceptance of Final Payment by the Contractor, a Subcontractor, or material supplier shall constitute a waiver of any and all Claims by that payee, of whatsoever nature, character or kind, except those previously made in writing and identified by that payee as unsettled at the time of Final Application for Payment.

9.8.6 County's Final Payment. The making of Final Payment shall not constitute a waiver of Claims by the County arising from:

(1) Unsettled stop notices;

(2) Faulty or defective work appearing after Substantial Completion of the Work;

(3) Failure of the Work to comply with the requirements of the Contract Documents;

(4) Terms of any special warranties required by the Contract Documents; or

(5) Any other Claim unless specifically waived by the County in writing.

10 PROTECTION OF PERSONS AND PROPERTY

10.1 Safety Precautions and Programs

The Contractor is responsible for establishing, maintaining, and supervising the necessary safety precautions needed to permit the performance of the Work without endangering public safety and property. A Site Specific Safety Program and the Contractor's Safety Policy must be prepared and submitted for the County's review and comments. Contractor shall comply with the review comments of County. The Site Specific Safety Program shall include the following:

(1) The identity of outside safety consultant or Contractor's safety officer and on-site safety officer;

(2) The schedule for the Contractor's safety inspections;

(3) The type and frequency of training conducted for Contractor's personnel including tailgate meeting, lifting training, emergency procedure, etc.;

(4) Information on the types of heavy equipment to be used and the necessary precaution to be taken if there is an accident;

(5) A copy of the Contractor's Hazardous Communications Program;

(6) A list of any possible fire hazards and the firefighting equipment for the particular Site;

(7) A detailed description of hazardous or unusual procedures necessary for the particular Site;

(8) Information on any material impact of the construction on the surrounding area including traffic flow, parking, street closure, utility shutoffs, and pedestrian crossing;

(9) Placement, quantity and type of safety warning lights, signs or other devices during construction;

(10) Written procedures in the event of an injury, fire, hazardous material experience, or other emergency during construction; and

(11) Description of the location and enclosure of the approved staging area.

Contractor shall also comply with any safety requirements required by insurers providing coverage for the Project. Notwithstanding the foregoing, Contractor specifically assumes all risk of damages or injury to any persons or property, wherever located, resulting from any action or operation of the Contractor or Contractor's Subcontractors or Sub-subcontractors under the Contract Documents or in connection with the Work.

10.2 Safety of Persons and Property

10.2.1 Contractor's Responsibility for Damage or Loss. Except as otherwise provided in the Contract Documents and except as to the cost of repair or restoration of damage to the Work caused by Force Majeure events, the Contractor shall bear all losses resulting to him/her on account of the amount or character of the Work, or from any unforeseen obstructions or difficulties which may be encountered, or from any encumbrances on the line of the Work, or because the nature of the ground in or on which the Work is done is different from what is assumed. The Contractor shall bear the risk for any County equipment, material, or supplies with which Contractor has been entrusted and shall bear responsibility for all bodily injuries to persons, including accidental death, which may be caused by Contractor's performance of the Work.

10.2.2 Contractor's Remedy for Damage or Loss. The Contractor shall promptly remedy all damage or loss to any property referred to in this Article arising, in whole or in part, from the Work performed by the Contractor or by 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, and for which the Contractor is responsible, except damage or loss attributable to the acts or omission of the County, or anyone directly or indirectly employed by the County, or by anyone for who the County may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's indemnification obligations under Paragraph 3.18 herein.

10.2.3 Precautions and Protection. The Contractor shall take necessary precautions for the safety of, and shall provide necessary protection to prevent damage, injury or loss to:

(1) Employees on the Site and other persons who may be affected thereby;

(2) The Work and materials and equipment to be incorporated therein, whether in storage on or off the Site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

(3) Other property at the Site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

10.2.4 Notice and Compliance with Applicable Law. The Contractor shall give notices and comply with Applicable Laws bearing on safety of persons or property or

their protection from damage, injury or loss. Contractor shall comply with all laws and regulations, including the California Labor Code and with all California Occupational Safety and Health Act ("OSHA"), Environmental Protection Agency, and South Coast Air Quality Management District and Mojave Desert Air Quality Management District regulations, concerning safety requirements and protection of workers including, but not limited to, those regulations concerning scaffolding, bracing, shoring, trench excavating and removal, and handling and disposal of hazardous waste. Contractor shall fully defend, indemnify, and hold harmless the County, its members, officers, volunteers, employees, and agents, including, but not limited to, the County's Project Manager, from any and all citations and/or memoranda assessed against the County due to regulatory violations of the Contractor, Contractor's Subcontractors, or Sub-subcontractors.

10.2.5 Safeguards. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgate safety regulations, and notify County and users of adjacent Sites and utilities. The Contractor shall also be responsible for all measures necessary to protect any property adjacent to the Project and improvements thereon. Any damage to adjacent property or improvements shall be promptly repaired or replaced by Contractor at its sole cost and expense within the Contract Sum.

10.2.6 Excavation. As required by Section 6705 of the California Labor Code and in addition thereto, whenever Work under the Contract involves the excavation of any trench or trenches five feet or more in depth, the Contractor shall submit for acceptance by the County or by a registered civil or structural engineer employed by the County, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the construction safety orders of the Division of Industrial Safety, the plan shall be prepared by a registered civil or structural engineer employed by the Contractor and all costs therefore shall be included in the price named in the Contract for completion of the Work as set forth in the Contract Documents. Nothing in this section shall be construed to impose tort liability on the County or any of its officers, agents, officials, volunteers, the Project Managers or employees.

10.2.7 Notice of Hazards. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care, carry on such activities under supervision of properly qualified personnel, and shall provide County and County's Project Manager with reasonable advance notice of such activity.

10.2.8 Loading. The Contractor shall not load or permit any part of the construction or Site to be loaded so as to endanger its safety. The Contractor shall be responsible for the protection of all existing structures and improvements, both above and underground, including both the exterior and interior finishes within the adjoining

working areas, and shall provide adequate temporary removal as necessary. Any existing structures or improvements damaged during construction shall be repaired or replaced with materials, workmanship, fixtures, or equipment of the same kind, quality and size as the original, prior to damage. Any materials or equipment temporarily removed and damaged shall be re-erected or installed in a manner approved by the County.

10.2.8.1 The Contractor shall review the structural capability of the construction and Site prior to allowing installation of temporary lifting devices or staging equipment or the temporary off-loading of materials. Contractor shall not exceed design loads without making modifications to the construction or Site to support such loads.

10.2.8.2 All modifications to the construction or Site to support temporary lifting devices, staging equipment, or loading shall be submitted to County for review and acceptance.

10.2.9 Accident Prevention. The Contractor shall designate a responsible member of the Contractor's organization at the Site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated by the Contractor in writing to the County.

10.2.10 Accident Reporting. The Contractor shall immediately report all accidents and injuries to County, and shall submit on a form approved by County within 24 hours of such accident or injury setting forth essential information for investigation of the accident or injury including, but not limited to, name, address, and phone number of all injured workers and witnesses, location on the jobsite, nature of injury, medical treatment, identity of ambulance company, and hospital.

10.2.11 Adjoining Property. Contractor shall employ all necessary measures to protect adjoining adjacent property and shall provide barricades, temporary fences, and covered walkways required to protect the safety of passersby, as required by prudent construction practices, local building codes, ordinances, or other laws and the Contract Documents.

10.2.12 Response. Contractor shall immediately respond to notice from the County of unsafe conditions.

10.2.13 Documents Available. Contractor shall have available at the Project Site, copies or suitable extracts of “Construction Safety Orders” and “General Industrial Safety Orders” issued by the State Division of Industrial Safety.

10.3 Hazardous Materials

10.3.1 Notice to County. The Contractor agrees that it is solely responsible for investigation and performing remedial actions on all hazardous materials and other

related environmental requirements located on the Project Site. Any hazardous materials that are encountered beyond those described in the Contract Documents may properly be the subject to a Change Order. The County agrees that the Contractor cannot be considered a hazardous materials generator of any such materials in existence on the Site at the time it is given possession of the Site. In the event the Contractor encounters on the Site materials which it reasonably believes to be "hazardous materials" as that term is defined by federal and state law, which have not been rendered harmless, the Contractor shall immediately stop work in the area affected and report the condition to the County in writing. The work in the affected area shall not thereafter be resumed until a suitable testing agency certifies the material as nonhazardous or the material is removed or rendered harmless as certified by a suitable testing agency.

10.3.2 Material Safety Data Sheets and Compliance with Proposition 65.

10.3.2.1 Contractor is required to ensure that material safety data sheets are available in a readily accessible place at the Work Site, for any material requiring a material safety data sheet per the federal "hazard communication" standard, or employees' right-to-know law. The Contractor is also required to insure proper labeling on any substance brought into the Project Site, and that any person working with the material, or within the general area of the material, is informed of the hazards of the substance and follows proper handling and protection procedures.

10.3.2.2 Contractor is required to comply with the provisions of California Health and Safety Code Sections 25249.5 et seq., which requires the posting and giving of notice to persons who may be exposed to any chemical known to the State of California to cause cancer. The Contractor agrees to familiarize itself with the provisions of this section, and to comply fully with its requirements.

10.4 Contractor Materials

The County shall not be responsible for materials and substances brought to the Site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

10.6 Protection of the Work

10.6.1 Contractor shall protect all materials, equipment, supplies and Work from injury or damage due to heat, storms, rain or wind. If unusually severe weather makes it impossible to continue operations safely in spite of necessary weather precautions,

Contractor shall cease Work and notify County of such cessation in accordance with the requirements of Article 4.

10.6.2 Contractor shall not permit open fires on the Project.

10.6.3 Contractor shall take necessary precautions to guard against and eliminate possible fire hazards and to prevent damage to construction Work, building materials, equipment, temporary field offices, storage shed, and public and private property.

10.6.4 If Contractor fails to adequately protect the Work, Contractor is responsible for all damage incurred by County. Contractor is responsible for payment of the deductible on the Builder's Risk Policy, however, County, at its sole discretion, can decide to pay the deductible and deduct such payment from payments then or thereafter due Contractor. If payments then or thereafter due the Contractor are not sufficient to cover such deductible amounts, the Contractor will then pay the different to the County.

10.7 Protection of Existing Property

The Contractor shall be responsible for all measures necessary to protect existing property to remain. This shall include, but is not limited to, padding and draping elevators used in construction, draping of openings and other measures to isolate areas remaining in use, relocation of furniture, fixtures, and equipment, protective covering/draping of furniture, fixtures, and equipment, and protection of landscape materials, planting, and interior and exterior finishes at and adjacent to the Work. Property damaged by the Contractor shall be repaired or replaced by the Contractor to the satisfaction of the County without increase to the Contract Sum. Such measures shall be taken at a frequency required to provide such protection and to keep the areas operational as indicated elsewhere in the Agreement.

11 INSURANCE AND BONDS

11.1 Performance Bond and Payment Bond

11.1.1 Bond Requirements.

11.1.1.1 Contractor shall furnish a Labor and Material Payment Bond and a Performance Bond on the forms provided by the County or on any other form approved by County. Contractor shall deliver to County no later than ten (10) calendar days after award of the Contract, evidence satisfactory to County that Contractor has obtained the required bonds. The Performance Bond shall be furnished as a guarantee of the faithful performance of the requirements of the Contract Documents in an amount equal to one hundred percent (100%) of the Contract Sum. The Payment Bond shall secure payment of all claims, demands, stop notices, mechanics liens, or charges of material suppliers, mechanics, or laborers employed by the Contractor or by any Subcontractor or any person, firm, or entity eligible to file a stop notice with respect to the Work in an amount equal to one

hundred percent (100%) of the Contract Sum. Bonds may be obtained through Contractor's usual source, provided the bonds meet all County requirements, and the cost thereof shall be included in the Contract Sum. In the event of changes in the Work, that increase the Contract Sum, the amount of each bond shall increase and at all times remain equal to the Contract Sum.

11.1.1.2 The bonds shall be executed by a California admitted surety with an A.M. Best's Company rating satisfactory to the County. If an A.M. Best's rating is not available, the proposed surety must meet comparable standards of another rating service satisfactory to County. Bonds issued by a California admitted surety listed in the latest versions of the U.S. Department of Treasury Circular 570 shall be deemed to be accepted unless specifically rejected by County. Bonds from a California admitted surety not listed in Treasury Circular 570 must be accompanied by all of the documents enumerated in California Code of Civil Procedure Section 995.660(a). All bonds must comply with the Bond and Undertaking Law (Code of Civil Procedure Section 995.010 et. seq.).

11.1.1.3 All such bonds shall be accompanied by a power of attorney from the surety company authorizing the person executing the bond to sign on behalf of the company. If the bonds are executed outside the State of California, all copies of the bonds must be countersigned by a California representative of the surety. The signature of the person executing the bond shall be acknowledged by a Notary Public as the signature of the person designated in the power of attorney.

11.1.1.4 If, during the continuance of the Contract, any of the sureties, in the opinion of the County, are or become non-responsible or otherwise unacceptable to County, County may require other new or additional sureties, which the Contractor shall furnish to the satisfaction of County within ten (10) days after notice, and in default thereof the Contract may be suspended and the materials may be purchased or the work completed as provided in Articles 2 and 13 herein.

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

11.1.3 The Performance Bond shall name the County as the beneficiary under the bond.

11.1.4 In the event of increases in the Contract Sum by Change Orders, or otherwise, the Contractor shall submit to the County evidence of additional bond coverage (both Labor and Material Payment Bond and Performance Bond) for such increases in the Contract Sum. Contractor shall be compensated for such additional bond coverage.

11.1.5 Changes in the Work or extensions of time, made pursuant to the Contract, shall in no way release the Contractor or Surety from their obligations; and the bonds shall remain in full force and effect until one year following the filing of Notice of Completion of the Project by the County. Notice of such changes or extensions shall be waived by the surety.

11.2 Insurance

11.2.1 Contractor shall not commence work under this Contract until all insurance has been obtained that is required under this section and such insurance has been verified by the County, nor shall Contractor allow any Subcontractor to commence work on its Contract until all similar insurance required of the Subcontractor has been so obtained and approved.

The Contractor agrees to provide insurance set forth in accordance with the requirements herein. If the Contractor uses existing coverage to comply with these requirements and that coverage does not meet the specified requirements, the Contractor agrees to amend, supplement or endorse the existing coverage to do so.

Without in anyway affecting the indemnity herein provided and in addition thereto, the Contractor shall secure and maintain throughout the contract term the following types of insurance with limits as shown:

11.2.1.1 Workers' Compensation/Employers Liability

A program of Workers' Compensation insurance or a state-approved, self-insurance program in an amount and form to meet all applicable requirements of the Labor Code of the State of California, including Employer's Liability with $250,000 limits covering all persons including volunteers providing services on behalf of the Contractor and all risks to such persons under this Contract.

If Contractor has no employees, it may certify or warrant to the County that is does not currently have any employees or individuals who are defined as "employees" under the Labor Code and the requirement for Workers' Compensation coverage will be waived by the County's Director of Risk Management.

With respect to Contractors that are non-profit corporations organized under California or Federal law, volunteers for such entities are required to be covered by Workers' Compensation insurance.

11.2.1.2 Commercial/General Liability Insurance

The Contractor shall carry General Liability Insurance covering all operations performed by or on behalf of the Contractor providing coverage for bodily injury and property damage with a combined single limit of not less than one million dollars ($1,000,000), per occurrence. The policy coverage shall include:

(a) Premises operations and mobile equipment.
(b) Products and completed operations.
(c) Broad form property damage (including completed operations).
(d) Explosion, collapse and underground hazards.
(e) Personal injury
(f) Contractual liability.
(g) $2,000,000 general aggregate limit.

11.2.1.3 Automobile Liability Insurance

Primary insurance coverage shall be written on ISO Business Auto coverage form for all owned, hired and non-owned automobiles or symbol 1 (any auto). The policy shall have a combined single limit of not less than one million dollars ($1,000,000) for bodily injury and property damage, per occurrence.

If the Contractor is transporting one or more non-employee passengers in performance of contract services, the automobile liability policy shall have a combined single limit of two million dollars ($2,000,000) for bodily injury and property damage per occurrence.

If the Contractor owns no autos, a non-owned auto endorsement to the General Liability policy described above is acceptable.

11.2.1.4 Increased General Liability and Automobile Liability Insurance Limits for Larger Construction Projects

Construction contracts for projects of one million ($1,000,000) or over and less than three million ($3,000,000) require limits of not less than three million ($3,000,000) in General Liability and Auto Liability coverage.

Construction contracts for projects of three million ($3,000,000) or over and less than five million ($5,000,000) require limits of not less than five million ($5,000,000) in General Liability and Auto Liability coverage.

Construction contracts for projects of five million ($5,000,000) or over require limits of not less than ten million ($10,000,000) in General Liability and Auto Liability.

11.2.1.5 Course of Construction/Installation (Builder's Risk) Property Insurance

Course of Construction/Installation (Builder's Risk) Property Insurance providing all risk, including theft coverage for all property and materials to be used on the project. The insurance policy shall not have any coinsurance penalty.

11.2.1.6 Umbrella Liability Insurance

An umbrella (over primary) or excess policy may be used to comply with limits or other primary coverage requirements. When used, the umbrella policy shall apply to bodily injury/property damage, personal injury/advertising injury and shall include a "dropdown" provision providing primary coverage for any liability not covered by the primary policy. The coverage shall also apply to automobile liability.

11.2.1.7 Continuing Products/Completed Operations Liability Insurance

Contractor shall provide Continuing Products/Completed Operations Liability Insurance with a limit of not less than five million ($5,000,000) for each occurrence for at least three years following substantial completion of the work on projects over one million ($1,000,000).

11.2.1.8 Environmental Liability Insurance

Any contract that that involves the use, handling, transportation, storage, abatement, containment or testing of any substance that is potentially toxic or hazardous to the environment, including but not limited to, those listed as hazardous by the United States Department of Transportation or the CAL OSHA "Director's list of Hazardous Substances" or listed as radioactive by the Nuclear Regulatory Commission, shall have the following additional requirements:

Environmental Liability Insurance with a combined single limit of not less than five million ($5,000,000) per claim or occurrence and a separate aggregate for the contract project. The required additional insured endorsement shall protect the County without any restrictions.

If insurance coverage is provided on a "claims made" policy, the "retroactive date" shall be shown and must be before the date of the start of the contract work. The claims made insurance shall be maintained or "tail" coverage provided for a minimum of five (5) years after contract completion.

11.2.2 Subcontractor Insurance Requirements.

The Contractor agrees to require all parties or subcontractors, including architects or others it hires or contracts with related to the performance of this Contract to provide insurance covering the contracted operations with the basic requirements identified in Paragraphs 11.2.3 through 11.2.11 and 3.18 (indemnification), and the insurance specifications identified under Paragraph 11.2, (including waiver of subrogation rights) and naming the County as an additional insured. The Contractor agrees to monitor and review all such coverage and assumes all responsibility ensuring that such coverage is provided as required here.

11.2.3 Additional Insured

All policies, except for the Workers' Compensation, Errors and Omissions and Professional Liability policies, shall contain endorsements naming the County and its officers, employees, agents and volunteers as additional insureds with respect to liabilities arising out of the

performance of services hereunder. The additional insured endorsements shall not limit the scope of coverage for the County to vicarious liability but shall allow coverage for the County to the full extent provided by the policy. Such additional insured coverage shall be at least as broad as Additional Insured (Form B) endorsement form ISO, CG 2010.11 85.

11.2.4 Waiver of Subrogation Rights

The Contractor shall require the carriers of required coverages to waive all rights of subrogation against the County, its officers, employees, agents, volunteers, contractors and subcontractors. All general or auto liability insurance coverage provided shall not prohibit the Contractor and Contractor's employees or agents from waiving the right of subrogation prior to a loss or claim. The Contractor hereby waives all rights of subrogation against the County.

11.2.5 Policies Primary and Non-Contributory

All policies required herein are to be primary and non-contributory with any insurance or self-insurance programs carried or administered by the County.

11.2.6 Severability of Interests

The Contractor agrees to ensure that coverage provided to meet these requirements is applicable separately to each insured and there will be no cross liability exclusions that preclude coverage for suits between the Contractor and the County or between the County and any other insured or additional insured under the policy.

11.2.7 Proof of Coverage

The Contractor shall furnish Certificates of Insurance to the County Department administering the contract evidencing the insurance coverage at the time the contract is executed, additional endorsements, as required shall be provided prior to the commencement of performance of services hereunder, which certificates shall provide that such insurance shall not be terminated or expire without thirty (30) days written notice to the Department, and Contractor shall maintain such insurance from the time Contractor commences performance of services hereunder until the completion of such services. Within fifteen (15) days of the commencement of this Contract, the Contractor shall furnish a copy of the Declaration page for all applicable policies and will provide complete certified copies of the policies and endorsements immediately upon request.

11.2.8 Acceptability of Insurance Carrier

Unless otherwise approved by Risk Management, insurance shall be written by insurers authorized to do business in the State of California and with a minimum "Best" Insurance Guide rating of "A- VII".

11.2.9 Deductibles and Self-Insured Retention

Any and all deductibles or self-insured retentions in excess of $10,000 shall be declared to and approved by Risk Management.

11.2.10 Failure to Procure Coverage

In the event that any policy of insurance required under this contract does not comply with the requirements, is not procured, or is canceled and not replaced, the County has the right but not the obligation or duty to cancel the contract or obtain insurance if it deems necessary and any premiums paid by the County will be promptly reimbursed by the Contractor or County payments to the Contractor will be reduced to pay for County purchased insurance.

11.2.11 Insurance Review

Insurance requirements are subject to periodic review by the County. The Director of Risk Management or designee is authorized, but not required, to reduce, waive or suspend any insurance requirements whenever Risk Management determines that any of the required insurance is not available, is unreasonably priced, or is not needed to protect the interests of the County. In addition, if the Department of Risk Management determines that heretofore unreasonably priced or unavailable types of insurance coverage or coverage limits become reasonably priced or available, the Director of Risk Management or designee is authorized, but not required, to change the above insurance requirements to require additional types of insurance coverage or higher coverage limits, provided that any such change is reasonable in light of past claims against the County, inflation, or any other item reasonably related to the County's risk.

Any change requiring additional types of insurance coverage or higher coverage limits must be made by amendment to this contract. Contractor agrees to execute any such amendment within thirty (30) days of receipt.

Any failure, actual or alleged, on the part of the County to monitor or enforce compliance with any of the insurance and indemnification requirements will not be deemed as a waiver of any rights on the part of the County.

12 UNCOVERING AND CORRECTION OF WORK

12.1 Uncovering of Work

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

12.1.2 No Specific Request. If a portion of the Work has been covered, which the County has not specifically requested to examine prior to its being covered, the County may request to see such Work and it shall be uncovered by the Contractor. If such

Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the County's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense within the Contract Sum unless the condition was caused by the County or a Separate Contractor in which event the County shall be responsible for payment of such costs.

12.2 Correction of Work

12.2.1 Before or After Final Completion. The Contractor shall promptly correct Work rejected by the County as failing to conform to the requirements of the Contract Documents, whether discovered before or after Final Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing, inspections, and compensation for the County's services and expenses made necessary thereby, shall be at the Contractor's expense within the Contract Sum.

12.2.1.1 If Contractor fails to promptly correct Work rejected by the County, as failing to conform to the requirements of the Contract Documents, or fails to perform the Work in accordance with the Contract Documents, the County may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated by Contractor, or until the County chooses to complete the Work. Contractor shall not be entitled to any adjustment of Contract Time or Contract Sum as a result of any such order. The County and County's Project Manager shall have no duty or responsibility to Contractor or any other party to exercise the right to stop the Work.

12.2.2 After Final Completion.

12.2.2.1 In addition to the Contractor's warranty obligations under Paragraph 3.5, if, within one year after the date of Final Completion of the Work or after the date for commencement of warranties established under Subparagraph 3.5.2, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the County to do so, unless the County has previously given the Contractor a written acceptance of such condition. Such corrective work shall be performed without charge or cost to County after Final Completion of the Work. The County shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time after receipt of notice from the County, the County may correct the nonconforming work in accordance with Paragraph 2.5.

12.2.3 Removal. The Contractor shall remove from the Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the County.

12.2.4 Destruction or Damage. The Contractor shall bear the cost within the Contract Sum of correcting destroyed or damaged construction, whether completed or partially completed, of the County or Separate Contractor caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

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

12.3 Acceptance of Nonconforming Work

If the County prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the County may do so instead of requiring its removal and correction. Such option shall be exercised solely by notice to Contractor and shall not be implied from any act or omission by the County. In such case, the Contract Sum will be reduced by an amount equal to the cost of replacing the Work to make it as originally specified or intended. Such adjustment shall be effected whether or not Final Payment has been made.

13 TERMINATION OR SUSPENSION OF THE CONTRACT

13.1 Termination by the Contractor

13.1.1 Work Stoppage Not Caused by County. If the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons: issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped; an act of government, such as a declaration of national emergency which requires all Work to be stopped; and Contractor has given County written notice within ten (10) days of the occurrence of such ground for termination, then the Contractor may, upon thirty (30) additional calendar days written notice to County and, unless the reason has theretofore been cured, terminate its performance and recover from the County payment for Work executed to date and reasonable demobilization costs.

13.1.2 Work Stoppage Caused by County. If the Work is stopped for a period of 120 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the County has persistently failed to fulfill the County's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may give County ten (10) calendar days written notice to cure. If the County fails to cure, the Contractor may, upon ten (10) additional calendar days' written notice to the County, terminate the Contract and recover from the County as provided in Subparagraph 13.1.1 above.

13.2 Termination by the County for Cause

13.2.1 Grounds. The County may terminate the Contractor's performance of the Contract for cause if:

(1) Contractor fails promptly to begin the Work under the Contract Documents; or

(2) Contractor refuses or fails to supply enough properly skilled workers or proper materials; or

(3) Contractor fails to perform the Work in accordance with the Contract Documents, including conforming to applicable standards set forth therein in constructing the Project, or refuses to remove and replace rejected materials or unacceptable Work; or

(4) Contractor discontinues the prosecution of the Work (exclusive of work stoppage: (i) due to termination by County; or (ii) due to and during the continuance of a Force Majeure event or suspension by County); or

(5) Contractor fails to resume performance of Work which has been suspended or stopped, within a reasonable time after receipt of notice from County to do so or (if applicable) after cessation of the event preventing performance; or

(6) Any representation or warranty made by Contractor in the Contract Documents or any certificate, schedule, instrument, or other document delivered by Contractor pursuant to the Contract Documents shall have been false or materially misleading when made; or

(7) Contractor fails to make payment to Subcontractors for materials or labor in accordance with the respective Contract Documents and Applicable Law; or

(8) Contractor disregards laws, ordinances, or rules, regulations, or orders of a public authority having jurisdiction; or

(9) Contractor otherwise is guilty of breach of a provision of the Contract Documents; or

(10) Contractor becomes insolvent, is adjudicated bankrupt, or makes a general assignment for the benefit of creditors and fails to provide County with adequate assurances of Contractor's ability to satisfy its contractual obligations.

A receiver, trustee, or other judicial officer shall not have any right, title, or interest in or to the Contract. Upon that person's appointment, County has, at its option and sole discretion, the right to immediately cancel the Contract and declare it null and void.

13.2.2 County's Rights. When any of the reasons specified in Subparagraph 13.2.1 exist, the County may, in addition to and without prejudice to any other rights or remedies of the County, and after giving the Contractor five (5) calendar days written notice, terminate employment of the Contractor and may:

(1) Take possession of the Site and of all materials, equipment, tools and construction equipment, and machinery thereon owned by the Contractor;

(2) Suspend any further payments to Contractor;

(3) Accept assignment of subcontracts pursuant to Paragraph 5.3; and

(4) Finish the Work by whatever reasonable method the County may deem expedient. Upon request of the Contractor, the County shall furnish to the Contractor a detailed accounting of the costs incurred by the County in finishing the Work.

13.2.3 Costs. If County's costs to complete and damages incurred due to Contractor's default exceed the unpaid Contract balance, the Contractor and Contractor's Sureties shall pay the difference to the County.

13.2.4 Erroneous Termination. If it has been adjudicated or otherwise determined that County has erroneously or negligently terminated the Contractor for cause, then said termination shall automatically convert to a termination by the County for convenience as set forth in Paragraph 13.4.

13.3 Suspension by the County

13.3.1 Suspension For Convenience.

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

13.3.1.2 Contractor shall promptly recommence the Work upon written notice from County directing Contractor to resume the Work. The Contract Sum and Contract Time shall be adjusted for any increases in the cost and time caused by suspension, delay, or interruption provided Contractor complies with the Change Order and

Claims proceedings set forth the Articles 4 and 7 of these General Conditions. No adjustment shall be made to the extent:

(1) That performance is, was, or would have been so suspended, delayed, or interrupted by another cause for which the Contractor is responsible; or

(2) That an equitable adjustment is made or denied under another provision of the Contract.

13.3.2 Suspensions For Cause. County has the authority by written order to suspend the Work without liability to County wholly or in part for Contractor's failure to:

(1) Correct conditions unsafe for the Project personnel or general public; or

(2) Carry out the Contract; or

(3) Carry out orders of County.

13.3.3 Responsibilities of Contractor During Suspension Periods. During periods that Work is suspended, Contractor shall continue to be responsible for the Work and shall prevent damage or injury to the Project, provide for drainage, and shall erect necessary temporary structures, signs or other facilities required to maintain the Project and continue to perform according the Article 10 of these General Conditions.

13.4 Termination by the County for Convenience

13.4.1 Grounds. Without limiting any rights which County may have by reason of any default by Contractor hereunder, County may terminate Contractor's performance of the Contract in whole or in part, at any time, for convenience or any other reason upon written notice to Contractor. Such termination shall be effective as of the date stated in the written notice, which shall be no less than ten (10) calendar days from the date of the notice.

13.4.2 Contractor Actions. Immediately upon receipt of such notice, Contractor shall: (i) cease performance of the Work of this Agreement to the extent specified in the notice; (ii) take actions necessary or that the County may direct, for the protection and preservation of the Work; (iii) settle outstanding liabilities, as directed by County; (iv) transfer title and deliver to County Work in progress, specialized equipment necessary to perform the Work, and Record Documents; and, (v) except for Work directed by County to be performed, incur no further costs or expenses. At the option of the County, all or any of the subcontracts entered into by Contractor prior to the date of termination shall be terminated or shall be assigned to County.

13.4.3 Compensation. If the Parties are unable to agree on the amount of a termination settlement, the County shall pay the Contractor the following amounts:

(1) For Work performed before the effective date of termination, the total (without duplication of any items) of:

(a) The Cost of the Work; and

(b) A sum, as profit on (1)(a), above, determined by the County to be fair and reasonable;

(2) The reasonable costs of settlement of the Work terminated, including:

(a) Accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data; and

(b) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

In no event shall Contractor be entitled to recover overhead or profit on Work not performed.

13.5 Authority of County

In determination of the question of whether there has been such noncompliance with the Contract as to warrant the suspension or termination of the Contract, the decision of the County will be binding on all parties.

13.6 Termination by Acts of God

In the event the Project is damaged by an "Act of God" as defined in Public Contract Code section 7105, the County may elect to terminate the Contract. If the County terminates the Contract pursuant to this paragraph, compensation to the Contractor shall be solely for any Work completed, any materials purchased, any bonds and insurance paid and for any equipment used prior to the occurrence of the "Act of God".

14 EMPLOYMENT OF LABOR/WAGE RATES

14.1 Determination of Prevailing Rates

Pursuant to California Labor Code, Part VII, Chapter 1, Article 2, Sections 1770, et seq., the County has obtained from the Director of the Department of Industrial Relations (DIR) pursuant to the California Labor Code, the general prevailing rates of per diem wages and the prevailing rates for holiday and overtime work in the locality in which the Work is to be performed. Copies of said rates are on file with the Department, San Bernardino County, will be made available for inspection during regular business hours, are included elsewhere in the specifications for the Work in the Project, and are also available online at www.dir.ca.gov/dlsr/DPreWageDetermination.htm. The wage rate for any classification not

listed, but which may be required to execute the Work, shall be commensurate and in accord with specified rates for similar or comparable classifications for those performing similar or comparable duties. In accordance with Section 1773.2 of the California Labor Code, the Contractor shall post, at appropriate and conspicuous locations on the jobsite, a schedule showing all applicable prevailing wage rates and shall comply with the requirements of Labor Code Sections 1773, et seq.

14.1.1 Federal Funding Requirements.

14.1.1.1 If federal funding is involved with the Project the Federal Davis-Bacon Act (40 U.S.C. 3141 et seq.), as supplemented by Department of Labor regulations (29 C.F.R. Part 5), will apply to the Project and those requirements shall be complied with by Contractor. The Contractor and all Subcontractors and Sub-subcontractors are required to pay their employees and workers a wage not less than the minimum wage for the work classification as specified in both the Federal and California wage decisions. The higher of the two applicable wage classifications, either California prevailing wage or Davis-Bacon Federal prevailing wage, will be enforced for all Work under this Contract. If applicable, the Contractor is responsible for ensuring Subcontractor compliance with Davis-Bacon and related federal law requirements.

14.1.1.2 Contractor must comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 C.F.R. Part 3).

14.1.1.3 Contractor must comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.) as supplemented by Department of Labor regulations (29 C.F.R. Part 5).

14.2 Subcontractors

14.2.1 Ineligible Subcontractors. Pursuant to the provisions of Section 1777.1 of the California Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a contractor or subcontractor on a public works project. This list of debarred contractors is available from the DIR website at http://www.dir.ca.gov/dir/Labor_law/DSLE/Debar.html. Any contract entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract, and any public money that may have been paid to a debarred subcontractor by a contractor on the project shall be returned to the County. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the Project.

14.2.1.1 Excluded Parties List System (EPLS). Neither Contractor nor its employees or subcontractors shall be named on the EPLA, which includes information regarding entities debarred, suspended, proposed for debarment, excluded or disqualified under the non-procurement common rule, or otherwise declared ineligible from receiving Federal contracts, certain subcontracts, and

certain Federal assistance and benefits. The EPLS can be accessed at http://www.epls.gov/. This information may include names, addresses, DUNS numbers, Social Security Numbers, Employer Identification Numbers or other Taxpayer Identification Numbers, if available and deemed appropriate and permissible to publicize by the agency taking the action. Contractor is aware that although United States General Service Administration operates this system, individual agencies are responsible for the timely reporting, maintenance, and accuracy of their data.

14.2.1.2 Certification. Contractor certifies that neither it nor its principals or Subcontractors are presently disbarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency as required by Executive Order 12549.

14.2.2 Employment of Apprentices. The Contractor and all Subcontractors performing Work for the Project shall comply with all requirements pertaining to the employment of apprentices pursuant to the provisions of the California Labor Code including, but not limited to, California Labor Code Section 1777.5.

14.3 Payment of Prevailing Rates

There shall be paid each worker of the Contractor, or any Subcontractor, of any tier, engaged in the Work, not less than the general prevailing wage rate, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor, of any tier, and such worker.

14.4 Prevailing Rate Penalty

The Contractor shall, as a penalty, forfeit two hundred dollars ($200.00) to the County for each calendar day or portion thereof, for each worker paid less than the prevailing rates as determined by the Director of the Department of Industrial Relations for such work or craft in which such worker is employed by the Contractor or by any Subcontractor in connection with the Work. Pursuant to California Labor Code Section 1775, the difference between such prevailing wage rates and the amount paid to each worker for each calendar day, or portion thereof, for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by the Contractor.

14.5 Payroll Records

14.5.1 Pursuant to California Labor Code Section 1776, the Contractor and each Subcontractor, of any tier, shall keep accurate certified payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by them in connection with the Work. The payroll records enumerated herein shall be verified by a written declaration made under penalty of perjury that the information contained in the payroll

record is true and correct and that the Contractor or Subcontractor has complied with the requirements of the California Labor Code Sections 1771, 1811, and 1815 for any Work performed by his or her employees on the Project. The payroll records shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) a certified copy of an employee's payroll record shall be made available for inspection or furnished to such employee or his/her authorized representative on request;

(2) a certified copy of all payroll records shall be made available for inspection or furnished upon request to the County, the Division of Labor Standards Enforcement and the Division of Apprenticeship Standards of the Department of Industrial Relations;

(3) a certified copy of payroll records shall be made available upon request to the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the County, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been previously provided to the County, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, the requesting party shall, prior to being provided the records, reimburse the cost of preparation by the Contractor, Subcontractor and the entity through which the request was made; the public shall not be given access to such records at the principal office of the Contractor;

(4) the Contractor shall file a certified copy of the payroll records with the entity that requested such records within ten (10) days after receipt of a written request; and

(5) copies provided to the public, by the County, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor or any Subcontractor of any tier, performing a part of the Work shall not be marked or obliterated. The Contractor shall inform the County of the location of payroll records, including the street address, city and county and shall, within five (5) working days, provide a notice of a change of location and address.

14.5.2 In the event Contractor does not comply with the requirements of this subsection, the Contractor shall have ten (10) days in which to comply, subsequent to a receipt of written notice specifying in what respects the Contractor must comply herewith. Should non-compliance still be evident after a ten (10) day period, the Contractor shall, as a penalty to the County, forfeit one-hundred dollars ($100.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, such penalty shall be withheld from any portion of the Contract Sum then due or to become due to the Contractor.

14.5.3 State Construction Bond and Weekly Electronic Certified Payroll Records.

14.5.3.1 If the Project is funded in whole or in part from a bond issued by the State to fund public works projects, the following requirements shall apply:

14.5.3.1.1 The Project is subject to the requirements of Division 2, Part 7, Chapter 1 of the California Labor Code and Title 8, Division 1, Chapter 8, Subchapter 4.5 of the California Code of Regulations. Under the above-cited Chapter of the Labor Code and Subchapter of the California Code of Regulations, this Project is subject to monitoring by the Compliance Monitoring Unit (CMU) of the California Department of Industrial Relations, Division of Labor Standards Enforcement. In addition, under the above-cited Chapter of the Labor Code and Subchapter of the California Code of Regulations, the Contractor (and their Subcontractors via the Contractor) shall submit on a weekly basis electronic certified payroll reports directly to the CMU and the County using the eCPR system – MyLCM or the County's LCPTracker Program. Further, the Contractor (and their Subcontractors via the Contractor) shall submit directly to the CMU accurate payroll records within 10 days of any separate request by the CMU. To enroll in MyLCM, obtain additional information and assistance, go to the third party non-government website at https://app.mylcm.com. Subcontractors may also enroll in MyLCM at the website.

14.5.3.1.2 At the Project Site the Contractor shall post throughout the term of the Contract a notice (in English and Spanish) as required by, and containing the language provided in section 16451(d) of Title 8 of the California Code of Regulations. The notice (in the form of posters) is available on the CMU website at http://www.dir.ca.gov/dlse/cmu/Forms_Publications and Resources.html, at the Division of Labor Standards Enforcement District Office or by e-mailing a request to CMU@dir.ca.gov. The notice will indicate to employees and others that the worksite falls under regulations of the CMU. The local CMU District Office is located at the following address: CMU District Office – San Bernardino, 464 W. Fourth Street, Room 348, San Bernardino, CA 92401, (909) 383-4334 or (909) 889-8120.

14.5.3.1.3 Failure to meet the requirements above will subject the Contractor to sanctions/withholding of Contract payments as allowed by law for any delinquent or inadequate certified payroll records. Payroll violations are required to be reported to the State and/or Federal government.

14.6 Limits on Hours of Work

Pursuant to California Labor Code Section 1810, eight (8) hours of labor shall constitute a legal day's work. Pursuant to California Labor Code Section 1811, the time of service of any worker employed at any time by the Contractor or by a Subcontractor, or any tier, upon the Work or upon any part of the Work, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except as hereafter provided. Notwithstanding the foregoing provisions, Work performed by employees of Contractor or any

Subcontractor, of any tier, in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and on-half (1½) times the basic rate of pay.

14.7 Penalty for Excess Hours

The Contractor shall pay to the County a penalty of twenty-five dollars ($25.00) for each worker employed on the Work by the Contractor or any Subcontractor, of any tier, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and forty (40) hours in any one calendar week, in violation of the provisions of the California Labor Code, unless compensation to the worker so employed by the Contractor is not less than one and one-half (1½) times the basic rate of pay for all hours worked in excess of eight (8) hours per day.

14.8 Contractor Responsibility

Any work performed by workers necessary to be performed after regular work hours or on Sundays or other holidays shall be performed without adjustment of the Contract Sum and/or without additional expense to the County.

14.9 Employment of Apprentices

Any apprentices employed to perform any of the Work shall be paid the standard wage to apprentices under the regulations of the craft or trade for which such apprentice is employed, and such individual shall be employed only for the Work of the craft or trade to which such individual is registered. Only apprentices, as defined in California Labor Code Section 3077, who are in training under apprenticeship standards and written apprenticeship agreements under California Labor Code Sections 3070 et seq. are eligible to be employed for the Work. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which such apprentice is training.

14.10 Apprenticeship Certificate

When the Contractor or any Subcontractor, of any tier, in performing any of the Work employs workers in any Apprenticeable Craft or Trade, as hereinafter defined, the Contractor and such Subcontractor shall apply to the Joint Apprenticeship Committee administering the apprenticeship standards of the craft or trade in the area of the site of the Work for a certificate approving the Contractor or such Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected, provided, however, that the approval as established by the Joint Apprenticeship Committee or Committees, subsequent to approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or such Subcontractor in order to comply with California Labor Code Section 1777.5. The Contractor and Subcontractor shall submit contract award information to the applicable Joint Apprenticeship Committee, which shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. There shall be an affirmative duty upon the Joint Apprenticeship Committee or Committees, administering the apprenticeship standards of the crafts or trades in the area of the site of the Work, to ensure equal employment and affirmative action and apprenticeship for women and minorities. Contractors or Subcontractors shall not be required to submit individual applications for approval to local Joint Apprenticeship Committees provided they are already covered by the local apprenticeship standards.

14.11 Ratio of Apprentices to Journeymen

The ratio of Work performed by the apprentices to journeymen, who shall be employed in the Work, may be the ratio stipulated in the apprenticeship standards under which the Joint Apprenticeship Committee operates, but in no case shall the ratio be less than one hour of apprentice work for each five hours of labor performed by a journey, except as otherwise

provided in California Labor Code Section 1777.5. The minimum ratio of the land surveyor classification shall not be less than one apprentice for each five journeymen. Any ratio shall apply during any day or portion of a day when any journeyman, or the higher standard stipulated by the Joint Apprenticeship Committee, is employed at the site of the Work and shall be computed on the basis of the hours worked during the day by journeymen so employed, except for the land surveyor classification. The Contractor shall employ apprentices for the number of hours computed as above before the completion of the Work. The Contractor shall, however, endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the site of the Work. Where an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Division of Apprenticeship Standards, upon application of a Joint Apprenticeship Committee, may order a minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification. The Contractor or any Subcontractor covered by this Article and California Labor Code Section 1777.5, upon the issuance of the approval certificate, or if it has been previously approved in such craft, or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the Contractor that it employs apprentices in such craft or trade in the State of California on all of its contracts on an annual average of not less than one apprentice to each five journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the Contractor from the 1-to-5 ratio as set forth in this Article and California Labor Code Section 1777.5. This Article shall not apply to contracts of general contractors, or to contracts of specialty contractors not bidding for work through a general or prime contractor, involving less than Thirty Thousand Dollars ($30,000.00) or twenty (20) working days. The term "Apprenticeable Craft or Trade" as used herein shall mean a craft or trade determined as an Apprenticeable occupation in accordance with rules and regulations prescribed by the Apprenticeship Council.

14.12 Exemption from Ratios

The Joint Apprenticeship Committee shall have the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting the Contractor from the 1-to-5 ratio set forth in this Article when it finds that any one of the following conditions are met:

(1) unemployment for the previous three-month period in such area exceeds an average of fifteen percent (15%); or

(2) the number of apprentices in training in such area exceeds a ratio of 1-to-5 in relation to journeymen; or

(3) the Apprenticeable Craft or Trade is replacing at least one-thirtieth (1/30) of its journeymen annually through apprenticeship training, either on a statewide basis or on a local basis; or

(4) if assignment of an apprentice to any work performed under the Contract Documents would create a condition which would jeopardize such apprentice's life or the life,

safety or property of fellow employees or the public at large, or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyman.

When such exemptions from the 1-to-5 ratio between apprentices and journeymen are granted to an organization which represents contractors in a specific trade on a local or statewide basis, the member contractors will not be required to submit individual applications for approval to local Joint Apprenticeship Committees, provided they are already covered by the local apprenticeship standards.

14.13 Contributions to Trust Funds

The Contractor or any Subcontractor, of any tier, who, performs any of the Work by employment of journeymen or apprentices in any Apprenticeable Craft or Trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any such craft or trade in the area of the site of the Work, to which fund or funds other contractors in the area of the site of the Work are contributing, shall contribute to the fund or funds in each craft or trade in which it employs journeymen or apprentices in the same amount or upon the same basis and in the same manner as the other contractors do, but where the trust fund administrators are unable to accept such funds, contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council. The Division of Labor Standards Enforcement is authorized to enforce the payment of such contributions of such fund(s) as set forth in California Labor Code Section 227. Such contributions shall not result in an increase in the Contract Sum.

14.14 Contractor's Compliance

The responsibility of compliance with this Article for all Apprenticeable Trades or Crafts is solely and exclusively that of the Contractor. All decisions of the Joint Apprenticeship Committee(s) under this Article are subject to the provisions of California Labor Code Section 3081. In the event the Contractor willfully fails to comply with the provisions of this Article and California Labor Code Section 1777.5, pursuant to California Labor Code Section 1777.7, the Contractor shall:

(1) be denied the right to bid on any public works contract for a period of one (1) year from the date the determination of non-compliance is made by the Administrator of Apprenticeship; and

(2) forfeit, as a civil penalty, the sum of One Hundred Dollars ($100.00) for each calendar day of noncompliance.

Notwithstanding the provisions of California Labor Code Section 1727, upon receipt of such determination, the County shall withhold such amount from the Contract Sum then due or to become due. Any such determination shall be issued after a full investigation, a fair and impartial hearing, and reasonable notice thereof in accordance with reasonable rules and procedures prescribed by the California Apprenticeship Council. Any funds withheld by the

County pursuant to this Article shall be deposited in the General Fund or other similar fund of the County. The interpretation and enforcement of California Labor Code Sections 1777.5 and 1777.7 shall be in accordance with the rules and procedures of the California Apprenticeship Council.

14.15 Contractor's Compliance with Law

Contractor, Contractor's agents, and Contractor's employees shall be bound by and comply with all applicable provisions of the Labor Code, and such federal, state and local laws which affect the conduct of the Work. This includes, but is not limited to laws regulating: payment of wages; eight-hour day; overtime, Saturday, Sunday and holiday work; and nondiscrimination.

The Contractor shall forfeit to the County the penalties prescribed in the Labor Code for violations.

14.15.1 Contractor shall comply with all Executive Orders, statutes or regulations regarding the stabilization of wages and prices in the construction industry.

14.16 Equal Employment Opportunity

14.16.1 Contractor agrees to fully comply with the laws and programs (including regulation issued pursuant thereto) which are listed following this paragraph. Such compliance is required to the extent such laws, programs and their regulations are, by their own terms, applicable to this Contract. Contractor warrants that it will make itself thoroughly familiar with the applicable provisions of said laws, programs and regulations prior to commencing performance of the Contract. Copies of said laws, programs and regulations are available upon request from County. To the extent applicable the provisions of said laws, programs and regulations are deemed to be a part of this Contract as if fully set forth herein.

14.16.1.1 Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended (38 U.S.C. 4212) and the applicable clause is inserted pursuant to 41 C.F.R. Sections 60-250.5(a).

14.16.1.2 Rehabilitation Act of 1973, as amended (29 U.S.C. 701 et seq.) and the applicable clause is inserted pursuant to 41 C.F.R. Sections 60-741.5(a).

14.16.1.3 California Fair Employment and Housing Act. (CA Government Code Section 12900 et seq.)

14.16.1.4 Civil Rights Act of 1964, as amended (42 U.S.C. 2000a et seq.), Executive Order No. 11246, September 24, 1965, as amended, and the applicable clause is inserted pursuant to 41 C.F.R. Section 60-1.4.

14.16.2 Executive Order 11246.

Contractor certifies that Contractor will fully comply with Executive Order 11246, as amended by Executive Order 11375, and any other executive order amending this order, and the rules and regulations issued thereunder, which are hereby incorporated by reference as appropriate. The Contractor commits itself to such compliance by submitting a properly signed bid or offer or by signing or otherwise accepting a Contract or subcontract.

14.17 Senate Bill 854 (Chapter 28, Statutes of 2014) and Senate Bill 96 (Chapter 28, Statutes of 2017) Requirements

14.17.1 Contractor shall comply with Senate Bill 854 (signed into law on June 20, 2014). The requirements include, but are not limited to, the following:

14.17.1.1 No contractor or subcontractor may be listed on a bid proposal (submitted on or after March 1, 2015) for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5, with limited exceptions from this requirements for bid purposes only as allowed under Labor Code section 1771.1(a).

14.17.1.2 No contractor or subcontractor may be awarded a contract for public work or perform work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

14.17.1.3 This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

14.17.1.4 As required by the Department of Industrial Relations, Contractor is required to post job site notices, as prescribed by regulation, regarding compliance monitoring and enforcement by the Department of Industrial Relations.

14.17.1.5 Contractors and all subcontractors must submit certified payroll records online to the Labor Commissioner for all new public works projects issued on or after April 1, 2015, and for all public works projects, new or ongoing, on or after January 1, 2016.

(1) The certified payroll must be submitted at least monthly to the Labor Commissioner.

(2) The County reserves the right to require Contractor and all subcontractors to submit certified payroll records more frequently than monthly to the Labor Commissioner

(3) The certified payroll records must be in a format prescribed by the Labor Commissioner.

14.17.1.6 Registration with the Department of Industrial Relations and the submission of certified payroll records to the Labor Commissioner are not required if the public works project is $25,000 or less when the project is for construction, alteration, demolition, installation or repair work, or if the public works project is $15,000 of less when the project is for maintenance work.

14.17.2 Labor Code section 1725.5 states the following:

"A contractor shall be registered pursuant to this section to be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any public work contract that is subject to the requirements of this chapter. For the purposes of this section, "contractor" includes a subcontractor as defined by Section 1722.1.

(a) To qualify for registration under this section, a contractor shall do all of the following:

(1) (A) Register with the Department of Industrial Relations in the manner prescribed by the department and pay an initial nonrefundable application fee of four hundred dollars ($400) to qualify for registration under this section and an annual renewal fee on or before July 1 of each year thereafter. The annual renewal fee shall be in a uniform amount set by the Director of Industrial Relations, and the initial registration and renewal fees may be adjusted no more than annually by the director to support the costs specified in Section 1771.3.

(B) Beginning June 1, 2019, a contractor may register or renew according to this subdivision in annual increments up to three years from the date of registration. Contractors who wish to do so will be required to prepay the applicable nonrefundable application or renewal fees to qualify for the number of years for which they wish to preregister.

(2) Provide evidence, disclosures, or releases as are necessary to establish all of the following:

(A) Workers' compensation coverage that meets the requirements of Division 4 (commencing with Section 3200) and includes sufficient coverage for any worker whom the contractor employs to perform work that is subject to prevailing wage requirements other than a contractor who is separately registered under this section. Coverage may be evidenced by a current and valid certificate of workers' compensation insurance or certification of self-insurance required under Section 7125 of the Business and Professions Code.

(B) If applicable, the contractor is licensed in accordance with Chapter 9 (commencing with Section 7000) of the Business and Professions Code.

(C) The contractor does not have any delinquent liability to an employee or the state for any assessment of back wages or related damages, interest, fines, or penalties pursuant to any final judgment, order, or determination by a court or any federal, state, or local administrative agency, including a confirmed arbitration award. However, for purposes of this paragraph, the contractor shall not be disqualified for any judgment, order, or determination that is under appeal, provided that the contractor has secured

the payment of any amount eventually found due through a bond or other appropriate means.

(D) The contractor is not currently debarred under Section 1777.1 or under any other federal or state law providing for the debarment of contractors from public works.

(E) The contractor has not bid on a public works contract, been listed in a bid proposal, or engaged in the performance of a contract for public works without being lawfully registered in accordance with this section, within the preceding 12 months or since the effective date of the requirements set forth in subdivision (e), whichever is earlier. If a contractor is found to be in violation of the requirements of this paragraph, the period of disqualification shall be waived if both of the following are true:

(i) The contractor has not previously been found to be in violation of the requirements of this paragraph within the preceding 12 months.

(ii) The contractor pays an additional nonrefundable penalty registration fee of two thousand dollars ($2,000).

(b) Fees received pursuant to this section shall be deposited in the State Public Works Enforcement Fund established by Section 1771.3 and shall be used only for the purposes specified in that section.

(c) A contractor who fails to pay the renewal fee required under paragraph (1) of subdivision (a) on or before the expiration of any prior period of registration shall be prohibited from bidding on or engaging in the performance of any contract for public work until once again registered pursuant to this section. If the failure to pay the renewal fee was inadvertent, the contractor may renew its registration retroactively by paying an additional nonrefundable penalty renewal fee equal to the amount of the renewal fee within 90 days of the due date of the renewal fee.

(d) If, after a body awarding a contract accepts the contractor's bid or awards the contract, the work covered by the bid or contract is determined to be a public work to which Section 1771 applies, either as the result of a determination by the director pursuant to Section 1773.5 or a court decision, the requirements of this section shall not apply, subject to the following requirements:

(1) The body that awarded the contract failed, in the bid specification or in the contract documents, to identify as a public work that portion of the work that the determination or decision subsequently classifies as a public work.

(2) Within 20 days following service of notice on the awarding body of a determination by the Director of Industrial Relations pursuant to Section 1773.5 or a decision by a court that the contract was for public work as defined in this chapter, the contractor and any subcontractors are registered under this section or are replaced by a contractor or subcontractors who are registered under this section.

(3) The requirements of this section shall apply prospectively only to any subsequent bid, bid proposal, contract, or work performed after the awarding body is served with notice of the determination or decision referred to in paragraph (2).

(e) The requirements of this section shall apply to any bid proposal submitted on or after March 1, 2015, to any contract for public work, as defined in this chapter, executed on

or after April 1, 2015, and to any work performed under a contract for public work on or after January 1, 2018, regardless of when the contract for public work was executed.

(f) This section does not apply to work performed on a public works project of twenty-five thousand dollars ($25,000) or less when the project is for construction, alteration, demolition, installation, or repair work or to work performed on a public works project of fifteen thousand dollars ($15,000) or less when the project is for maintenance work."

14.17.3 Labor Code section 1771.1 states the following:

"(a) A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.
(b) Notice of the requirement described in subdivision (a) shall be included in all bid invitations and public works contracts, and a bid shall not be accepted nor any contract or subcontract entered into without proof of the contractor or subcontractor's current registration to perform public work pursuant to Section 1725.5.
(c) An inadvertent error in listing a subcontractor who is not registered pursuant to Section 1725.5 in a bid proposal shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive, provided that any of the following apply:
(1) The subcontractor is registered prior to the bid opening.
(2) Within 24 hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in subparagraph (E) of paragraph (2) of subdivision (a) of Section 1725.5.
(3) The subcontractor is replaced by another registered subcontractor pursuant to Section 4107 of the Public Contract Code.
(d) Failure by a subcontractor to be registered to perform public work as required by subdivision (a) shall be grounds under Section 4107 of the Public Contract Code for the contractor, with the consent of the awarding authority, to substitute a subcontractor who is registered to perform public work pursuant to Section 1725.5 in place of the unregistered subcontractor.
(e) The department shall maintain on its Internet Web site a list of contractors who are currently registered to perform public work pursuant to Section 1725.5.
(f) A contract entered into with any contractor or subcontractor in violation of subdivision (a) shall be subject to cancellation, provided that a contract for public work shall not be unlawful, void, or voidable solely due to the failure of the awarding body, contractor, or any subcontractor to comply with the requirements of Section 1725.5 or this section.
(g) If the Labor Commissioner or his or her designee determines that a contractor or subcontractor engaged in the performance of any public work contract without having been registered in accordance with this section, the contractor or subcontractor shall

forfeit, as a civil penalty to the state, one hundred dollars ($100) for each day of work performed in violation of the registration requirement, not to exceed an aggregate penalty of eight thousand dollars ($8,000) in addition to any penalty registration fee assessed pursuant to clause (ii) of subparagraph (E) of paragraph (2) of subdivision (a) of Section 1725.5.

(h)(1) In addition to, or in lieu of, any other penalty or sanction authorized pursuant to this chapter, a higher tiered public works contractor or subcontractor who is found to have entered into a subcontract with an unregistered lower tier subcontractor to perform any public work in violation of the requirements of Section 1725.5 or this section shall be subject to forfeiture, as a civil penalty to the state, of one hundred dollars ($100) for each day the unregistered lower tier subcontractor performs work in violation of the registration requirement, not to exceed an aggregate penalty of ten thousand dollars ($10,000).

(2) The Labor Commissioner shall use the same standards specified in subparagraph (A) of paragraph (2) of subdivision (a) of Section 1775 when determining the severity of the violation and what penalty to assess, and may waive the penalty for a first time violation that was unintentional and did not hinder the Labor Commissioner's ability to monitor and enforce compliance with the requirements of this chapter.

(3) A higher tiered public works contractor or subcontractor shall not be liability for penalties assessed pursuant to paragraph (1) if the lower tier subcontractor's performance is in violation of the requirements of Section 1725.5 due to the revocation of a previously approved registration.

(4) A subcontractor shall not be liable for any penalties assessed against a higher tiered public works contractor or subcontractor pursuant to paragraph (1). A higher tiered public works contractor or subcontractor may not require a lower tiered subcontractor to indemnity or otherwise be liable for any penalties pursuant to paragraph (1).

(i) The Labor Commissioner or his or her designee shall issue a civil wage and penalty assessment, in accordance with the provisions of Section 1741, upon determination of penalties pursuant to subdivision (g) and subparagraph (B) of paragraph (1) of subdivision (h). Review of a civil wage and penalty assessment issued under this subdivision may be requested in accordance with the provisions of Section 1742. The regulations of the Director of Industrial Relations, which govern proceedings for review of civil wage and penalty assessments and the withholding of contract payments under Article 1 (commencing with Section 1720) and Article 2 (commencing with Section 1770), shall apply.

(j)(1) Where a contractor or subcontractor engages in the performance of any public work contract without having been registered in violation of the requirements of Section 1725.5 or this section, the Labor Commissioner shall issue and serve a stop order prohibiting the use of the unregistered contractor or the unregistered subcontractor on all public works until the unregistered contractor or unregistered subcontractor is registered. The stop order shall not apply to work by registered contractors or subcontractors on the public work.

(2) A stop order may be personally served upon the contractor or subcontractor by either of the following methods:

(A) Manual delivery of the order to the contractor or subcontractor personally.

(B) Leaving signed copies of the order with the person who is apparently in charge at the site of the public work and by thereafter mailing copies of the order by first class mail, postage prepaid to the contractor or subcontractor at the address on file with either of the following:
(i) The Contractors' State License Board.
(ii) The Secretary of State.
(3) The stop order shall be effective immediately upon service and shall be subject to appeal by the party contracting with the unregistered contractor or subcontractor, by the unregistered contractor or subcontractor, or both. The appeal, hearing, and any further review of the hearing decision shall be governed by the procedures, time limits, and other requirements specified in subdivision (a) of Section 238.1.
(k) Failure of a contractor or subcontractor, owner, director, officer, or managing agent of the contractor or subcontractor to observe a stop order issued and served upon him or her pursuant to subdivision (j) is guilty of a misdemeanor punishable by imprisonment in county jail not exceeding 60 days or by a fine not exceeding ten thousand dollars ($10,000), or both.
(l) This section shall apply to any bid proposal submitted on or after March 1, 2015, and any contract for public work entered into on or after April 1, 2015. This section shall also apply to the performance of any public work, as defined in this chapter, on or after January 1, 2018, regardless of when the contract for public work was entered.
(m) Penalties received pursuant to this section shall be deposited in the State Public Works Enforcement Fund established by Section 1771.3 and shall be used only for the purposes specified in that section.
(n) This section shall not apply to work performed on a public works project of twenty-five thousand dollars ($25,000) or less when the project is for construction, alteration, demolition, installation, or repair work or to work performed on a public works project of fifteen thousand dollars ($15,000) or less when the project is for maintenance work."

14.17.4 Labor Code section 1771.4 states the following:

"a) All of the following are applicable to all public works projects that are otherwise subject to the requirements of this chapter:

(1) The call for bids and contract documents shall specify that the project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

(2) The awarding body shall post or require the prime contractor to post job site notices, as prescribed by regulation.

(3) Each contractor and subcontractor shall furnish the records specified in Section 1776 directly to the Labor Commissioner, in the following manner:

(A) At least monthly or more frequently if specified in the contract with the awarding body.

(B) In a format prescribed by the Labor Commissioner.

(4) If the contractor or subcontractor is not registered pursuant to Section 1725.5 and is performing work on a project for which registration is not required because of

subdivision (f) of Section 1725.5, the unregistered contractor or subcontractor is not required to furnish the records specified in Section 1776 directly to the Labor Commissioner but shall retain the records specified in Section 1776 for at least three years after completion of the work.

(5) The department shall undertake those activities it deems necessary to monitor and enforce compliance with prevailing wage requirements.

(b) The Labor Commissioner may exempt a public works project from compliance with all or part of the requirements of subdivision (a) if either of the following occurs:

(1) The awarding body has enforced an approved labor compliance program, as defined in Section 1771.5, on all public works projects under its authority, except those deemed exempt pursuant to subdivision (a) of Section 1771.5, continuously since December 31, 2011.

(2) The awarding body has entered into a collective bargaining agreement that binds all contractors performing work on the project and that includes a mechanism for resolving disputes about the payment of wages.

(c) The requirements of paragraph (1) of subdivision (a) shall only apply to contracts for public works projects awarded on or after January 1, 2015.
(d) The requirements of paragraph (3) of subdivision (a) shall apply to all contracts for public work, whether new or ongoing, on or after January 1, 2016."

15 MISCELLANEOUS PROVISIONS

15.1 Governing Law

The Contract shall be governed by the laws of the State of California without regard to choice of law principles thereof. The exclusive venue of any legal action brought by the County, the Contractor, or any Consultant or Subcontractor, with regard to this Agreement or Project, shall be in the Superior Court of California, San Bernardino County, San Bernardino District. Contractor agrees to incorporate this provision into all Subcontractor agreements.

15.2 Successors and Assigns

The County and Contractor respectively bind themselves, their partners, successors, assigns, and legal Project Managers to the other Party hereto and to partners, successors, assigns, and legal Project Managers of such other Party in respect to covenants, agreements, and obligations contained in the Contract Documents. The Contractor shall not sublet or assign the Work of this Contract or any portion thereof or any monies due thereunder, without the express prior written consent and approval of County. County may freely assign its rights hereunder, without limitation, to a separate entity and Contractor agrees, upon such entity's request, to continue and complete performance of the Work upon payment of any undisputed outstanding amounts due Contractor for services performed up to and including the effective date of the assignment, provided adequate proof of funding to completion is offered by assignee. Any entity which shall succeed to the rights of County shall be entitled to enforce the rights of County hereunder. If requested by such entity, Contractor will execute a separate letter or

other agreement with such entity further evidencing Contractor's commitment to continue performance of the Contract.

15.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person, or by US Mail, courier service, or package delivery service (such as UPS and FedEx) to the individuals identified for receipt of notice in the Agreement.

15.4 Rights and Remedies

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

15.4.2 No Waiver. No action or failure to act by the County shall constitute a waiver of any right or duty afforded the County under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically provided in the Contract Documents or as may be otherwise agreed in writing.

15.5 Tests and Inspections

15.5.1 Required Tests, Inspections, and Costs. If the Contract Documents, County instructions, laws, ordinances, or any public authority require any Work to be specially tested or approved, Contractor shall give notice, in accordance with such authority, of its readiness for observation or inspection, at least two (2) working days prior to being tested or covered up. Whenever the Contractor desires to carry on the Work of this Contract at night or on a Saturday, Sunday, or holiday, Contractor shall request authorization in writing from the County for such work at least two (2) working days in advance so that inspection may be provided if authorization is granted and the Contractor agrees to pay overtime reimbursement of costs for this service. If inspection is by authority other than County, Contractor shall inform County of date fixed for such inspection. All required certificates of inspection shall be secured by Contractor. If any Work required to be tested should be covered up without approval or consent of County, Contractor must, if required by County, uncover the Work for examination and satisfactorily reconstruct at Contractor's expense within the Contract Sum in compliance with Contract. All labor and equipment necessary for exposing and testing shall be furnished by the Contractor at his expense. The Contractor shall replace, at Contractor’s expense, any materials or Work damaged by exposure and any faulty materials or workmanship evidenced by such exposure or testing. Where such inspection and testing are to be conducted by an independent laboratory or agency, such materials or samples of materials to be tested shall be selected by such laboratory or agency or County's Project Manager, and not by Contractor. Contractor shall notify County a sufficient time in advance of manufacture of materials to be supplied by it under Contract, which must, by terms of contract, be tested, in order that County may arrange for testing of same at source of supply. Prior to having satisfactorily passed such testing and inspection, or prior to receipt of notice from said Project Manager that such testing and inspection will not be required, the materials shall not be incorporated into the Work without prior approval of County and subsequent testing and inspection. Re-examination of questioned work may be ordered by County and, if so ordered, Work must be uncovered by Contractor. All labor and equipment necessary for exposing and testing shall be furnished by the Contractor at his expense. The Contractor shall

replace, at Contractor's expense, any materials or Work damaged by exposure and any faulty materials or workmanship evidenced by such exposure or testing.

15.5.2 Additional Tests and Inspections. If the County or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Subparagraph 15.5.1, the County will instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the County, and the Contractor shall give timely notice to the County of when and where tests and inspections are to be made so that the County may be present for such procedures. Such costs shall be at the County's expense, if applicable. If such procedures for testing, inspection, or approval under Subparagraphs 15.5.1 and 15.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for County's testing and inspection services and expenses, shall be at the Contractor's expense, within the Contract Sum. Cost of retesting, reinspection, and reapprovals as described herein, including compensation for the County's testing and inspection services and expenses, shall be paid for by the County and deducted from the Contract Sum by a Change Order or Construction Change Directive.

15.5.3 Documentation. Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the County. Delivery of such documentation is a condition precedent to County's obligation to make payment to Contractor.

15.5.4 Observation of Tests. If the County is to observe tests, inspections, or approvals required by the Contract Documents, County will do so promptly and, where practicable, at the normal place of testing.

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

15.5.6 Responsibility. Any inspection or approval by any representative or agent of the County will not relieve the Contractor of the responsibility of incorporating in the Work only those materials which conform to the Specifications, and any nonconforming materials shall be removed from the Site whenever identified. Further, inspection or approval by the County does not relieve the Contractor of its obligation to provide Work which conforms in all aspects with the Contract Documents.

15.6 Record Retention and Audits

15.6.1 The County and any entities and/or agencies designated by the County, shall have access to, and the right to audit, and the right to copy at the County's cost, all of Contractor's books, records, Contracts, correspondence, instructions, Drawings, receipts, vouchers, purchase orders, and memoranda relating to the Work, changes in

the Work, any Change Orders or Construction Change Directives or written amendments to the Contract, and any claims.

15.6.2 Contractor agrees that the County and its designated representative shall have the right to review, to audit, and to copy any records and supporting documentation pertaining to the performance of this Agreement. Contractor agrees to allow interviews of any employees who might reasonably have information related to such records. Further, Contractor agrees to include a similar right of the County to audit records and interview staff in any subcontract related to performance of this Agreement.

15.6.3 The Contractor shall establish an official file for the Project (the "Official Project File"). The Official Project File shall contain adequate documentation of all actions that have been taken with respect to the Project, in accordance with generally accepted government accounting principles and the requirements for record retention for capital projects constructed with the proceeds of tax exempt bonds. The Contractor will provide a copy of such file to the County at its request or upon termination of this Agreement. The documents to be retained shall include, but are not limited to, Contractor's books, records, Contracts, correspondence, instructions, Drawings, receipts, vouchers, purchase orders, and memoranda relating to the Work, changes in the Work, any Change Orders or Construction Change Directives or Contract Amendments, and any claims.

15.6.4 Contractor agrees to protect records adequately from fire or other damage. When records are stored away from Contractor's principal office, a written index of the location of records stored must be on hand and ready access must be assured. All the Contractor records contained in the Official Project File must be preserved a minimum of five (5) years (the "Record Maintenance Period"). These records shall be subject at all reasonable times to inspection, examination, monitoring, copying, excerpting, transcribing, and audit by the County or designees, by state government auditors or designees, or by federal government auditors or designees. If any litigation, claim, negotiation, audit, or other action involving the records has been started before the expiration of the Record Maintenance Period, the related records must be retained until the completion of the action and resolution of all issues which arise from it if such date is later than the end of the Record Maintenance Period.

15.6.5 All books, account, reports, files, correspondence, data, and other records relating to this Contract shall be maintained by the Contractor and shall be subject at all reasonable times to review, inspection, and audit by the County or its designated Project Managers for a period of five (5) years after Final Completion of the Work. County shall be entitled, upon forty-eight (48) hours written notice, to inspect all books, records, accounts, and the Official Project File kept by Contractor relating to the Work contemplated by the Agreement. Such records shall be produced by the Contractor at a place designated by the County, upon written notice to the Contractor.

15.6.6 Contractor agrees to maintain adequate fiscal and Project books, records, documents, and other evidence pertinent to the Contractor's Work on the Project in accordance with generally accepted accounting principles. Adequate supporting documentation shall be maintained in such detail so as to permit tracing transactions from the invoices, to the financial statement, to the accounting records, and to the supporting documentation. These records shall be maintained for the Record Maintenance Period, and shall be subject to examination and/or audit by County or designees, and state government auditors or designees.

15.6.7 Contractor agrees to make the Official Project File, books, records, supporting documentations and other evidence available to the County, or its designated representatives, during the course of the Project and for the Record Maintenance Period. Contractor agrees to provide suitable facilities for access, monitoring, inspection and copying of said records.

15.6.8 Contractor shall maintain books, records, documents, and other evidence sufficient to reflect properly the amount, receipt, and disposition of all Project funds. The maintenance requirements extend to books of original entry, source documents supporting accounting transactions, the general ledger, subsidiary ledgers, personnel and payroll records, canceled checks, and related documents and records. Source documents include copies of all awards, applications, and required financial and narrative reports. Personnel and payroll records shall include the time and attendance reports for all individuals reimbursed under the award, whether they are employed full-time or part-time. Time and effort reports are also required for consultants and subcontractors. Generally accepted government accounting principles and adequate supporting documentation shall be maintained in such detail so as to provide an audit trail which will permit tracing transactions from the invoices to the financial statement, to the accounting records, and to the supporting documentation for the purpose of determining compliance with Public Contract Code Section 10115 et seq., Government Code Section 8546.7 and 2 CCR Section 1896.60 et seq. (as applicable).

15.7 Independent Contractor

Contractor is employed hereunder to render a service within the scope of its training and experience, and Contractor shall be an independent Contractor and not an employee of the County. As such, County shall not be called upon to assume any liability for the direct payment of any salary to any employee or Subcontractor of Contractor, nor to pay any benefit to any employee or Subcontractor or vendor under the Workers' Compensation laws. None of Contractor's officers, agents, employees, and Subcontractors, nor any of their agents, officers, and employees, shall be deemed officers, agents, employees, and Subcontractors of the County, and the County shall not be liable or responsible to them for anything whatsoever other than liability to Contractor set forth in this Contract.

15.8 Keys and Access

If the County furnishes keys and/or access cards to the Contractor to provide access to County's property, the Contractor shall assure that such access instruments are not duplicated and shall return all such instruments in good condition upon request of the County or prior to receipt of final payment, whichever is earlier. If the Contractor fails to return all access instruments furnished to it, the Contractor shall be responsible, within the Contract Sum, for all Work, materials, and costs associated with reestablishing secured access.

15.9 Survival of Terms

The provisions of the Contract which by their nature survive termination of the Contract or Final Completion, including all warranties, indemnities, payment obligations, and the County's right to audit Contractor's books and records, shall remain in full force and effect after Final Completion or termination of the Contract and shall be binding upon Contractor until any action thereunder is barred according to terms in the Contract Documents or by the applicable statute of limitations or statute of repose.

15.10 Cooperation With Labor

15.10.1 General. The Parties agree and declare that Contractor and County are separate and independent entities and that Contractor has full responsibility for performance of the Work and direction of the work force, subject to and under the duty of Contractor to cooperate with County and its Separate Contractors. Contractor recognizes that in the performance of its Work it may be required to work with and near Separate Contractors and Project Managers of County on the jobsite. The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, slowdowns, disputes, or other labor disturbance. If the Work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the County and without recourse to the County, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the Work of any particular trade. Except as specifically provided in Paragraph 8.4 herein, Contractor shall be liable to County for all damages suffered by County, and no extensions of Contract Time shall be given to Contractor, as a result of work stoppage, slowdowns, or strikes related to labor disputes.

15.10.2 Picketing.

15.10.2.1 Contractor agrees that should there be picketing or a threat of picketing by any labor organization at or near the Site, Contractor, in cooperation with County, shall establish a reserve gate system and require employees of Contractor, Subcontractors, and suppliers to use one or more designated gates. In that event, it shall be the affirmative obligation of Contractor, as a material consideration of this Agreement to ensure that employees of Contractor, Subcontractors, and suppliers

use only the gates or other entryways designated by County from time to time on the Project.

15.10.2.2 Notwithstanding the establishment or non-establishment of a reserve gate, in the event employees of Contractor, Subcontractors or suppliers refuse to work because of any labor disputes or grievances (including any "secondary" or "sympathy" strike or boycott directed against the Project) not caused by County or its Separate Contractors and not the result of an industry-wide strike and that actually prevent performance of the Work, Contractor shall not be relieved of its obligation to supply enough properly skilled workers to perform the Work without interruption or further delay.

15.10.3 Labor Disputes. Contractor and County agree to cooperate fully with each other and their Project Managers and attorneys with respect to any labor dispute that should arise on the Site, including, but not limited to the giving of testimony and evidence to the agent or judge of the National Labor Relations Board or testimony in connection with proceedings in state or federal court. Contractor hereby warrants that it is not now nor will Contractor be delinquent in the payment or reporting to any labor management benefit trust.

15.11 No Personal Liability

Notwithstanding any contrary provision in this Agreement or the Contract Documents, no member, principal, officer, employee, agent, Project Manager, or subsidiary of County (each a "direct affiliate of County"), or member, general partner, limited partner, principal, officer, employee, agent, or Project Manager of any direct affiliate of County (together with direct affiliates of County, the "affiliates of County") shall have any personal liability for the performance of any contractual obligations, or in respect of any liability of County under this Agreement and no monetary or other judgment shall be sought or enforced against any such individuals or their assets, all such personal contractual liability being expressly waived by Contractor. Further, the covenants and obligations contained in this Agreement on the part of County shall be covenants and obligations of the County only, and not of any affiliate of County. No affiliate of County shall be individually liable for breach of any covenant or obligation of County, and no recourse shall be had against the assets of any affiliate of County (except to the extent of County's assets but excluding therefrom any negative capital account of any such affiliate of County) for payment of any sums due or enforcement of any other relief, based upon any claim made by Contractor for breach of any of County's covenants or obligations. Notwithstanding the foregoing, Contractor does not waive any rights under Applicable Law in California concerning the commission of fraud or conversion.

15.12 Antitrust Claims

The Contractor by signing this Agreement hereby certifies that if these services or goods are obtained by means of a competitive bid, the Contractor shall comply with the requirements of the Government Code Sections set out below.

15.12.1 The Government Code Chapter on Antitrust claims contains the following definitions:

(1) "Public purchase" means a purchase by means of competitive bids of goods, services, or materials by the State or any of its political subdivisions or public agencies on whose behalf the Attorney General may bring an action pursuant to subdivision (c) of Section 16750 of the Business and Professions Code.

(2) "Public purchasing body" means the State or the subdivision or agency making a public purchase. (Government Code Section 4550.)

15.12.2 In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder. (Government Code Section 4552.)

15.12.3 If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. (Government Code Section 4553.)

15.12.4 Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action. (See Government Code Section 4554.)

15.13 Compliance with Restrictions

Contractor shall comply with all conditions, restrictions and reservations of record, statutes, regulations, and ordinances, including, without limitation, all pollution control, environmental protection, zoning, planning, land use requirements, all restrictions and requirements affecting the Project and adjoining properties, and disabled access imposed by the County and all other governmental entities including, without limitation, the requirements of any general plan and environmental requirements in connection with use, occupancy and building permits, and requirements of public utilities which affect construction of the Work in effect at the time of execution of this Agreement.

15.14 Legal Requirements

Contract shall perform the Work in accordance with the requirements of all Applicable Laws, codes, ordinances, and regulations even though such requirements are not specifically mentioned in the Specifications or shown on the Drawings. When the Work required by the Contract Documents is in conflict with any such legal provision, the Contractor shall notify the County in writing and shall not proceed with the Work until the County has so ordered.

15.15 Third Party

No provision contained in the contract Documents shall create or give to third parties any claim or right of action against the County.

END OF GENERAL CONDITIONS

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

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.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided at end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions 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 as well as 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 substitutions 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 calendar days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request, or seven calendar days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. 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.

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 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.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 calendar days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

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 offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

REQUEST FOR SUBSTITUTION

The undersigned Contractor requests consideration of the following request for substitution:

Date:

Project Name:

Specified Product:
Section Number:

Section Title:

Part, Article, Paragraph:

Description of specified work:

Requested Substitution: (Include product data and supplemental information as requested by the Architect)

Manufacturer's Certification:
The undersigned represents the manufacturer of the requested substitution and hereby certifies and warrants that the function and quality of the requested substitution is equivalent or superior to the specified work.

manufacturer's representative name and signature	date	company

Documentation:
[ ] Applicable information required by Specification Section 012500 - Substitution Procedures is part of this request.

Contractor's Acceptance:
The undersigned certifies the Proposed Substitution complies with requirements of Section 01 25 00 - Substitution Procedures.

Change to Contract Sum: $_____ [ ] Decrease [ ] Increase

Change to Contract Time: [ ] Adds _____calendar days [ ] Deletes _____ calendar days [ ] Has no impact

Reason for Substitution: [ ] Substitution for Cause [ ] Substitution for Convenience

contractor's name and signature	date	company

Architect's Action:

[ ] Recommends acceptance [ ] Does not recommend acceptance
[ ] Returned - Request does not comply with specified requirements

Architect's name and signature	date	company

Owner's Action:

[ ] Accepts [ ] Does not accept

Owner's name and signature	date	company

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.

1. Minor Changes in the Work.
2. Proposal Requests.
3. Administrative Change Orders.
4. Change Order procedures.
5. Construction Change Directive.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue an Architect's Supplemental Instructions on AIA Document G710 authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within 20 calendar days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1. Schedule of Values.
2. Applications for Payment.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven calendar days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Owner's name.
c. Owner's Project number.
d. Name of Architect.
e. Architect's Project number.
f. Contractor's name and address.
g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

a. Related Specification Section or division.

b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site.

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
8. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
11. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the time of the month specified in the Preconstruction Conference. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven calendar days prior to due date for review by Architect.

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

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.

J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

    a. Complete administrative actions, submittals, and Work preceding this application, as described in Division 01 Section "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

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

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative provisions for coordinating construction operations.

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

1.2 SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 calendar days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:

    a. Same digital data software program, version, and operating system as original Drawings.

2. File Submittal Format: Submit or post coordination drawing files using PDF format.
3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.

    a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven calendar days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within seven calendar days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at Progress Meetings. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven calendar days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model and CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project management software includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.

c. Document workflow planning, allowing customization of workflow between project entities.
d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
e. Track status of each Project communication in real time, and log time and date when responses are provided.
f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Processing and tracking of payment applications.
h. Processing and tracking of contract modifications.
i. Creating and distributing meeting minutes.
j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility, including smartphones and tablets.

2. Provide Project management software user licenses for use of Owner, Architect, and Architect's consultants. Provide software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive in PDF format. Provide data in locked format to prevent further changes.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare 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.
3. Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven calendar days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three calendar days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 working days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner; Architect and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Sustainable design requirements, if any.
o. Preparation of Record Documents.
p. Use of the premises.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 calendar days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner; Architect and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for completing sustainable design documentation, if any.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.

h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.
j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
k. Submittal procedures.
l. Owner's partial occupancy requirements.
m. Installation of Owner's furniture, fixtures, and equipment.
n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation, if any.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

1.2 SUBMITTALS

A. Format for Submittals: Submit required submittals in PDF format.

B. Startup construction schedule.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at weekly intervals.

F. Site Condition Reports: Submit at time of discovery of differing conditions.

G. Unusual Event Reports: Submit at time of unusual event.

1.3 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity with other activities and schedule them in proper sequence.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 10 working days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

    a. Securing of approvals and permits required for performance of the Work.
    b. Temporary facilities.
    c. Construction of mock-ups, prototypes and samples.
    d. Owner interfaces and furnishing of items.
    e. Interfaces with Separate Contracts.
    f. Regulatory agency approvals.
    g. Punch list.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.

g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Building flush-out.
m. Startup and placement into final use and operation.
n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. When revisions are made, distribute updated schedules to the same parties. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Testing and inspection.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one calendar day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013233
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for photographic documentation.

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.
5. Construction webcam.

1.2 SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three working days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in web-based Project management software site:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.
g. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

A. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time from camera.

D. File Names: Name media files with date, Project area and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Date Stamp: Date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Image File Naming Convention:

07425 _ 000 _ 20190101 _ 01.jpg
(Project Number)_(Additional Service)_(Year)(Month)(Day)_(Image Number).jpg

D. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take minimum 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take minimum 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.

F. Periodic Construction Photographs: Take not less than 20 photographs periodically coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

G. Final Completion Construction Photographs: Take minimum 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

1.6 CONSTRUCTION WEBCAM

A. Webcam: Provide two fixed-location camera(s) with weatherproof housing, mounted to provide unobstructed view of construction site from location approved by Architect, with the following characteristics:

1. Remotely controllable view with mouse-click user navigation for horizontal pan, vertical tile, and optical zoom of 500 percent minimum.
2. Capable of producing minimum 12 megapixel images.
3. Provide pole mount, power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.

B. Live Streaming Images: Provide web-accessible image of current site image, updated at five-minute intervals during daytime operation.

C. Web-Based Interface: Provide online interface to allow viewing of each high-definition digital still image captured and stored during construction, from the Internet.

1. Access Control: Provide password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
2. Software: Provide responsive software interface for use on computer, tablet, and mobile screens with accompanying iPhone/iPad app and Android apps.
3. Storage: Maintain images on the website for reference during entire construction period, and for minimum 30 days after Final Completion. Provide sufficient memory on remote server to store all Project images.
4. Online Interface: Provide website interface with Project and client information and logos, calendar-based navigation interface for selecting images, and pan and zoom capability within high-definition images.
5. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
6. Slideshow: Provide capability to automatically display current images from sites when there are three or more cameras used.
7. Time-Lapse: Provide capability for online display of project time-lapse.
8. Dashboard: Provide capability to view thumbnails of all cameras on one screen.
9. Weather: Provide corresponding weather data for each image captured.

D. Maintain cameras and web-based access in good working order, according to web-based construction photographic documentation service provider's written instructions until Final Completion. Provide for service of cameras and related networking devices and software.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for submittals.

1. Submittal schedule requirements.
2. Submittal formats.
3. Submittal procedures.
4. Submittal requirements.
5. Contractor’s review.
6. Architect’s review.

1.2 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as a submittal, a list 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 Schedule: 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 Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required 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. Name of subcontractor.
    d. Description of the Work covered.
    e. Scheduled date for Architect's final release or approval.

1.3 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.

7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Submittal purpose and description.
9. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
10. Drawing number and detail references, as appropriate.
11. Indication of full or partial submittal.
12. Location(s) where product is to be installed, as appropriate.
13. Other necessary identification.
14. Remarks.
15. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.4 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections. Submit according to one of the following:

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

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 submittals for related parts of the Work specified in different Sections, 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 15 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 15 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 calendar 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 15 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. 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.

E. 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.

F. 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.

1.5 SUBMITTAL REQUIREMENTS

A. Product Data: Collect manufacturer’s technical product 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 unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog product data.
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 that show 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 Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. 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.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. 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.

6. 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 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.

7. 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 will retain one Sample set; remainder will be returned.

      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.

D. 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.

E. 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.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.

2. 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.
3. 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.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. 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 substrate preparation and primers required.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.6 CONTRACTOR'S REVIEW

A. Submittal Review: 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp or an indication in web-based Project management software. Include 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.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.7 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action**.**
2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.

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

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Architect will return without review submittals received from sources other than Contractor.

E. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for quality assurance and quality control.

1. Delegated design or engineering services.
2. Testing and inspection services.
3. Conflicting requirements.
4. Submittals.
5. Contractor’s Quality-Control Plan.
6. Reports and documents.
7. Quality Assurance.
8. Quality Control.
9. Special Tests and Inspections.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.

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

C. 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, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

a. Verify selections made under Sample submittals.
b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. 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.

J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED DESIGN OR ENGINEERING SERVICES

A. Performance and Design or Engineering Criteria: Where professional design or engineering 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 or Engineering Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or engineered or certified by a design professional, indicating that the products and systems are in compliance with performance and design or engineering criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 TESTING AND INSPECTION SERVICES

A. General: Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is 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.

1.6 SUBMITTALS

A. Mockup Shop Drawings:

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

C. Qualification Data: For Contractor's quality-control personnel.

D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

E. Reports: Prepare and submit certified written reports and documents as specified.

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

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 calendar days of Notice to Proceed, and not less than five calendar days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent or someone who does not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection:

1. In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

a. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
b. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
c. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 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, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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, telephone number, and email address 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 of 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, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. 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.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, 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.

E. 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 is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E699, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. 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.

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

J. 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 Contractor's responsibilities, including the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
5. When testing is complete, remove test specimens and test assemblies; do not reuse products on Project.
6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, 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.

K. 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 of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven calendar days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

    a. Allow seven calendar days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.10 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 inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances specified in Division 01 Section "Allowances," as authorized by Change Orders.
3. Costs for retesting and reinspecting 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, whether specified or not, to verify and document that the Work complies with requirements.

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. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will 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 inspection 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 inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

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

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations 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 duties of Contractor.

E. 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 "Submittal Procedures."

F. 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 preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

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 as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 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 and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, 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

SECTION 014200
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for the following:

1. Temporary utilities.
2. Support facilities.
3. Security and protection facilities.

1.2 USE CHARGES

A. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

B. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 SUBMITTALS

A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

B. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

C. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Accessible Temporary Egress: Comply with applicable accessibility provisions identified on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

B. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.
5. Lighting fixtures capable of maintaining average illumination of 20 foot-candles at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.

    a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Connect to existing service.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide safety shower, eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

F. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

B. Storage and Staging: Provide temporary offsite area for storage and staging needs.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

C. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

E. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6 mil polyethylene sheet on each side. Cover floor with two layers of 6 mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 016100
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for following:

1. Product delivery, storage, and handling.
2. Product warranties.
3. Product selection procedures.
4. General installation provisions.

1.2 DEFINITIONS

A. Products: Term “product” includes terms “material,” “equipment,” “system,” “component,” and terms of similar intent.

B. Hazardous Substances Prohibited by Law: Including, but not limited to, any product, material, element, constituent, chemical, substance, compound, or mixture, which is defined in, included under, or regulated by any environmental laws.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between 2 or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Restriction of Hazardous Substances Compliance: Contractor shall take whatever measures deemed necessary to insure that employees, suppliers, vendors, fabricators, subcontractors, or their assigns, comply with restriction requirements for hazardous substance.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: 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 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 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 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. Store 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.

1.5 PRODUCT WARRANTIES

A. General: Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of 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 Contract Documents to provide specific rights for Owner.

B. Special Warranties: 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 Specifications, prepare a written document using indicated form properly executed.
3. Refer to individual Specification Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with 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. If standard products are 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 right to limit selection to products with warranties not in conflict with requirements of Contract Documents.
4. Where products are accompanied by term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
6. Use of phrase “or equal” shall be defined as “or equivalent as judged by Architect.”

B. “Acceptable Manufacturers” or “Acceptable Manufacturers and Products”:

1. Where Specifications include a list of named manufacturers and products that are acceptable, provide any product from that list that complies with requirements of Contract

Documents.
2. Manufacturers and products that can be used are restricted to those on list.
3. Manufacturers and products not included on list are considered substitutions.

C. "Available Manufacturers" or "Available Manufacturers and Products":

1. Where Specifications include a list of named manufacturers and products that are known to be available, provide any product from that list, or a product from an unnamed manufacturer, that complies with requirements of Contract Documents.
2. Manufacturers and products that can be used are not restricted to those on list.
3. Manufacturers and products not included on list are not considered substitutions.

D. "Basis of Design":

1. Use of phrase "Product Standard" or similar phrase shall be defined as "Basis of Design."
2. When Specifications name a single manufacturer and product, it is to establish significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics, for purposes of evaluating other named manufacturers and products. Drawings and Specifications indicate and specify characteristics that are based on "Basis of Design" manufacturer and product. Other acceptable or available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change intent of Contract Documents as judged by Architect.
3. If Specification includes a list of "Acceptable Manufacturers" or "Acceptable Manufacturers and Products," provide named "Basis of Design" product or any product from that list that complies with requirements of Contract Documents.
4. If Specification includes a list of "Available Manufacturers" or "Available Manufacturers and Products," provide named "Basis of Design" product or any product from that list, or a product from an unnamed manufacturer, that complies with requirements of Contract Documents.
5. If Specification does not include a list of either "Acceptable Manufacturers and Products" or "Available Manufacturers and Products," any product that complies with requirements of Contract Documents may be used.

E. "Required Manufacturer" or "Required Manufacturer and Product":

1. Where Specifications name a single, required manufacturer and product, only that manufacturer and product may be used.
2. Any other manufacturer and product is considered a substitution.

F. Visual Matching Specification: Where Specifications include phrase "match Architect's sample" or similar phrase, provide a product that complies with requirements of Contract Documents and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

G. Visual Selection Specification: Where Specifications include 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.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Manufacturer's Instructions:

1. Comply with manufacturer's installation instructions and recommendations, to extent that instructions and recommendations are more explicit or stringent than requirements in Contract Documents.
2. Handle, install, connect, clean, condition and adjust products according to manufacturer's instructions and in conformity with specified requirements.

    a. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with manufacturer for further instructions.
    b. Do not proceed with Work without clear instructions.

3. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by manufacturer.

B. Product Inspection: Inspect products immediately upon delivery and again prior to installation. Reject damaged and defective items.

C. Weather Conditions: Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible product or material as necessary to prevent deterioration.

END OF SECTION

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: General administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Installation of the Work.
2. Coordination of Owner's portion of the Work.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

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

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls and floors for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Division 01 Section "Project Management and Coordination."

3.3 INSTALLATION OF THE WORK

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Select tools or equipment that minimize production of excessive noise levels.

G. Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.4 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.5 PROGRESS CLEANING

A. Clean project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

D. Certificates of Release: From authorities having jurisdiction.

E. Certificate of Insurance: For continuing coverage.

F. Field Report: For pest-control inspection.

G. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list").

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Sections, including specific warranties, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 working days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 working days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in one of the following formats:

    a. PDF Electronic File: Architect will return annotated file.
    b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 working days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit [**on digital media acceptable to Architect**] [**by uploading to web-based project software site**] [**by email to Architect**].

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in [**Section 015000 "Temporary Facilities and Controls."**] [**Section 017419 "Construction Waste Management and Disposal."**]

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Division 01 Section "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Systems and equipment operation manuals.
3. Systems and equipment maintenance manuals.
4. Product maintenance manuals.

1.2 SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit [**on digital media acceptable to Architect**] [**by uploading to web-based project software site**] [**by email to Architect**]. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 calendar days before commencing demonstration and training. Architect 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 calendar days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 calendar days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

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: Bookmark 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 navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. 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.

D. 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."

1.5 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. 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.

E. 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.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

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.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
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.
10. License requirements including inspection and renewal dates.

C. 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.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

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.

B. 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 warranties and bonds as described below.

C. 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.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; 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.

    a. 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.

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.

E. 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.

F. 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.

G. 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.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

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

J. 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 maintenance manuals.

1.8 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: For those products, materials, and finishes specified in Specification Sections to submit maintenance data, assemble maintenance data indicating care and maintenance.

B. 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.

C. 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.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. 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.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for Project Record Documents, including the following:

1. Record drawings.
2. Record specifications.
3. Maintenance of Record Documents.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit PDF electronic files of scanned Record Prints.
2) Print each drawing, 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.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, 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 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.
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 prints 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. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints 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. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

1.4 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. Note related Change Orders and Record Drawings where applicable.

B. Format: Submit record specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.5 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for

construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Demolition and removal of selected portions of building.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 PRE-DEMOLITION MEETING

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

B. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, which might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

1.4 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.5 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Cover and protect furniture, furnishings, and equipment that have not been removed.
4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.7 CLEANING

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

END OF SECTION

SECTION 031000
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for providing concrete formwork, shoring and reshoring for cast-in-place concrete, and installation of items furnished by others, including anchor bolts, setting plates, bearing plates, anchorages, inserts, frames, nosings and other items to be embedded in concrete.

B. Related Sections:

1. Concrete reinforcing is specified in Section 032000.

2. Cast-in-place concrete is specified in Section 033000.

1.02 SUBMITTALS

A. General: Comply with Section 013300.

B. Product Data: Manufacturer's product data and installation instructions for proprietary materials, including form liners and release agents, manufactured form systems, ties and accessories.

C. Shop Drawings: Show general construction of forms including jointing, special formed joints or reveals, location and pattern of form tie placement, and other items affecting exposed concrete. Include details of inserts and anchorages.

1.03 QUALITY ASSURANCE

A. Concrete formwork shall comply with ACI 318.

B. Allowable Tolerances: Design, construct, set, and maintain the formwork to ensure completed work meets the suggested tolerance limits specified in ACI 347.

C. Placement:

1. Before placement, check lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.

2. During placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed, plywood-faced or other panel type materials providing as-cast surfaces.

1. Furnish in largest sizes to minimize number of joints and to conform to joint system shown on drawings.

2. Provide form material with sufficient thickness to withstand pressure of placed concrete without bow or deflection beyond allowable tolerances.

3. Use overlaid plywood, APA grade trademarked "Medium Density Overlay Plyform Exterior," or new or reused BB plywood.

B. Earth Forms: Unless otherwise indicated or required, concrete for footings may be placed directly against vertical excavated surfaces, provided the material will stand without caving, that minimum reinforcing steel clearances indicated are maintained, and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as indicated. Concrete which is exposed to view on exterior shall be formed to a minimum depth of 6-inches below finished grade.

C. Wood Forms: Industry standard foundation forms.

D. Cylindrical Forms:

1. Heavy glass-fiber reinforce plastic or galvanized steel sheets.

2. Butt sections together, with bolted or keyed joints.

3. Finish interior joints of forms smooth so there is no visible seam on finished concrete surfaces.

E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise shown, provide ties so that portion remaining within concrete after removal of exterior parts is 1-inch from outer concrete surface.

2. Unless otherwise indicated, provide form ties which will leave a hole not larger than 1-inch diameter in concrete surface.

3. Form ties fabricated on project site and wire ties are not acceptable.

F. Form Coating: Commercial formulation release agent that will not bond with, stain, nor adversely affect concrete surfaces; will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. Form release agent shall be VOC compliant.

G. Inserts: Metal inserts for anchorage of materials or equipment to concrete construction, not supplied by other trades and required for work.

1. Adjustable wedge inserts of malleable cast iron, complete with bolts, nuts and washers; 3/4-inch bolt size unless otherwise indicated.

2. Threaded inserts of malleable cast iron, furnished complete with full-depth bolts; 3/4-inch bolt size, unless otherwise indicated.

3. Sheet metal reglets formed of same type and gauge as flashing metal to be built into reglets, unless otherwise indicated. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

2.02 DESIGN OF FORMWORK

A. General: Comply with ACI 318.

B. Design, erect, support, brace and maintain formwork so that it will safely support vertical and lateral loads, until such loads can be supported by concrete structure.

1. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength.

2. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, ambient temperature, founda-

tion pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

3. Design formwork to be removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Fabricate formwork to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material as required to prevent leakage and fins. Ridges, depressions, or fins at form joints exposed to view in the completed work will not be acceptable.

PART 3 - EXECUTION

3.01 FORM CONSTRUCTION

A. General:

1. Construct forms to sizes, shapes, lines and dimensions shown and required to obtain accurate location, grades, level and plumb work.

2. Provide for openings, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required.

3. Select materials to obtain required finishes.

B. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

2. Provide top forms for inclined surfaces where slope is too steep to place concrete.

3. Kerf wood inserts for forming keyways, reglets, and recesses, to prevent swelling and allow easy removal.

C. Provide temporary openings where interior area of formwork is inaccessible for cleanout, inspection before concrete placement, and placement of concrete.

1. Brace temporary closures and set tightly to forms to prevent loss of concrete mortar.

2. Locate temporary openings on forms in as inconspicuous location as possible.

3. Form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

D. Falsework: Erect falsework and support, brace, and maintain to safely support loads applied until such loads can be supported by in-place concrete structures.

E. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing, using wedges or jacks or a combination. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

F. Support form facing materials with structural members spaced to prevent deflection.

1. Provide camber in formwork as required for anticipated deflections due to weight and pressure of fresh concrete and construction loads for long span members without intermediate supports.

2. Inspect falsework and formwork during and after concrete placement to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimension.

G. Forms for Exposed Concrete:

1. Drill forms to suit form ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2. Do not use metal cover plates for patching holes or defects in forms.

3. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.

4. Use extra studs, walers and bracing to prevent bowing of forms between studs.

5. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.

6. Form molding shapes, recesses and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.

7. Joints in formwork shall be abutted flush. Ridges, depressions, or fins at form joints will not be acceptable. Do not use form tape which creates ridges in the finished surface.

H. Corner Treatment: Form exposed corners of beams and columns to produce square, smooth, solid, unbroken lines, except as otherwise indicated.

1. Form chamfers with 3/4-inch x 3/4-inch strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.

2. Unexposed corners may be formed either square or chamfered.

I. Provisions for Other Work:

1. Provide openings in formwork to accommodate work of other Sections, including those under separate contract (if any).

2. Size and location of openings, recesses and chases are responsibility of Section requiring such items.

3. Accurately place and securely support items to be built into forms.

J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces. Remove chips, wood, sawdust, dirt and other debris just before concrete is to be placed.

3.02 FORM COATINGS

A. Coat form contact surfaces with form release agent before reinforcement is placed.

1. Do not allow excess material to accumulate in forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete.

2. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with non-staining, rust-preventative release agent or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. General:

1. Set and built into work, anchorage devices and other embedded items attached to, or supported by, cast-in-place concrete.

2. Use setting drawings, diagrams, instructions and directions furnished by suppliers of items to be attached.

B. Edge Forms and Screed Strips:

1. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours.

2. Provide and secure units to support types of screeds required.

B. Conduits and Pipes Embedded in Concrete: Comply with ACI 318, Section 20.7.

3.04 SHORES AND SUPPORTS

A. Comply with ACI 318, Section 26.11 for shoring and reshoring in multistory construction, and as specified.

B. Extend shoring at least 3-floors under floor or roof being placed for structures over 4-stories.

1. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores.

2. Space out shoring in stories below this level so that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided.

3. Extend shores beyond minimum if required to ensure proper distribution of loads throughout structure.

C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

D. Keep reshores in place a minimum of 15-days after placing upper tier, or until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.05 REMOVAL OF FORMS

A. General: Comply with ACI 318, Section 26.11.

B. Formwork not supporting concrete, such as sides of beams, walls, columns, and similar items may be removed after curing at not less than 50-deg. F. for 24-hours after placing concrete; provided concrete is sufficiently hard to not be damaged by form removal operations and curing and protection operations are maintained.

C. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements may not be removed until concrete has attained design minimum 28-day compressive strength.

1. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members, as specified in Section 03 33 00.

2. Form facing material may be removed 4-days after placement, only if shores and other vertical supports have been arranged to permit removal without loosening or disturbing shores and supports.

3.06 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work.

1. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable.

2. Apply new form release agent material to concrete contact surfaces as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints.

1. Align and secure joints to avoid offsets.

2. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

END OF SECTION

SECTION 032000
CONCRETE REINFORCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for providing concrete reinforcement.

B. Related Sections:

1. Concrete forming is specified in Section 031000.

2. Cast-in-place concrete is specified in Section 033000.

1.02 SUBMITTALS

A. General: Comply with Section 013300.

B. Product Data: Manufacturer's product data, specifications, and installation instructions for proprietary materials and accessories.

C. Mill Certificates: Steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel.

D. Shop Drawings: For fabrication, bending, and placement of reinforcing.

1. Comply with ACI 315.

2. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for fabrication and placement.

1.03 QUALITY ASSURANCE

A. Concrete reinforcement shall comply with ACI 318, Chapter 20

B. Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4. Welders whose work fails to pass inspection shall be requalified before proceeding further welding.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 016100.

B. Deliver reinforcement to Project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on shop drawings.

C. Store materials to prevent damage and accumulation of dirt or excessive rust.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: ASTM A615, deformed, Grade 60, ASTM A706 Deformed Grade 60.

B. Reinforcement for Spirals: ASTM A82.

C. Bars for Welded Splices: ASTM A706, low-alloy steel.

D. Steel Wire: ASTM A82.

E. Deformed Wire: ASTM A496.

F. Welded Smooth Wire Fabric: ASTM A185.

G. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.

1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.

2. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

3. For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide supports with either plastic protected or stainless steel protected legs, at Contractor's option.

4. Over waterproof membranes, use precast concrete block bar supports to prevent penetration of the membrane.

2.02 FABRICATION

A. General:

1. Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with ACI 318, Chapter 20.

2. In case of fabricating errors, do not re-bend or straighten reinforcing in a manner that will weaken the material.

3. Unacceptable Materials: Reinforcement with one of the following defects will not be permitted in the work:

a. Bar lengths, depths and bends exceeding CRSI fabrication tolerances.

b. Bends or kinks not indicated.

c. Bars with reduced cross-section due to excessive rusting.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with referenced codes and standards.

1. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

2. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

3. Place reinforcement to obtain minimum concrete coverage specified in ACI 318, Section 20.6.

4. Ensure bar spacing meets requirements of ACI 318, Section 25.2.

5. Arrange, space, and securely tie bars and bar supports together with 16-gauge wire to hold reinforcement in position during concrete placement operations.

6. Set wire ties so that twisted ends are away from exposed concrete surfaces.

B. Provide sufficient numbers of supports of strength to carry reinforcing.

1. Do not place reinforcing bars more than 2-inches beyond the last leg of continuous bar supports.

2. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

C. Splices: Splice bars by lapping ends and tightly wire tying. Minimum lap of spliced bars shall be as indicated.

D. Welding:

1. Comply with requirements of AWS D1.4 for field welding.

2. Prior to field welding, determine weldability of reinforcing bars by laboratory chemical analysis of steel.

3. Only steel conforming to chemical requirements specified in AWS D12.1 may be welded.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for providing cast-in-place concrete.

B. Related Sections:

1. Concrete floor sealer is specified in Section 030500.

2. Concrete forming is specified in Section 031000.

3. Concrete reinforcing is specified in Section 032000.

4. Below grade vapor retarders are specified in Section 072616.

1.02 SUBMITTALS

A. General: Comply with Section 013300.

B. Product Data: Manufacturer's product data, specifications with application and installation instructions for proprietary materials and items, including admixtures, bonding agents, waterstops, joint systems, chemical floor hardeners, and dry shake finish materials.

C. Samples: Samples of specified materials if requested by Architect. Include names, sources and descriptions.

D. Laboratory Test Reports: Laboratory test reports for concrete materials, mix design tests.

E. Material Certificates: Furnish materials certificates in lieu of laboratory test reports when permitted by Architect. Material certificates shall be signed by material producer and Contractor, certifying that each material item complies with, or exceeds specified requirements.

F. Delivery Tickets: Furnish copies of delivery tickets for each load of concrete delivered to site. Provide information specified.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Materials and execution shall be in accordance with CBC Chapter 19 and ACI 318 the Referenced Standards.

B. Concrete construction shall comply with ACI 117 Manual of Concrete Practice. A copy of this publication shall be kept in the field office during concrete construction.

C. Concrete Testing Service:

1. Contractor shall employ a testing laboratory experienced in design and testing concrete materials and mixes to perform material evaluation tests and to design concrete mixes. Person taking the tests shall be an ACI Field Technician Grade 1.

2. Materials and installed work may require testing and retesting, as directed by Architect, during progress of work.

a. Allow access to material stockpiles and facilities.

b. Tests, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

D. Tests for Concrete Materials:

1. For normal weight concrete, test aggregates by methods of sampling and testing of ASTM C33.

2. For lightweight concrete, test aggregates by methods of sampling and testing of ASTM C330.

3. For portland cement, sample cement and determine chemical and physical properties by methods of test of ASTM C150.

4. Submit written reports to Architect, for each material sampled and tested, prior to start of work.

5. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to Architect. Certificates of compliance shall be signed by materials producer and Contractor.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 61 00.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I or II unless otherwise approved. Use only one brand of cement for each required type throughout Project, unless otherwise approved by Architect.

B. Fly Ash: ASTM C618, Class F. Sampling and testing of fly ash shall be in accordance with ASTM C311.

C. Normal Weight Aggregates: ASTM C33 and as specified.

D. Lightweight Aggregates: ASTM C330.

E. Water: Clean, fresh, drinkable.

F. Admixtures:

1. Water Reducing Admixture: ASTM C494; Euclid Chemical Co. "Eucon WR-75", Master Builders "Pozzolith 200N", Sika Chemical Corp. "Plastocrete 161" or approved equal.

2. Water Reducing, Retarding Admixture: ASTM C494; Euclid Chemical Co. "Eucon Retarder-75", Master Builders "Pozzolith 100XR", Sika Chemical Corp. "Plastiment" or approved equal.

3. High Range Water Reducing Admixture: ASTM C494 Type F or G; Euclid Chemical Co. "Eucon 37", Sika Chemical Corp. "Sikament" or approved equal.

4. Air Entraining Admixture: ASTM C260.

5. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E; Euclid Chemical Co. "Accelguard 80" or approved equal. The admixture manufacturer shall have long-term non-corrosive test data from an independent testing laboratory using an acceptable accelerated corrosion test method such as that using electrical potential measures.

6. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing

more than 0.05-percent chloride ions are not permitted.

2.02 RELATED MATERIALS

A. Non-Shrink Structural Grout: Pre-packaged, non-metallic, non-gaseous, non-shrink when tested in accordance with ASTM C1107, Grade C at fluid (flow cone) consistency of 20- to 30-seconds. Grout shall attain 7,500-psi compressive strength in 28-days at specified flow and shall not bleed. Euclid Chemical Co. "Hi-Flow Grout", L&M Construction Chemicals "Crystex", Master Builders "Masterflow 928" or approved equal.

B. Evaporation Retarder: Euclid Chemical Co. "Euco-Bar", L&M Construction Chemicals "E-Con", Master Builders "Confilm" or approved equal. Use to prevent plastic shrinkage drying cracks in rapid moisture loss conditions.

2.03 PROPORTIONING AND DESIGN OF MIXES

A. Develop mix proportions in accordance with ACI 318, CHPT 5.

1. Proportioning on the basis of field experience or trial mixes shall comply with CBC Section 1905.3.

2. Proportioning without field experience or trial mixtures is not allowed.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 15-percent.

C. Submit written reports to Architect of each proposed mix for each type of concrete at least 15-days prior to start of work. Do not begin concrete production until mixes have been reviewed.

D. Admixtures:

1. Concrete shall contain the specified water-reducing or water-reducing retarding admixture and/or high-range water-reducing admixture. Concrete required to be air-entrained shall contain and approved air-retraining admixture. Pumped concrete, concrete for industrial slabs, fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water-cement ratio below 0.50 shall contain water-reducing admixture.

E. Concrete Types: Concrete Strengths (all normal weight). Shall be per the plans

F. Slump Limits: Concrete containing high-range water-reducing admixture shall have a maximum slump of 9-inches unless otherwise approved by the Architect. The concrete shall batch at a slump of 2- to 3-inches, be verified, then the high-range water-reducing admixture added to increase the slump to the approved level. All other concrete shall have a slump of 4-inches for slabs and 4-inches for other members, (+) or (-) 1”

G. Chloride ion content of aggregates of constituents shall be tested by the laboratory when directed by the Architect. The total chloride ion content of the mix including all constituents shall not exceed 0.03-percent or 0.56-percent or 0.075-percent chloride ions by weight of cement.

2.04 RESTORATION MATERIALS

A. Bonding Agent: ASTM C1059, Type II; Euclid Chemical Co. "Flex-Con", L&M Construction Chemicals "Everbond", Master Builders "Acryl-Set" or approved equal.

B. Structural Bonding Epoxy Adhesive: Two-component, 100-percent solids, 100-percent reactive compound suitable for use on dry or damp surfaces; Euclid Chemical Co. "Euco Epoxy #452MV or #620", Sika Chemical Corp. "Sikadur Hi-Mod" or approved equal.

C. Overhead Repair Mortar: L&M Construction Chemicals "Durapatch VOH" or approved equal.

D. Self-Leveling Cementitious Underlayment: Ardex "Ardex K-15", L&M Construction Chemicals "Levelex" or approved equal.

2.05 CONCRETE CURING MATERIALS

A. Liquid Membrane Forming Curing Compounds:

1. Dissipating Resin Curing Compound: VOC compliant, clear, water-based resin, complying with ASTM C309, Type 1 (or 1D with dye), Class B; Euclid Chemical Company "Kurez VOX", L&M Construction Chemicals "L&M Cure R" or approved equal. Use in areas to receive subsequently-applied flooring.

PART 3 - EXECUTION

3.01 PREPARATION

A. Preplacement Inspection:

1. Before placing concrete, inspect formwork, reinforcing steel, and items to be embedded or cast-in.

2. Moisten wood forms immediately before placing concrete where form coatings are not used.

3. Soil at bottom of foundation systems is subject to testing for soil bearing value by the project geotechnical engineer. Place concrete immediately after approval of excavations.

4. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

3.02 CONCRETE MIXING

A. Measurement: Materials for concrete shall be measured by weighing the aggregates and cement using equipment that is suitable, designed and constructed for this purpose. Each size of aggregate and the cement shall be weighed separately. The accuracy of measuring devices shall be such that quantities be measured to within the following percentages of the desired amount: 1-percent for cement and water, 2-percent for aggregates, 3-percent for admixtures. Mixing water and admixtures shall be measured by volume.

B. Mixing: All concrete shall be ready-mixed and delivered in accordance with ACI 318, Chapter 5. Deposit concrete into final position within one-hour of introduction of mixing water.

3.03 CONCRETE PLACEMENT

A. Placing Record: Record time and date of casting concrete in units of building; maintain record open to inspection.

B. General: Place concrete in compliance with ACI 318, Chapter 5, and as specified.

1. Deposit concrete continuously or in layers so that concrete will not be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as

specified. Deposit concrete as nearly as possible to its final location to avoid segregation.

2. Screed concrete to receive other construction to proper level to avoid excessive skimming or grouting.

3. Do not use concrete which becomes non-plastic and unworkable, does not meet required quality control limits, or which has been contaminated by foreign materials.

4. Do not retemper concrete.

5. Remove rejected concrete from Project site.

C. Concrete Conveying: Comply with ACI 318, Chapter 5. Handle concrete from point of delivery and transfer to concrete conveying equipment and to locations of final deposit as rapidly as possible by methods to prevent segregation and loss of mix materials.

1. Provide mechanical equipment for conveying concrete to ensure continuous flow at delivery end.

2. Provide runways for wheeled concrete conveying equipment from delivery point to locations of final deposit.

3. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice and other deleterious materials.

D. Placing Concrete into Forms:

1. Deposit in forms in horizontal layers not deeper than 24-inches, in a manner to avoid inclined construction joints.

2. Where placement consists of several layers, place each while preceding layer is still plastic to avoid cold joints.

3. Remove temporary spreaders in forms when concrete placing has reached elevations of spreaders.

4. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Do not vibrate forms and reinforcing.

5. Do not use vibrators to transport concrete inside forms.

a. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of machine.

b. Place vibrators to rapidly penetrate at least 6-inches into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to set.

d. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other items without causing segregation of mix.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until the panel or section is completed.

F. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcement, other embedded items, and into corners.

G. Bring slab surfaces to correct level with a straightedge and strike off.

1. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows.

2. Do not disturb slab surface prior to beginning finishing operations.

H. Maintain reinforcing steel in proper position during concrete placement operations.

I. Bonding: Roughen surface of set concrete at joints, to a minimum amplitude of ¼", and clean surfaces of laitance, coatings, loose particles, and foreign matter. Apply bonding agent when noted on plans.

1. Roughen surfaces to expose bonded aggregate uniformly; leave no laitance, loose particles of aggregate, or damaged concrete at surface.

2. Bond fresh concrete to new concrete that has set but is not fully cured, as follows:

a. At joints between footings and walls or columns, and between walls or columns and beams or slabs they support, and elsewhere unless otherwise specified, dampen, but do not saturate, roughened and cleaned surface of set concrete immediately before placing fresh concrete.

b. At joints in exposed work, at vertical joints in walls, at joints in girders, beams, supported slabs and other structural members, and at joints designed to contain liquids, apply a commercial bonding agent to roughened and cleaned surface of set concrete.

1) Apply commercial bonding agent in accordance with manufacturer's printed instructions.

3. Bond fresh concrete to fully-cured hardened concrete or existing concrete. Before depositing fresh concrete, thoroughly roughen and clean hardened surfaces.

4. Bond curbs and equipment pads to base slabs with bonding agent in accordance with manufacturer's directions.

5. Topping Slab: Prior to placement of heavy-duty floor topping, the base slab shall be cleaned, saturated surface dry, and a bonding agent approved by the topping manufacturer applied. Place topping in accordance with manufacturer's instructions.

J. Cold Weather Placing: Protect concrete work from damage or reduced strength caused by frost, or low temperatures, in compliance with the requirements of ACI 318, Section 5.12, and as specified.

1. When air temperature has fallen to or is expected to fall below 40-deg. F., uniformly heat water and aggregates before mixing to obtain a concrete placement temperature of not less than 50-deg. F. and not more than 90-deg, F.

2. Maintain concrete at a minimum temperature of 50-deg. F. for not less than 72-hours after placing.

3. Verify that forms, reinforcing steel, and adjacent concrete surfaces are free of frost, before placing concrete.

4. Only the specified non-corrosive non-chloride accelerator shall be used. Calcium chloride, thiocyanates or admixtures containing more than 0.05-percent chloride ions are not permitted.

K. Hot Weather Placing: When hot weather conditions exist that would impair quality and strength of concrete, place in compliance with ACI 318, Section 5.13, and as specified.

1. Cool ingredients before mixing to maintain concrete placement temperature below 90-deg. F. Mixing water may be chilled, or chopped ice may be used provided water equivalent of ice is calculated to total amount of mixing water.

2. Cover reinforcing steel with water-soaked burlap so that steel temperature will not exceed ambient air temperature immediately before embedment in concrete.

3. Fog spray forms, reinforcing steel and subgrade just prior to placing concrete.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions.

L. Non-Shrink Grout Placement: Column base plates, equipment bases and other locations indicated shall be grouted with the specified non-shrink grout.

1. Prior to grouting, roughen and clean concrete free of laitance or contaminants.

2. Presoak, saturate surface dry the area to be grouted.

3. Clean plate free of grease, rust, oil or contaminants.

4. Follow ACI guidelines.

5. Place grout in accordance with manufacturer's instructions. Avoid the formation of cold joints or voids.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or if not indicated so as to not impair strength and appearance of structure, as approved by Architect. Comply with requirements of CBC Section 1906.4.

1. Provide keyways per plan.

2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joint, except for slabs on grade.

B. Isolation Joints in Slabs on Ground: Provide at points of contact between slabs on ground and columns, per plan.

C. Control Joints in Slabs on Ground: Provide control joints in slabs on ground to form panels or patterns as indicated. Use inserts 1/8- to 1/4-inch wide x 1/4 of slab depth, unless otherwise indicated.

1. Form control joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert.

2. After concrete has cured, remove inserts and clean groove of loose debris.

3. Control joints may be produced by saw cuts 1-inch deep, using powered cutters when concrete has cured sufficiently to carry the machine weight and without dislodging aggregate.

4. Unless otherwise indicated, joint spacing in slabs on grade shall be 24 to 36 times slab thickness.

3.05 FINISH ON FORMED SURFACES

A. Rough Form Finish: Provide as-cast rough form finish to formed concrete surfaces concealed in finish work or by other construction, unless otherwise indicated.

1. Standard rough form finish shall be the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4-inch in height rubbed down or chipped off.

B. Smooth Form Finish: Provide as-cast smooth form finish for formed surfaces exposed to view, or that are covered with a coating material applied directly to concrete, or a covering material bonded to concrete such as waterproofing, dampproofing, painting, or similar system.

1. Produce smooth form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams.

2. Repair and patch defective areas; remove and smooth fins and other projections.

3.06 MONOLITHIC SLAB FINISHES

A. Floor surfaces shall be within +or- 3/4-inch of finished floor elevations indicated. If variations greater than this exist, the Architect may direct the Contractor to grind the surfaces to bring them within the requirements. Patching of low spots shall not be permitted. Grinding shall be done as soon as possible but not until the concrete is sufficiently strong to prevent dislodging coarse aggregate particles.

B. Scratch Finish: Apply to slab surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material, and as indicated.

1. After placing slabs, plane surface to a tolerance F_F 15 / F_L 13.

2. Slope surfaces uniformly to drains where required.

3. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.

C. Float Finish: Apply to slab surfaces to receive trowel finish and other finishes as specified, and slab surfaces to be covered with membrane or elastic waterproofing and as indicated.

1. After screeding, consolidating, and leveling, do not work surface until ready for floating.

2. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats or hand floats.

3. Consolidate surface with power-driven floats, or by hand-floating.

4. Check and level surface plane to a tolerance F_F 20 / F_L 17.

5. Cut down high spots and fill low spots.

6. Uniformly slope surfaces to drains.

7. Refloat surface to uniform, smooth, granular texture immediately after leveling.

D. Trowel Finish: Apply to slab surfaces exposed to view, unless otherwise indicated, and slab surfaces to be covered with resilient flooring, paint, or other thin-film finish coating system.

1. After floating, begin first troweling using power-driven trowel.

2. Begin final troweling when surface produces ringing sound as trowel is moved over surface.

3. Consolidate concrete surface by final hand troweling, free of trowel marks, uniform in texture and appearance, and with surface plane tolerance F_F 30 / F_L 25.

4. Grind smooth surface defects which would telegraph through applied floor covering system.

E. Trowel and Fine Broom Finish: Where ceramic tile is to be installed with thin-set mortar, apply trowel finish as specified, and immediately follow by slightly scarifying surface with a fine broom.

F. Non-Slip Broom Finish: Apply to exterior concrete platforms, steps, and ramps, and where indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming in direction perpendicular to main traffic route.

2. Coordinate final finish with Architect before application.

3.07 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 318, Section 5.11.

B. Cure slabs and other non-formed surfaces using one of the following methods:

1. Application of the specified membrane-forming curing and sealing compound applied in accordance with the manufacturer's instructions immediately after final finishing.

a. Membrane curing compound used in floor slabs receiving applied finish flooring shall be guaranteed by the manufacturer, in writing, not to impair bonding of adhesive.

b. Apply membrane-forming curing compound to damp concrete surfaces as soon as possible after final finishing operations are complete, but no later than 2-hours.

c. Apply uniformly in continuous operation by power spray or rollers in accordance with manufacturer's directions.

d. Recoat areas which are subjected to heavy rainfall within 3-hours after initial application.

e. Maintain continuity of coating and repair damage during curing period.

f. Apply to horizontal surfaces when concrete is dry to touch with power spray or hair broom, in accordance with manufacturer's directions.

C. Submit Concrete Curing procedure to include all methods and materials to be employed to aid in concrete curing at least 15 days prior to placing concrete.

3.08 CONCRETE SURFACE REPAIRS

A. Patch defective areas with specified proprietary patching mortar or cement mortar immediately after removal of forms, when directed by Architect.

1. Cut out honeycomb, rock pockets, and voids over l/4-inch and holes left by tie rods and bolts, down to solid concrete or to a depth of 1-inch.

a. Make edges of cuts perpendicular to concrete surface.

b. Before placing patching mortar, clean, dampen with water, and brush-coat area to be patched with bonding agent.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that when dry, patching mortar will match color of surrounding concrete.

a. Provide test areas at inconspicuous locations to verify mixture and color

match before proceeding with patching.

b. Compact mortar in place and strike off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Repair exposed-to-view formed concrete surfaces that contain defects impacting finish appearance.

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect.

2. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning.

3. Flush out form tie holes, fill with dry pack mortar, or precast cement plugs secured in place with bonding agent.

4. Repair concealed formed concrete surfaces containing defects that adversely affect durability of concrete. If defects cannot be repaired, remove and replace concrete having defective surfaces.

C. Repair of Slab Surfaces: The Owner's Testing Laboratory may test slab surfaces for conformance with specified floor flatness and levelness values as specified in QUALITY CONTROL DURING CONSTRUCTION Article.

1. Test floor surfaces sloped to drain for trueness of slope, in addition to smoothness, using template having required slope. Correct high and low areas as specified.

2. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete.

a. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4-inch clearance around.

b. Dampen concrete surfaces in contact with patching concrete and apply bonding compound.

c. Mix patching concrete to produce concrete of same type or class as original adjacent concrete.

d. Place, compact and finish as required to blend with adjacent finished concrete.

e. Cure in same manner as adjacent concrete.

3.09 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Owner will employ a special inspector to perform inspection during constructions, as follows:

1. Code Required Testing: Comply with CBC Section 1705 and Table 1705.3.

2. Test concrete to control slumps in accordance with ASTM C143.

3. Test concrete for compressive strength as follows:

a. Make and cure three cylinders according to ASTM C31 for each 50-cubic yards or 2000-square feet of surface area for slabs or walls, or fraction thereof, at each class of structural concrete poured at site each day.

b. In addition, samples for strength tests for each class of concrete shall be

taken for 7-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.

c. Test one cylinder at 7-days and two cylinders at 28-days for strength in accordance with ASTM C39.

B. Pay the Owner's testing laboratory for taking core specimens of hardened structural concrete and testing specimens according to ASTM C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

C. Additional sampling and testing for field quality control during placement of concrete may include the following, as directed by the Architect.

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

a. Slump: ASTM C143; one test for each concrete load at point of discharge; and one for each set of compressive strength test specimens.

b. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each days pour of each type of air entrained concrete.

c. Concrete Temperature: Test hourly when air temperature is 40-deg. F. and below, and when 80-deg. F. and above; and each time a set of compression test specimens are made.

D. Test results shall be reported in writing to Architect and Contractor within 24-hours of making.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing structural steel.

B Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Promptly remove and replace materials or fabricated components which do not comply.

C. Design of Members and Connections: Details are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Notify Architect whenever design of members and connections are not clearly indicated.

D. Comply with structural drawings for steel moment rigid frames:

1.02 SUBMITTALS

A. General: Comply with Section 013300.

B Shop Drawings: Furnish shop drawings prepared under supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

2. Furnish setting diagrams, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other Sections.

C. Test Reports: Furnish copies of test reports conducted on shop and field bolted and welded connections. Include data on types of tests conducted and test results.

D. Surveys: Furnish certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of base plates and anchor bolts, and final elevations and locations for members. Show discrepancies between actual installation and contract documents.

1.03 QUALITY ASSURANCE

A. Welding Qualifications: Prior to commencing welding, welding procedures, welding operations, and welders shall be qualified in accordance with AWS D1.1.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 016100.

B. Deliver materials to site at intervals to ensure uninterrupted progress of the work.

C. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete or masonry.

D. Store materials to permit easy access for inspection and identification.

1. Keep structural steel members off ground, using pallets, platforms, or other supports.

2. Protect steel members and packaged materials from erosion and deterioration.

3. Do not store materials on structure in a manner to cause distortion or damage to members or supporting structures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Structural Plates and Bars: ASTM A36

C. Wide Flange Sections: ASTM A992, Grade 50.

D. Square and Rectangular HSS:ASTM A500 Grade B (46 Ksi)

E. Round HSS: ASTM A500 Grade B (42 Ksi)

F. Steel Pipe: ASTM A53, Type E or S, Grade B.

G. Anchor Bolts: ASTM F1554 Grade 36, nonheaded type unless otherwise indicated.

H. Threaded Fasteners: ASTM A325N, bearing bolts. Provide hexagonal heads and nuts for all connections unless otherwise indicated.

I. Welding Electrodes: AWS E70XX.

J. Structural Steel Primer: VOC compliant rust-inhibitive alkyd primer.

2.02 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop where possible.

2. Fabricate items in accordance with AISC Specifications and as indicated on final shop drawings.

3. Provide camber in structural members where indicated.

4. Mark and match-mark materials for field assembly.

5. Fabricate for delivery sequence which will expedite erection and minimize field handling.

6. Where shop priming is required, complete assembly, including welding, before start of finishing operations. Provide finish surfaces of members exposed-to-view which are free of markings, butts and other defects.

B. Connections: Weld or bolt shop connections as indicated.

1. Bolt field connections, except where welded connections or other connections are indicated.

2. Provide normal strength threaded fasteners for all bolted connections, unless noted

otherwise.

3. Provide unfinished threaded fasteners for bolting secondary members to primary members, and for temporary bracing to facilitate erection.

4. High-Strength Bolted Connections: Install in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts", (RCRBSJ).

C. Welded Construction: Comply with AWS Code **D1.1** for procedures, appearance, and quality of welds and methods. **Comply with the additional requirements of AWS Code D1.8 for all welds in Seismic Force Resisting System (SFRS) components**. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through framing members as indicated on final shop drawings.

1. Punch, drill, or cut holes perpendicular to metal surfaces.

2. Do not flame cut holes or enlarge holes by burning.

3. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2-inches of embedded areas only.

1. Do not paint surfaces which are to be field welded or high-strength bolted with friction-type connections.

2. Do not paint surfaces which are to receive sprayed-on fire-proofing.

B. Surface Preparation: After inspection and before shipping, clean steel to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel to be field-painted in accordance with SSPC SP-2, 3, or 6 as applicable.

C. Painting: Immediately after surface preparation, apply primer at dry film thickness of not less than 2-mils, in accordance with manufacturer's instructions. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.01 ERECTION

A. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection proceeds. Do not proceed with erection until corrections have been made.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made.

C. Setting Bases and Bearing Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve surface bond.

2. Clean bottom surfaces of base and bearing plates.

3. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

4. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate prior to packing with grout.

5. Pack grout solidly between bearing surfaces and bases or plates, filling voids. Finish exposed surfaces, protect installed materials, and allow to dry.

D. Field Assembly:

1. Set structural frames to lines and elevations indicated. Align and adjust members before permanently fastening.

2. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

3. Adjust for discrepancies in elevations and alignment.

4. Level and plumb individual members within specified AISC tolerances. Establish measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature of structure when completed.

E. Erection Bolts: Remove erection bolts on exposed welded construction. Fill holes with plug welds and grind smooth.

F. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

G. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes requiring enlargement to admit bolts.

H. Touch-Up Painting:

1. Clean field welds, bolted connections, and abraded areas of shop paint.

2. Apply paint by brush or spray to exposed areas using same material and thickness as used for shop painting.

3. Apply by brush or spray, minimum dry film thickness of 1.5-mils.

3.02 FIELD QUALITY CONTROL

A. Special Inspection: As specified in CBC Section 1704 and CBC Table 1704.3.

1. Steel Construction: As specified in CBC Section 1704.3.

2. Welding: As specified in Section CBC Section 1704.3.1.

B. Structural Observations: As specified in CBC Section 1709.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing cold-formed metal framing.

B. Related Sections:

1. Construction waste management is specified in Section 017419.

1.02 SUBMITTALS

A. General: Comply with Section 013300.

1.03 QUALITY ASSURANCE

A. Code-compliance certification of studs and tracks by the Steel Stud Manufacturers or the Steel Framing Industry Association (SFIA).

B. Products to be certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.

C. Testing Agency Qualifications: Qualified in accordance with ASTM E329 for testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA).

F. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

G. Comply with the following AISI specifications and standards:

1. AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members."
2. AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provisions."
3. AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Standard."
4. AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."
5. AISI S240, "North American Standard for Cold-Formed Steel Structural Framing."

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

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PART 2 – PRODUCTS

2.01 MANUFACTURERS

A Basis-of-Design Product: Subject to compliance with requirements, provide cold-formed steel framing products by one of the following or as allowed by the E.O.R.:

1 CEMCO; California Expanded Metal Products Co.
2 Clark Dietrich
3 SCAFCO
4 United Metal Products Inc.
5 Consolidated Fabricators Corporation

2.02 PERFORMANCE REQUIREMENTS

A Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing to comply with AISI S100 and AISI S200 and ASTM C955, Section 8

B Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.03 COLD-FORMED STEEL FRAMING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.

C. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, ASTM A653, SS, ASTM A1033 non-structural of grade and coating designation as follows:

D. Grade: 33 ksi, 50 ksi, as required by structural performance.

E. Coating: G60 for structural framing, G40 for non-structural framing.

2.04 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Steel Thickness: 0.0329 inch (0.84 mm) 0.0428 inch (1.09 mm) 0.0538 inch (1.37 mm) 0.0677 inch (1.72 mm) 0.0966 inch (2.45 mm).
2. Depth: 2-1/2 inches (64 mm) 3-5/8 inches (92 mm) 6 inches (152 mm) As indicated on Drawings.

3. Flange Width: 1-3/8 inches (35 mm) 1-5/8 inches (41 mm) 2 inches (51 mm) 2-1/2 inches (63 mm) 3 inches (76 mm)].

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Steel Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches (32 mm)

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges.:Steel-thickness sequence in "Minimum Base-Steel Thickness" Subparagraph below corresponds to common thickness designators 33, 43, 54, 68, and 97 and obsolete 20-, 18-, 16-, 14-, and 12-gauge designations. If retaining different thicknesses for different locations, indicate locations here or in the framing articles below.Retain "Basis-of-Design Product" Subparagraph below to identify a specific product or a comparable product by a current member of the SFIA.

D. U-Channel Assembly: Manufacturer's standard-length U-channel for lateral bracing for exterior load-bearing walls.

1. U-Channel Size: 1-1/2 inches (38.1 mm).
2. U-Channel Minimum Base-Steel Thickness: 0.0538 inch (1.37 mm).

2.05 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched or punched with standard holes, with stiffened flanges, and as follows:

B. Minimum Base-Steel Thickness: 0.0329 inch (0.84 mm) 0.0428 inch (1.09 mm) [0.0538 inch (1.37 mm) 0.0677 inch (1.72 mm) 0.0966 inch (2.45 mm).
C. Flange Width: 1-5/8 inches (41 mm) 2 inches (51 mm) 2-1/2 inches (63 mm)

2.06 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

B. Minimum Base-Steel Thickness: 0.0329 inch (0.84 mm) [0.0428 inch (1.09 mm) 0.0538 inch (1.37 mm) 0.0677 inch (1.72 mm) 0.0966 inch (2.45 mm).

C. Flange Width: 1-1/4 inches (31 mm) 1 3/8 inches (35 mm) minimum

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: [**ASTM A780/A780M**] [**MIL-P-21035B**] [**or**] [**SSPC-Paint 20**].

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.08 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, in accordance with referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

F. Fabricate framing assemblies using jigs or templates.
1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

3. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4.. Locate mechanical fasteners and install in accordance with Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads. Retain subparagraph below if fabricated assemblies include other materials; revise to suit Project.

5. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, in accordance with Shop Drawings.

6. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

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7 Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 ft. (1:960) and as follows:

a. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
b. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.02 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

C. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing in accordance with ASTM C1007, AISI S200 AISI S240 and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

D. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

E. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

F. Cut framing members by sawing or shearing; do not torch cut.

G. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

1. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2 Locate mechanical fasteners, install in accordance with Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

H. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

I. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

J. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

K. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

L. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.04 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 ft. (1:960) and as follows:

1 Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Tests and Inspections:

1 .Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
2 Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.07 PROTECTION

A Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 055133
STEEL LADDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel ladders.
2. Accessories indicated, specified, or required to complete installation.

1.2 DELEGATED ENGINEERING REQUIREMENTS

A. Contract Document Concept: Drawings and Specifications express concept of ladder work, however, they may not indicate or specify total work that may be required, nor shall they be construed as engineered.

B. Delegated Engineering Responsibility: Require manufacturer to employ a delegated engineering professional to provide engineering for each member and component of ladder work, including attachment to building structural frame, required to meet concept expressed in Contract Documents that includes, but is not limited to, following:

1. Comprehensive engineering analysis indicating location, type, magnitude, and direction of loads imposed on exterior wall and building structural frame.
2. Preparation of engineering calculations, shop drawings, and other submittals.

1.3 SUBMITTALS

A. Shop Drawings: Detailed and dimensioned plans, elevations, and large-scale details.

1. Include fabrication and installation details.
2. Include anchorage and accessory items.
3. Distinguish between shop- and field-assembled work.

B. Delegated Engineering Submittal: Include analysis data signed and sealed by the engineering professional responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated that have resulted in installations similar to this Project, and, that has a record of successful in-service performance.

B. Quality Standards:

1. OSHA 1910.23.
2. OSHA 1926.1053.
3. ANSI A14.3.
4. ASME A17.1.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36.

2.2 RELATED MATERIALS

A. Fasteners, General: Zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5. Select fasteners for type, grade, and class required.

B. Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer compatible with topcoat.

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

D. Post-Installed Anchors:

1. Type: Torque-controlled expansion anchors.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe, unless otherwise indicated.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Fabricate ladders in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

D. Cut, reinforce, drill, and tap metal as indicated to receive finish hardware, screws, and similar items.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal rigidly in place and to support indicated loads.

2.4 STEEL LADDERS

A. Construction:

1. Space siderails 18 inches apart unless otherwise indicated.

2. Siderails: Continuous, 1/2 by 2-1/2 inch steel flat bars, with eased edges.
3. Rungs: 3/4 inch diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches on centers with welded or bolted steel brackets.
7. Galvanize and prime exterior ladders, including brackets.
8. Prime interior ladders, including brackets and fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive ladder and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Set steel ladders accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.3 ADJUSTING

A. Touchup Painting: Immediately after erection, paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing rough carpentry, including wood framing, timber for posts and beams, rooftop equipment bases and support curbs, wood grounds, nailers, blocking, and plywood wall and roof sheathing.

B. Related Sections:

1. Common product requirements are specified in Section 01 61 00.

2. Construction waste management is specified in Section 01 74 19.

3. Cast-in-place concrete is specified in Section 03 30 00.

4. Wood treatment is specified in Section 06 05 73.

5. Gypsum sheathing is specified in Section 06 16 43.

6. Sheathing paper is specified in Section 06 16 93.

7. Glued-laminated construction is specified in Section 06 18 00.

1.02 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Material Certificates:

1. Where dimensional lumber is to comply with minimum allowable unit stresses, furnish listing of species and grade selected for use and evidence of compliance with specified requirements.

2. Compliance may be a signed copy of lumber producer's grading rules showing design values for selected species and grade.

3. Design values shall be as approved by Board of Review of American Lumber Standards Committee.

1.03 QUALITY ASSURANCE

A. Rough carpentry work shall comply with CBC Chapter 23.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 01 61 00.

B. Keep materials under cover and dry. Protect against exposure to weather and contact with wet or damp surfaces.

C. Stack lumber, plywood and other panels; provide for air circulation within and around stacks and under temporary coverings.

D. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air

circulation.

PART 2 - PRODUCTS

2.01 LUMBER

A. Manufacture lumber to comply with PS 20 and with applicable grading rules of inspection agencies certified by ALSC Board of Review.

B. Factory-mark each piece of lumber identifying grading agency, grade, species, moisture content at time of surfacing, and mill. Identifying grade stamps for lumber and plywood exposed to view in the finished construction shall be removed by sanding prior to finishing. Grade stamps may be applied to the lower quality concealed face of plywood if acceptable to the Authority having jurisdiction.

C. Nominal sizes are indicated, except as indicated by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide seasoned lumber with 19-percent maximum moisture content at time of dressing and shipment for sizes 2-inches or less in nominal thickness.

3. Provide specially milled lumber as indicated or required for sloping or angled construction.

2.02 DIMENSIONAL LUMBER

A. Non-Structural Light Framing: Douglas Fir-Larch species, Standard & Better grade.

B. Structural Framing: Douglas Fir-Larch graded and marked in accordance with the Standard Grading Rules No. 16 of the NFPA. Refer to Structural Drawings for grade.

2.03 TIMBERS

A. Timber (5-inches and thicker): No. 1 Grade Douglas Fir. Provide appearance grade where exposed.

2.04 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work, including, rooftop equipment curbs and support bases, bucks, nailers, blocking, grounds, and similar members.

1. Moisture Content: 19-percent maximum for lumber items not specified to receive wood preservative treatment.

2. Grade: No. 2 or Better in accordance with NFPA rules.

2.05 PLYWOOD CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with CBC Section 2303.1.4.

B. Trademark: Identify each construction panel with APA trademark.

C. Concealed APA Performance-Rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with specified requirements for grade designation, span rating, exposure durability classification, edge detail and thickness as indicated on the Structural Drawings.

1. Wall Sheathing: APA RATED SHEATHING.

a. Exposure Durability Classification: Exposure 1.

b. Span Rating: See Structural Drawings.

c. Thickness: See Structural Drawings.

2. Roof Sheathing: APA RATED SHEATHING.

a. Exposure Durability Classification: Exposure 1.

b. Span Rating: See Structural Drawings.

c. Thickness: See Structural Drawings.

d. Where exposed in the completed work, provide one side with Grade B veneer.

3. Shear Walls: APA RATED SHEATHING STRUCTURAL I 5 PLY.

a. Exposure Durability Classification: Exposure 1.

b. Span Rating: As indicated on the structural drawings.

c. Thickness: As indicated on the structural drawings.

D. Plywood Backing Panels: Fire-retardant treated, APA C-D PLUGGED INT with exterior glue, not less than 15/32-inch thick, or as indicated.

2.06 MISCELLANEOUS MATERIALS

A. Fasteners and Anchors:

1. General: Comply with CBC Section 2304.10.

2. Provide size, type, material and finish indicated and recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.

B. Fire-Retardant Treatment: Provide as indicated on drawings and where required by the Building Code. Pressure treat to flame spread rating of 25 or less and fuel contribution of 30 or less when tested in accordance with ASTM E84, each piece bearing the UL label of conformance. Re-dry to maximum 14% moisture content.

C. Framing connector hardware to be manufactured by Simpson Srong-Tie as specified on the structural drawings.

1. Connectors other than Simpson may be used provided:

a. Connectors meet or exceed the capacity of the specified Simpson counterparts. Verification of the capacity of the alternate hardware shall be the responsibility of the contractor.
b. Connectors are ICC or IAPMO listed in an evaluation report.

2.07 GENERAL

A. All wood products must be non-tropical.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as indicated and required. Countersink nail heads on exposed carpentry work and fill holes. The number and size of nails connecting wood members shall be as indicated or specified in CBC Table 2304.10.2.

D. Use common wire nails, except as otherwise indicated. Make tight connections between members. Install fasteners without splitting wood; pre-drill as required.

E. Nailing Requirements: Comply with CBC Section 2304.10 and as indicated on the Structural Drawings.

3.02 WOOD GROUNDS, NAILERS, AND BLOCKING

A. Provide where indicated and/or required for screeding or attachment of other work. Form to shapes indicated and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Provide permanent grounds of dressed, preservative treated, key- bevelled lumber not less than 1-1/2-inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD FRAMING, GENERAL

A. Comply with CBC Section 2304.

B. Provide framing members of size and on spacing indicated, and frame openings as indicated. Do not splice structural members between supports.

C. Anchor and nail as indicated.

D. Install fireblocking and draftstopping as specified in CBC Section 718.2.

3.04 JOIST FRAMING

A. Comply with CBC Section 2304.4.

B. Install with crown edge up and support on each member with not less than 1-1/2-inches of bearing on wood.

C. Attach to wood bearing members as indicated on structural drawings.

D. Frame openings with headers and trimmers as indicated on structural drawings.

E. Notch only as indicated on structural drawings.

F. Provide solid blocking as indicated on structural drawings.

G. Lap members where required per structural drawings.

3.05 RAFTER AND CEILING JOIST FRAMING

A. Comply with CBC Section 2304.4.

B. Ceiling Joists: Provide member size and spacing indicated on structural drawings.

3.06 TIMBER FRAMING

A. Comply with CBC Section 2304.10.

B. Provide wood beams and girders of the size and spacing indicated. Install with crown edge up and provide not less than 4-inch bearing on supports. Provide continuous members unless shown; tie together over supports if not continuous.

C. Provide wood posts of sizes shown. Provide metal anchoring and attachment devices.

3.07 INSTALLATION OF PLYWOOD CONSTRUCTION PANELS

A. General:

1. Wall Sheathing: Comply with CBC Section 2304.6.

2. Roof Sheathing: Comply with CBC Section 2304.8.2.

B. Comply with applicable recommendations of APA Form No. E30F.

C. Fastening Methods: Fasten panels as specified.

1. Sheathing: Nail to framing.

2. Plywood Backing Panels: Nail to supports.

3. Allow 1/16-inch gap between plywood subflooring panels.

3.09 SOUND CONTROL WORK

A. Specified requirements apply to framing for interior partitions indicated as sound partitions.

B. Isolate sill plates from direct contact with structure by installing over either continuous isolation strips or two continuous 1/4-inch beads of acoustical sealant applied at quarter points of plate width.

3.10 WASTE MANAGEMENT

A. General: Comply with Section 01 74 19.

B. Separate the following categories for salvage or re-use on the site:

1. Sheet materials larger than 2-sq. ft.

2. Solid wood trim longer than 16-inches and multiple offcuts of any size larger than 12-inches.

C. The following categories may be re-used in the manufacture of particleboard or medium density fiberboard:

1. Composite wood.

2. Clean dimensional lumber.

D. Separate the following categories for disposal and place in designated areas for hazardous materials:

1. Treated, stained, painted, or contaminated wood.

END OF SECTION

SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

Section Includes: Wood blocking, nailers and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

2.2 PLYWOOD

Plywood: DOC PS 1, Exterior, A-C, in thickness indicated or, if not indicated, not less than 5/8 inch nominal thickness.

2.3 FASTENERS

A. General: Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Power-Driven Fasteners: NES NER-272.

C. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

END OF SECTION

SECTION 061733
WOOD I-JOISTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing wood I-joists, including connectors, anchors, and accessories required to interconnect and secure I-joists to building structure.

B. Related Sections:

1. Construction waste management is specified in Section 01 74 19.

2. Rough carpentry items are specified in Section 06 10 00.

1.02 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Drawings: Drawings showing layout and detail necessary for determining fit and placement in the building.

C. Execution: Fabrication and/or cutting shall not proceed until the architect and/or structural engineer has reviewed and approved the submittal package.

1.03 QUALITY ASSURANCE

A. Standards: Comply with manufacturer's respective Evaluation Report.

B. Manufacturer Qualification: Provide factory-glued structural units, with independent third party inspection.

C. Factory mark each piece with independent inspection agency's logo.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01 61 00.

B. Keep I-joist units dry during delivery, storage, handling, and erection.

C. Time delivery to avoid extended on-site storage, and to avoid delaying work of other Sections.

D. If I-joists are to be stored before erection, place joist bundles on blocks off ground.

PART 2 - PRODUCTS

2.01 A. Flange material, web material and adhesives shall conform to the provisions outlined in the Product Evaluation ports for the respective manufacturer as listed in the drawings general notes.

2.02 FABRICATION

A. I-joists shall be manufactured in a plant listed in the product Evaluation Report under the

supervision of an approved third-party inspection agency.

B. Tolerances: Depth +/- 1/16”, Flange Width +/- 1/16”

C. Identification: Each joist shall be identified by a stamp indicating the joist series, Evaluation Report number, manufacturer's name, plant number, date of fabrication and the independent inspection agency’s logo.

PART 3 - EXECUTION

3.01 INSTALLATION

A. When storing on-site prior to installation, shall be protected from the weather.

B. Install in accordance with the structural drawings, manufacturer’s drawings and/or supplier’s drawings.

C. Adequately brace members as they are placed to maintain safe position until sheathing is applied.

END OF SECTION

SECTION 061800
GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing structural glued laminated timber members, including connectors, anchors, and accessories required to interconnect and secure glulam members to building structure.

B. Related Sections:

1. Common product requirements are specified in Section 01 61 00.

2. Construction waste management is specified in Section 01 74 19.

3. Rough carpentry items are specified in Section 06 10 00.

4. Shop-fabricated wood trusses are specified in Section 06 17 53.

1.02 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Product Data: Manufacturer's data, specifications and installation instructions covering lumber, adhesives, fabrication process, preservative treatment, accessories and protection.

C. Certifications: Furnish certification indicating glued laminated timbers comply with requirements of ANSI/AITC A109.1.

1.03 QUALITY ASSURANCE

A. Standards: Comply with ANSI/AITC A190.1, "Structural Glued Laminated Timber".

B. Manufacturer Qualification: Provide factory-glued structural units, produced by an AITC-licensed firm, qualified to apply the AITC Quality Inspection mark.

C. Factory mark each piece with AITC Quality Inspection mark. Place AITC mark on timber surfaces which will not be exposed in completed work.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01 61 00.

B. Keep glued-laminated structural units dry during delivery, storage, handling, and erection, by maintaining factory-applied protective covering in weather-tight and light-proof condition, or by applying other weathertight protection.

C. Maintain protective covering until building enclosure is completed, and until final finishing of exterior work is ready to proceed.

D. Do not store members in areas of high or low relative humidity.

E. Time delivery to avoid extended on-site storage, and to avoid delaying work of other Sections.

F. If laminated units are to be stored before erection, place individual units or bundle wrapped units on blocks off ground with individual members separated for air circulation. Leave

wrappings intact, but slit or puncture lower side to permit drainage of water.

PART 2 - PRODUCTS

2.01 STRUCTURAL GLUED LAMINATED UNITS

A. Lumber: Comply with ANSI A109.1 and applicable lumber association standards for allowable stress, appearance, fabrication limitations and species.

B. Preservative Treatment: Pressure treat lumber prior to gluing in accordance with AWPA C28 for water-borne preservatives. Discard pieces affected by treatment.

C. Stress Values for Beams: Provide glued-laminated timber members sized as indicated, with laminating combinations that meet or exceed the stress values indicated on the Structural Drawings for normal loading duration and dry condition of use.

D. Lumber Species: Douglas Fir.

E. Adhesive: ANSI/AITC A190.1, wet-use type.

F. Connectors, Anchors, Accessories: Provide fabricated steel shapes, plates and bars complying with ASTM A36, welded into assemblies of types and sizes indicated, or manufacturer's standard units. Provide steel bolts, lag bolts, nails and other standard fasteners as required.

2.02 FABRICATION

A. General: Comply with ANSI/AITC A190.1. Where dimensions are not completely documented, provide manufacturer's standard sizes and shapes required to comply with specified requirements. Shop-cut connections and connecting hardware to greatest extent feasible.

B. Grade: Industrial grade units complying with AITC 110.

C. Camber: The required camber for fabrication of each member is indicated on drawings, and may be either circular or parabolic at manufacturer's option.

2.03 FACTORY-APPLIED PROTECTION

A. Before shipping or exposing to outdoor conditions, individually wrap each member with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering, with water-resistant seams.

B. Small members of uniform size may be bundle-wrapped, in lieu of individual wrappings, Provide protective slip sheets between factory finished surfaces.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install miscellaneous steel connectors, anchors, and accessories as indicated.

B. Adequately brace members as they are placed to maintain safe position until full stability is provided.

C. Cutting: Avoid cutting members during erection. Except for fastener drilling and other minor cutting, coat cuts with end sealer.

1. Where treated members must be cut during erection, apply a heavy brush coat of the same treatment, complying with AWPA Standard M4.

D. Handle and temporarily support members to prevent visible surface damage.

E. Do not remove wrapping or individually wrapped members until required for installation.

F. Repair damaged surfaces and finishes after completing erection and removing wrappings, or replace damaged members as directed where damage is beyond acceptable repair.

3.02 PROTECTION

A. Control heating, ventilating, and air conditioning to avoid damage to or deterioration of work.

3.03 WASTE MANAGEMENT

A. Separate the following categories for salvage or re-use on the site:

1. Sheet materials larger than 2-sq. ft.

2. Solid wood trim longer than 16-inches and multiple offcuts of any size larger than 12-inches.

B. The following categories may be re-used in the manufacture of particleboard or medium density fiberboard:

1. Composite wood.

2. Clean dimensional lumber.

C. Separate the following categories for disposal and place in designated areas for hazardous materials:

1. Treated, stained, painted, or contaminated wood.

END OF SECTION

SECTION 062023
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior woodwork.
2. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: For each type of shop-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

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

C. Samples for Verification Purposes:

1. Lumber with Shop-Applied Transparent Finish: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished cabinets.
3. Lumber and Panel Products with Shop-Applied Transparent Finish: 5 inches wide by 10 inches long for lumber and 8 by 10 inches for panels, for each finish system and color.

a. Finish one-half of exposed surface.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece.

B. Softwood Plywood: DOC PS 1.

C. Hardboard: ANSI A135.4.

D. MDF: ANSI A208.2, Grade 130.

E. Particleboard: ANSI A208.1, Grade M-2.

2.2 WOODWORK FOR TRANSPARENT FINISH

A. AWI-AWS Grade: Custom.

B. Wood Species: As indicated on the Drawings.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.4 FABRICATION

A. Fabrication Quality Standards: AWI’s Architectural Woodwork Standards, sections as indicated below.

B. Shop Fabrication: Fabricate, assemble, finish, and install hardware to maximum extent possible before shipment to site.

1. Fabricate cabinets to dimensions, profiles, and details indicated.
2. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

3. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
4. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

C. Edges: Ease edges to radius indicated for following:

1. Corners of Cabinets and Edges of Lumber Members 3/4 inches Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 inches Thick: 1/8 inch.

D. Balanced Panel Fabrication: Veneered and clad panels shall be symmetrical from panel center line; balance type, thickness, and moisture content of veneers and cladding on both faces of panel.

E. Furring, Blocking, Shims, and Hanging Strips: Fabricate from fire retardant treated lumber; sand lightly to remove raised grain on exposed surfaces before fabrication.

2.5 SHOP FINISHING

A. General: Finish woodwork at fabrication shop as specified in this Section. Defer final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: Premium.
2. Finish: System - 12, water-based polyurethane.
3. Staining: Match Architect's sample.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Sheen: Satin, 31-45 gloss units measured on 60 degree gloss meter according to ASTM D523.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32 inch maximum offset for flush installation and 1/16 inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.5 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.6 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 064116
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.
3. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

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

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in architectural wood cabinets.

C. Samples for Verification Purposes:

1. Plastic Laminate: 8 by 10 inches Samples for each type, color, pattern, and surface finish.
2. Thermoset Decorative Panels: 8 by 10 inches, for each color, pattern, and surface finish.

a. Provide edge banding on one edge.

3. Exposed Cabinet Hardware and Accessories: One unit for each type and finish.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Company with not less than 5 years’ experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

B. Installer Qualifications: Fabricator of products.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

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

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

2.2 ARCHITECTURAL WOOD CABINETS, GENERAL

A. No urea formaldehyde materials.

B. Quality Standard: Unless otherwise indicated, comply with AWI’s “Architectural Woodwork Standards” (AWS) for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. AWI-AWS Grade: Custom.

B. Type of Construction: Frameless.

C. Cabinet Door and Drawer Front Interface Style: Flush overlay.

D. Laminate Cladding for Exposed Surfaces: Grades as indicated or if not indicated as required by quality standard:

1. Horizontal Surfaces: Grade HGS, 0.048 inches thick.

2. Vertical Surfaces: Grade VGS, 0.028 inches thick.
3. Drawer and Door Edges: Grade VGS, 0.028 inches thick.
4. Drawer and Door Edges: Polyvinyl chloride.
5. Horizontal, Except Countertops: Grade VGS, 0.028 inches thick.

E. Materials for Semi-Exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

   a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.18 inch thick, matching laminate in color, pattern, and finish.
   b. Semiexposed Backs of Panels with Exposed Plastic-Laminate Surfaces: Grade CLS.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

F. Materials for Concealed Surfaces: Grade BKL, 0.020 inches thick.

G. Body Members (Ends, Divisions, Bottoms and Sub-Tops): Particleboard or fiberboard, 3/4 inch minimum thickness.

H. Face Frames, Rails, Kicks and Bases: Particleboard or fiberboard, 3/4 inch minimum thickness.

I. Shelves: Hardwood plywood, except particleboard for cabinets with plastic laminate cladding, supported on shelf rests set in 2 vertical rows of multiple holes:

1. Spans up to 32 inches: 3/4 inch minimum thickness.
2. Spans up to 42 inches: 1 inch minimum thickness.

J. Drawer Boxes:

1. Sides, Backs and Sub-Fronts: Depending on scheduled finish, 7 ply hardwood lumber or hardwood plywood; 1/2 inch minimum thickness; joined according to one of following:

   a. Glued multiple dovetail.
   b. Glued French dovetail.
   c. Glued and doweled.

2. Bottoms: Depending on scheduled finish, hardwood plywood; 1/4 inch minimum thickness; captured in standing dado shoulder.
3. Acceptable Alternate: Preassembled metal drawer bodies.

K. Drawer Fronts: Particleboard or fiberboard, 3/4 inch minimum thickness.

L. Doors: Particleboard or fiberboard; if hinge screws enter only edge of door, provide 3/4 in lumber edges glued to core prior to laminating:

1. Width up to 30 inches and Height up to 60 inches: 3/4 inch minimum thickness.
2. Width up to 36 inches and Height up to 72 in: 1 to 1-1/4 inch thickness.
3. Doors Larger Than Sizes Above: 1-3/8 or 1-3/4 inch doors; refer to appropriate Division 08 Section.

M. Dust Panels: 1/4 inch plywood or tempered hardboard above compartments and drawers unless

located directly under tops.

2.4 PLASTIC LAMINATES AND RELATED ACCESSORIES

A. Plastic Laminates:

1. Product Quality Standard: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
2. Adhesive for Bonding Decorative Laminates: No-added formaldehyde based thermoplastic resin recommended by fabricator to suit application and comply with specified requirements
3. Colors, Patterns, and Finishes: As indicated on the Drawings.
4. Acceptable Manufacturers:

    a. Abet Laminati, Inc.
    b. Arborite.
    c. Formica Corp.
    d. International Paper.
    e. Lamin-Art, Inc.
    f. Nevamar Company, LLC; Decorative Products Div.
    g. Pioneer Plastics Corp.
    h. Westinghouse Electric Corp.; Specialty Products Div.
    i. Wilsonart International; Div. of Premark International, Inc.

B. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

C. Polyvinyl Chloride (PVC) Edge Banding:

1. Description: Continuous strips manufactured by calendering or extruding polyvinyl chloride (PVC); with a coat of hotmelt adhesive on back for applying with hot-air device; having following characteristics:

    a. Self extinguishing according to ASTM D1929.
    b. Does not utilize ozone depleting substances.
    c. Resistant to chemicals and solvents.

2. Acceptable Manufacturers:

    a. Canplast.
    b. Central Edgebanding.
    c. D.C. Distributing.
    d. Doellken-Woodtape.
    e. Edge Co.
    f. Olon Industries.
    g. Rehau.

2.5 WOOD MATERIALS

A. General: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Fiberboard:

1. Material Quality Standard: ANSI A208.2, Grade 160, 47 pound density minimum.
2. Description: Composite panel composed of cellulosic fibers bonded together with a synthetic resin or other suitable bonding system under heat and pressure.

    a. Moisture resistant type when used for countertops containing sinks.
    b. Fire retardant treated when indicated or required by authorities having jurisdiction.

C. Particleboard:

1. Material Quality Standard: ANSI A208.1, except formaldehyde emissions not to exceed 0.21 parts per million according to ASTM E1333, Grade M-3, 47 pound density minimum.
3. Description: Composite panel composed of cellulosic materials (usually wood), generically discrete pieces or particles, bonded together with a synthetic resin or binder, which may also contain additives, under heat and pressure.

    a. Moisture resistant type when used for countertops containing sinks.
    b. Fire retardant treated when indicated or required by authorities having jurisdiction.

D. Lumber: Softwood and hardwood solid wood graded in accordance with grade of Work specified, of quality suitable for construction and finish indicated.

1. Exposed and Finished: Matching adjacent wood veneer.
2. Concealed and Unfinished (Fabrication Purposes): Fabricators option.

E. Tempered Hardboard: ANSI A135.4.

1. Density: Not less than 31 pounds per cubic foot.
2. Absorption: Not more than 20 percent.
3. Thickness Swelling: Not more than 15 percent.

2.6 CABINET HARDWARE AND ACCESSORIES

A. Frameless Concealed Hinges (European Type):

1. Description: Full overlay, minimum 110 degree swing, soft-closing, allows adjustment of side, depth, height, and spring force.
2. Finish and Material: Nickel plated steel.
3. Number of Hinges:

    a. 2 Hinges: Doors 24 inches wide to 36 inches high and 9 to 11 pounds.
    b. 3 Hinges: Doors 24 inches wide to 60 inches high and 13 to 20 pounds.
    c. 4 Hinges: Doors 24 inches wide to 80 inches high and 29 to 33 pounds.
    d. 5 Hinges: Doors 24 inches wide to 96 inches high and 40 to 48 pounds.

4. Basis of Design: Blum Inc.; Clip top Blumotion.
5. Acceptable Manufacturers:

    a. Blum Inc.
    b. Ferrari America.
    c. Grass America, Inc.
    d. Hafele America Co.
    e. Hettich America.
    f. Melpha-Alfit USA.

g. Salice America.

B. Wire Pulls:

1. Description: Wire design, 5/16 inch outside diameter, 1-5/16 inch projection, 4 inch center to center; back mounted.
2. Finish and Material: Satin stainless steel.
3. Basis of Design: EPCO (Engineered Products Co.); MC402-4-SS.

C. Shelf Rests:

1. Description: White plastic clip with double mounting pins for holes in sidewall of cabinet, and locking tongue that holds shelf down, color as selected from manufacturers colors.
2. Acceptable Manufacturers and Products:

a. Bainbridge Manufacturing; 3220 Shelf Support.
b. Outwater Hardware Corp.; SUP-5030-Q-W.

D. Drawer Slides:

1. Description: Undermount design; soft-closing; full extension, zinc-plated steel slides with all steel ball bearings.
2. Box Drawer Slides Basis of Design: Accuride; 3160EC.

E. Door and Drawer Locks: 1-3/4 inch disc tumbler cylinder cam lock; keyed alike; nickel-plated.

F. Door and Drawer Silencers: BHMA A156.16, L03011.

2.7 MISCELLANEOUS MATERIALS

A. Countertop Support Brackets:

1. Description: Steel T-shape profiles formed into L-shaped bracket; mitered and welded joints; pre-drilled holes for mounting.
2. Factory Finish: Manufacturers standard painted finish.
3. Acceptable Manufacturers:

a. Iron Supports.
b. Original Granite Brackets.
c. Rakks/Rangine Corporation.

B. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

C. Acrylic Caulking:

1. Description: Siliconized acrylic caulking custom colored to match adjacent finished surfaces.
2. Acceptable Manufacturers and Products:

a. ColorFast Industries Inc.; Laminate Caulk.
b. ColorRite; ColorRite.
c. Kampel Enterprises, Inc.; ColorFlex Custom Colored Caulking.

2.8 FASTENERS

A. General: Material, type, size, and finish required for each substrate for secure anchorage.

B. Screws: ASME B18.6.1.

C. Nails: FS FF-N-105.

D. Wood Dowels: Industrial grade hardwood laterally fluted with chamfered ends and minimum diameter of 0.31 inches.

E. Staples: Not permitted.

F. Joint Connectors:

1. Description: Concealed mechanical draw bolt, with tightening nuts and locking sleeve, for pulling countertop butt-to-butt joints tight and to maintain constant pressure between pieces; sized for application.
2. Available Manufacturers and Products:

    a. Hafele America Co.; Zipbolt Joint Connectors.
    b. Knape & Vogt Manufacturing Co.; 516.

G. Glue: Aliphatic resin glue formulated for use on all types of wood; resistant to water, oil, grease, and paint solvents; sandable after drying; complying with VOC limits specified.

H. Biscuits: Die cut from beechwood blanks, and compressed for strength and cross-hatched to improve glue bonding.

I. Hanging Clips: Two piece extruded aluminum zee hanging clips.

2.9 FABRICATION

A. Fabrication Quality Standards: AWI's Architectural Woodwork Standards, sections as indicated below.

B. Shop Fabrication: Fabricate, assemble, finish, and install hardware to maximum extent possible before shipment to site.

1. Fabricate cabinets to dimensions, profiles, and details indicated.
2. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
3. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
4. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

C. Edges: Ease edges to radius indicated for following:

1. Corners of Cabinets and Edges of Lumber Members 3/4 inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 inches Thick: 1/8 inch.

D. Balanced Panel Fabrication: Veneered and clad panels shall be symmetrical from panel center line; balance type, thickness, and moisture content of veneers and cladding on both faces of panel.

E. Furring, Blocking, Shims, and Hanging Strips: Fabricate from fire retardant treated lumber; sand lightly to remove raised grain on exposed surfaces before fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to which cabinets will be installed for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Conditioning: Before installation, condition woodwork for not less than 72 hours to average prevailing temperature and humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.3 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Install cabinets without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with screws sized for not less than 1-1/2 inch penetration into wood framing, blocking, or hanging strips.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Unfaced fiberglass batt insulation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated.

QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E84 for surface-burning characteristics and other methods indicated with product, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

2.2 UNFACED FIBERGLASS BATT INSULATION

A. Product Quality Standard: ASTM C665, Type I.

B. Description: Unfaced blankets produced by bonding inorganic glass fibers with a thermosetting binder; formaldehyde free.

C. Surface Burning Characteristics: According to ASTM E84.

1. Flame Spread: Class A, no greater than 25.
2. Smoke Developed: No greater than 50.

D. Combustion Characteristics: Pass according to ASTM E136.

E. R-Value or Thickness: As indicated on the Drawings.

F. Acceptable Manufacturers and Products:

1. CertainTeed Corp.; CertaPro.
2. Johns Manville; Unfaced Batts.
3. Owens-Corning; Pink Next Gen Fiberglass Insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Cleaning: Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

E. If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 072617
BELOW SLAB VAPOR BARRIER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Below slab-on-grade vapor barrier.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each product indicated, specified, or required.

1. Include manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal.
2. Include manufacturer's standard drawing details for lapping, openings, penetrations, corners, and other conditions encountered.

B. Manufacturer's Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer warrants the following for the life of the installation:

1. Compliance with designated ASTM E1745 classification.
2. No manufacturing defects in the vapor barrier product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Stego Industries LLC.
2. Vapor Barrier Sheet: Stego Wrap 15 mil Vapor Barrier.
3. Seaming Tape: Stego Tape; red color with manufacturer's logo.
4. Edge Seal Tape: StegoTack Tape; gray color.
5. Mastic: Stego Mastic.
6. Screed Guide System: Stego Beast Screed.

B. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
2. Fortifiber Building Systems Group; Moistop Ultra 15.

3. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
4. Insulation Solutions, Inc.; Viper VaporCheck 16.
5. Meadows, W. R., Inc.; Perminator 15 mil.
6. Raven Industries Inc.; Vapor Block 15.
7. Reef Industries, Inc.; Griffolyn Type-65G or 15 mil Green.
8. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.2 MATERIALS

A. Vapor Barrier Sheet: ASTM E1745, Class A; prefabricated, flexible, lightweight material manufactured from raw or virgin polyethylene or polyolefin resins (post-consumer, recycled resins are not permitted); not less than 15 mils thick.

1. Water Vapor Transmittance: Maintain permeance of less than 0.01 perms [grains/(square feet x hour x inch of water)] as tested according to ASTM E1745 Section 7.1 (7.1.1 – 7.1.5).

2.3 ACCESSORIES

A. Seaming Tape: Manufacturers standard one-sided pressure-sensitive tape for sealing membrane joints; 3.75 inches wide; provided by vapor barrier manufacturer.

B. Edge Seal Tape: Manufacturers standard two-sided pressure-sensitive tape for sealing membrane to other adjacent structures; 2 inches wide; provided by vapor barrier manufacturer.

C. Mastic: ASTM D412; Manufacturers standard water-based bituminous asphalt emulsion; provided by vapor barrier manufacturer.

1. Water Permeance: Not more than 0.03 perms according to ASTM F1249 or ASTM E96.

D. Penetration Accessories: Manufacturers standard premolded products for sealing penetrations; provided by vapor barrier manufacturer.

E. Screed Guide System: Adjustable elevation, three component, polypropylene guide screed that eliminates common wet-screed methods causing puncturing the vapor barrier; foot component with engineered peel-and-stick adhesive; provided by vapor barrier manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine subgrade and foundation surfaces to receive below slab vapor barrier for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Subgrade: Ensure subgrade is smooth, level, and compacted without sharp or protruding objects that might rip, tear or puncture vapor barrier sheet.

3.3 INSTALLATION

A. Installation Performance Requirements: Ensure vapor barrier sheet isolates earth subgrade from concrete slab-on-grade.

B. Installation Quality Standards: In additions to standards listed elsewhere, perform work according to following, unless otherwise specified:

1. ASTM E1643, except place vapor barrier on top of granular fill.
2. Respective manufacturer's installation instructions.

C. Installation: Install sheets to form continuously sealed below concrete slab vapor barrier over properly prepared earth subgrade prior to slab reinforcement installation.

1. Place sheets in widest width possible over subgrade with longest dimension parallel with direction of concrete pour with proper face toward concrete.
2. Pull sheets taut to eliminate fishmouths, wrinkles, buckles, and kinks.
3. Properly dry and clean mating surfaces of sheet prior to sealing with seaming tape.
4. Accurately align sheets and maintain uniform side and end laps; stagger end laps.
5. Overlap sides and ends of barrier not less than 6 inches and seal with seaming tape.
6. Ensure sheets are continuous from edge to edge of concrete slab according to following:

    a. Place on top of footings and "roll-up" onto vertical surfaces and seal with edge sealing tape.
    b. Extend out from under edges of concrete slabs 2 inches minimum to demonstrate continuity.

7. Cut sheets carefully around penetrations and seal with either premolded accessories or on-site constructed collar fabrications using seaming tape or mastic; if field fabricated comply with manufacturers recommended details.
8. Repair rips, tears, or punctures with seaming tape, or by cutting out damaged areas and patching with new membrane, overlapping damaged area 6 inches minimum in each direction and sealing with seaming tape.

3.4 PROTECTION

A. Protection During Concrete Work: Ensure vapor barrier will be without damage or deterioration during in-place fabrication of steel reinforcement and subsequent placement of concrete.

1. Prevent vehicles from driving over vapor barrier.
2. Prevent unnecessary foot traffic over vapor barrier.
3. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier. Provide penetration prevention accessories from the same source as the vapor barrier manufacturer.
4. Provide protective plywood and bridging for concrete pumping lines crossing membrane.
5. At locations where portions of slab are not placed (block-outs, voids and leave-outs), provide protection to prevent water infiltration into void that would contaminate subgrade below vapor barrier; maintain until concrete is subsequently placed.

END OF SECTION

SECTION 072726
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fluid-applied vapor permeable membrane air barrier.
2. Related materials necessary to complete application.

1.2 DEFINITIONS

A. Air Barrier: Collection of materials applied to an opaque wall, including joints, openings, penetrations, and junctions to abutting construction to restrict air penetration and water infiltration.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required.

1. Include manufacturer’s written instructions for evaluating, preparing, and treating substrate onto which work will be applied.
2. Include manufacturer’s written application instructions.
3. Include manufacturer’s written approval of products not manufactured by primary manufacturer.
4. Include manufacturer’s written statement that materials are compatible with adjacent materials that connect to or that come in contact with air barrier.

B. Shop Drawings: Show locations, extent and details of air barrier.

1. Include details of typical conditions, intersections with other envelope materials.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include how materials that cover air barrier assemblies are secured with air-tight condition maintained.
4. Include how openings such as doors and windows are treated.
5. Include how penetrations such as conduits, pipes, electric boxes and similar items are treated.

C. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Entity with not less than 5 years’ experience in performing specified work similar in design, products, and extent indicated for this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Protect stored materials from direct sunlight.

1.6 FIELD CONDITIONS

A. Environmental Limitations:

1. Apply air barrier components within range of ambient and substrate temperatures recommended by air barrier manufacturer.
2. Protect substrates from environmental conditions that affect performance of air barrier.
3. Do not apply air barrier components to a damp or wet substrate or during snow, sleet, rain, fog, mist, or freezing temperatures.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace air barrier that does not comply with performance and other requirements specified in this Section within 5 years' from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. GCP Applied Technologies; Perm-A-Barrier VPL.
2. W. R. Meadows, Inc.; Air-Shield LMP.
3. Tremco; ExoAir 230.

2.2 PERFORMANCE REQUIREMENTS

A. Air Barrier Performance:

1. Capable of performing as a continuous vapor permeable air barrier and as a liquid water drainage plane flashed to discharge to the exterior.
2. Capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Penetration: Not more than 0.004 cubic feet per minute per square foot of surface area at 1.57 foot-pounds per square foot pressure difference according to ASTM E2178 (unmodified).

C. Vapor Permeance: Not less than 10 perms according to ASTM E96, Method B.

D. Fire Propagation Characteristics: Passes NFPA 285 testing.

E. Surface Burning Characteristics: ASTM E84 or UL 723.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

F. UV Resistance: Can be exposed to sunlight for not more than 180 days.

2.3 PRIMARY MATERIALS

A. Air Barrier: Liquid-applied, one-component, vapor permeable, air barrier that when applied over a smooth, void-free substrate forms a continuous, seamless, monolithic and fully bonded membrane that is resistant to air passage and water penetration.

2.4 RELATED MATERIALS

A. General: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other related materials that are recommended in writing by air barrier manufacturer to produce a complete air barrier assembly and that are compatible with primary air barrier material and adjacent construction to which they may seal.

B. Stainless Steel Sheet Flashing: ASTM A240, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

    a. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
    b. Verify that substrates have cured and aged for minimum time recommended in writing by air barrier manufacturer.

2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details.

B. Provide clean, dust-free, and visibly dry substrate that is free of moisture.

C. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to substrate to provide continuous support for air barrier.

H. Prepare, treat, rout, and fill cracks, and gaps in substrate according to air barrier manufacturer's written instructions.

3.3 RELATED MATERIALS INSTALLATION

A. Install related materials according to air barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air barrier.

B. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier material on same day. Reprime areas exposed for more than 24 hours.

C. Treat wall penetrations and openings according to air barrier manufacturer’s instructions.

Treat joints in sheathing according to air barrier manufacturer’s instructions.

E. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier material with spray foam sealant.

Seal top of through wall flashings to air barrier with an additional 6 inch wide transition strip.

G. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 APPLICATION

A. Apply air barrier so as to provide continuity throughout the building envelope according to manufacturer's recommendations and as follows:

1. Apply air barrier material to wet film thickness recommended by manufacturer.
2. Seal around penetrations with a gap less than 1/2 inch with termination mastic.
3. Seal around penetrations with a gap greater than 1/2 inch with spray foam sealant.
4. Provide rubberized asphalt underlayment at horizontal or low slope applications of air barrier.
5. Do not install membrane flashing in any condition where it is not fully supported. Use stainless steel sheet flashing for conditions where flashing is required to span a gap greater than 1/8 inch.
6. Connect air barrier continuously to glazed curtain wall, storefront and exterior doors using a combination of neoprene flashing, membrane flashing, stainless steel sheet flashing and sealant as indicated in the Drawings or as appropriate to the condition and approved by the air barrier manufacturer.
7. Repair or reseal areas, because of construction activities, that require alteration after air barrier installation has been completed. Repair or reseal according to manufacturer’s recommendations.

8. Seal penetrations, including blind side penetrations.

B. Do not expose air barrier assemblies to sunlight longer than as recommended by the manufacturer.

C. Inspect aplication and repair voids, holidays, damaged or non-uniform areas prior to installation of exterior cladding.

3.5 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.6 PROTECTION

A. Protect air barrier from damage during application, exposure to ultra-violet light, harmful weather exposure, and remainder of construction period according to manufacturer's written instructions. If damaged or exposed to unfavorable conditions for longer than recommended, remove and replace materials or install additional, full-thickness, air barrier after repairing and preparing the damaged and/or overexposed materials according to manufacturer's written instructions.

END OF SECTION

SECTION 074243
COMPOSITE METAL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Composite metal panels and accessories indicated, specified, or required to complete installation.

1.2 DELEGATED ENGINEERING REQUIREMENTS

A. Contract Document Concept: Drawings and Specifications express concept of composite metal panels work, however, they may not indicate or specify total work that may be required, nor shall they be construed as engineered.

B. Delegated Engineering Responsibility: Require manufacturer to employ a delegated engineering professional to provide engineering for each member and component of composite metal panels work, including attachment to building structural frame, required to meet concept expressed in Contract Documents that includes, but is not limited to, following:

1. Comprehensive engineering analysis indicating location, type, magnitude, and direction of loads imposed on exterior wall and building structural frame.
2. Preparation of engineering calculations, shop drawings, and other submittals with professional seal affixed according to respective jurisdictional licensing regulations.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

D. Delegated Engineering Submittal: Include analysis data signed and sealed by the professional engineer responsible for their preparation.

E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Company with experience in fabricating composite metal panels similar in design, products, and extent indicated for this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

1. Member in good standing of MCA.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

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

B. Special Manufacturer’s Finish Warranty, Factory-Applied Spray Paint Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a Number 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. 3A Composites USA; Alucobond.
2. Alpolic Materials; Alpolic/PE.
3. Alcoa Architectural Products; Reynobond.
4. Centria; Formabond.
5. KingSpan; ACM R4-300.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard composite metal panels representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cubic feet per minute per square foot when

tested according to ASTM E283 at test-pressure difference of 6.24 foot-pounds per square foot.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at test-pressure difference of 6.24 foot-pounds per square foot.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.3 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020 inch thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 4 millimeters.
2. Core: Fire rated.
3. Exterior Finish: Clear anodized.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653, G90 coating designation or ASTM A792, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.5 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

A. Finish Quality Standards: In addition to standards specified elsewhere, perform work according to following, unless otherwise specified:

1. NAAMM’s Metal Finishes Manual.
2. AA’s DAF-45 Designation Systems for Aluminum Finishes.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved submittal samples.
2. Noticeable variations in same piece are not acceptable.
3. Variations in appearance of other components are acceptable if they are within range of approved submittal samples and they are assembled or installed to minimize contrast as determined by Architect.

C. Sprayed Fluoropolymer Aluminum Finish: AAMA 2605, AA-C12C42R1x.

1. Two Coat Opaque Finish: Fluoropolymer finish containing not less than 70 percent Kynar or Hylar polyvinyldene fluoride (PVDF) resin by weight in color coat.

2. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.
4. Acceptable Resin Manufacturers and Products:

    a. AkzoNobel Coatings, Inc.; Trinar.
    b. Arkema Englert Inc.; Kynar 500.
    c. Ausimont USA, Inc.; Hylar 5000.
    d. Morton International; Fluoroceram.
    e. PPG Industries Inc.; Duranar.
    f. Valspar Corporation; Fluropon.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

    a. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
    b. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

        1) Verify that weather barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

2. Examine roughing-in for components and systems penetrating composite metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal composite material panel manufacturer's written recommendations.

3.3 INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.

2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

D. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section “Joint Sealants.”
2. Dry Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gasket system.

E. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section “Joint Sealants.”
2. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.

F. Subgirt-and-Spline Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard subgirts and splines that provide support and complete secondary drainage assembly, draining to the exterior at horizontal joints. Attach metal composite material wall panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight

mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 075423
THERMOPLASTIC POLYOLEFIN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fully adhered thermoplastic polyolefin membrane roofing.
2. Accessories indicated, specified, or required to complete installation.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Flashing details at penetrations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color required.

D. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

E. Maintenance Data: For inclusion in maintenance manual required by appropriate Division 01 Section.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications:

1. Experience: Company with not less than 5 years’ experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required work.
2. Supervision: Maintain competent supervisor who is at Project during times specified Work is in progress, and, who is experienced in installing systems similar to type and scope required for Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.7 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
2. Warranty Period: 20 years No Dollar Limit from date of Substantial Completion.

B. Installer’s Special Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, for the following warranty period:

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. Carlisle SynTec Inc.
2. GAF Materials Corp.
3. Holcim Elevate.
4. Johns Manville.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D3746 or ASTM D4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: SH.

2.3 THERMOPLASTIC POLYOLEFIN MEMBRANE ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D6878, flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber with polyester weft inserted reinforcement.

1. Thickness: 60 mils, nominal.
2. Exposed Face Color: White.

2.4 RELATED ROOFING MATERIALS

A. General: Related materials recommended by roofing system manufacturer for intended use and compatible with roofing.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard, water based.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive thermoplastic polyolefin membrane roofing and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 FULLY ADHERED ROOFING INSTALLATION

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION

SECTION 076113
STANDING SEAM METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Standing seam metal roof panels, custom fabricated or on-site roll formed, underlayment, roof insulation, pipe flashing, and accessories indicated, specified, or required to complete installation.

B. Design Intent: To match existing standing seam metal roofing in every way possible.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

B. Shop Drawings: Detailed and dimensioned plans, elevations, and large-scale details. Distinguish between factory- and field-assembled work.

1. Include details of edge conditions, side-seam and end lap joints, panel profiles, corners, anchorages, closures, and special details.
2. Include details for joining and securing panels, pattern of seams, layout of fasteners, cleats, clips, and other attachments.
3. Include details of termination points and assemblies, including fixed points.
4. Include details of roof penetrations eaves, ridges, valleys, rakes, crickets, and counterflashings.
5. Include details of connections to adjoining work.
6. Include details for gutters and downspouts.

C. Samples for Verification: 12 inch long by actual width of unit, including finished seam and in required profile; include fasteners, cleats, clips, and other attachments.

D. Manufacturer's Project Acceptance Document: Certification that manufacturer and installer will warrant the standing seam metal roofing for the specific site, design, details, and application indicated for this Project.

E. Maintenance Data:

1. Include manufacturer's instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

F. Manufacturer's Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications:

1. Experience: Company with not less than 5 years' experience in custom fabrication of sheet metal roofing, or authorized by portable roll-forming equipment manufacturer, to perform specified Work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.
2. Supervision: Maintain competent supervisor who is at Project during times specified Work is in progress, and, who is experienced in installing systems similar to type and scope required for Project.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Handling: Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Storage: Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

1.6 WARRANTY

A. Special Manufacturer's Weathertightness Warranty:

1. Warranty: Single source warranty, without monetary limitation, including both labor and materials, signed by standing seam metal roofing manufacturer, agreeing to warrant the completed system and related work to be watertight within 20 years from date of substantial completion.
2. Failures: Include, but are not limited to, following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

B. Special Manufacturer's Finish Warranty:

1. Warranty: Standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within 20 years from date of substantial completion.
2. Deterioration: Includes, but is not limited to, following:

    a. Color fading more than 5 Hunter units according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: PAC-Clad - Petersen Aluminum Corporation.
2. Series: PAC-150 180° Double Lock.
3. Color: As selected from manufacturer's full range.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. Berridge Manufacturing Company.
2. Centria Architectural Systems.
3. MBCI.
4. Morin - A Kingspan Group Company.
5. PAC-Clad - Petersen Aluminum Corporation.

2.2 PERFORMANCE REQUIREMENTS

A. Air Infiltration: Air leakage through assembly of not more than 0.06 cubic feet per minute per square foot of roof area when tested according to ASTM E1680 at following test-pressure difference:

1. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 foot-pounds per square foot and greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
2. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

B. Water Penetration: No water penetration when tested according to ASTM E1646 at following test-pressure difference:

1. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 foot-pounds per square foot and greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
2. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

C. Roofing System Design: Metal roof panels identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure indicated.

D. Windstorm Resistance Quality Standard: Products and installation complying with FMG 4471, Windstorm Classification, Class 1-90.

2.3 SHEET METAL

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by hot-dip process and prepainted by the coil-coating process to comply with ASTM A755.

1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755; nominal 22 gauge thickness; smooth, flat finish.

2.4 METAL PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Panel Width: 12 inches.
2. Panel Height: 1-1/2 inch.

2.5 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 degrees F according to ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 degrees F according to ASTM D1970.

2.6 ACCESSORIES

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653, G90 coating designation or ASTM A792, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system

B. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

C. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96 inch long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

D. Downspouts: Formed from same material as roof panels. Fabricate in 10 foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

E. Fasteners: Suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
4. Fasteners for Steel Sheet: Hot-dip galvanized steel according to ASTM A153, ASTM F2329, or Series 300 stainless steel.

F. Flashing and Trim:

1. Formed from same material as roof panels, prepainted with coil coating, minimum 0.022 in thick.
2. Provide flashing and trim as required to seal against weather and to provide finished appearance.
3. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
4. Finish flashing and trim with same finish system as adjacent metal roof panels.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

H. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

I. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

J. Joint Sealant: ASTM C920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

2.7 FABRICATION

A. Fabrication Quality Standard: SMACNA's Architectural Sheet Metal Manual.

B. Metal Roof Panels:

1. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements.
2. Comply with indicated profiles and with dimensional and structural requirements.
3. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

4. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

C. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with recommendations in fabrication quality standard that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. End Seams: Fabricate nonmoving end seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Form non-expansion sealed but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.8 FINISH

A. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved submittal samples.
2. Noticeable variations in same piece are not acceptable.
3. Variations in appearance of other components are acceptable if they are within range of approved submittal samples and they are assembled or installed to minimize contrast as determined by Architect.

B. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive standing seam metal roof panels and associated work for compliance with requirements and other conditions affecting performance.

a. Verify that substrates are sound, dry, smooth, clean, and securely anchored.

2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform work according to following, unless otherwise specified:

1. SMACNA's Architectural Sheet Metal Manual.
2. Respective manufacturer’s installation instructions.

3.4 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

3.5 FLASHING INSTALLATION

A. Rake Drip Edges: Install rake drip edge flashings under underlayment and fasten to roof deck.

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

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

3.6 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Install screw fasteners in predrilled holes.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Install flashing and trim as metal panel work proceeds.
5. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
6. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to metal decking with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6 inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8 in offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

A. Remove strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous flashings.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Detailed and dimensioned plans, elevations, large-scale details of sheet metal flashing and trim. Distinguish between shop- and field-assembled work.

1. Include material, thickness, weight, and finish for each item and location in Project.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, supporting, securing, including layout and spacing of fasteners, clips, cleats, and other attachments.
4. Include details showing interface and relationship to adjacent materials.

C. Samples for Verification: 8 inches square sample for each type of exposed coil-coated, metallic-coated steel sheet.

D. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Quality Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Installer Qualifications:

1. Experience: Installer with not less than 5 years’ experience in performing specified Work similar to scope of this Project, with a record of successful in-service performance and completion of projects and with sufficient production capability, facilities, and personnel to produce required Work.
2. Supervision: Installer shall maintain a competent supervisor who is at Project site during times specified Work is in progress that is experienced in installing systems similar to type and scope required for Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

1.5 WARRANTY

A. Manufacturer’s Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a Number 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

B. Installer’s Special Warranty: Installer's warranty, signed by Installer, covering the Work of this Section, including all components of sheet metal flashing and trim within two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 METAL FLASHING MATERIALS

A. Coil-Coated Metallic-Coated Steel Sheet:

1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755.
2. Surface: Smooth, flat finish.
3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Color: As selected by Architect from manufacturer's full range.

4. Concealed Color and Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality, mill phosphatized for field painting, not less than 0.028 inches thick (24 gauge) nominal unless otherwise indicated.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D1970; stable after testing at 240 degrees F.
2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.

2.4 RELATED MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Suitable fasteners designed to withstand design loads.

1. Material: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer.
2. Finish: Match finish of exposed heads with material being fastened.
3. Exposed Fasteners: Self-drilling screws, gasketed, with hex washer head.
4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Do not use graphite pencils to mark metal surfaces.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

D. Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

H. Fabricate inside and outside corners, intersections, and complex flashing conditions in shop with properly folded, constructed joints.

I. Exposed edges of metal flashing shall be folded and hemmed.

J. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

K. Fabrication Tolerances:

Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8 offset of adjoining faces and of alignment of matching profiles.

2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

2.6 MISCELLANEOUS FLASHINGS

A. Description: Formed-metal in section lengths not exceeding 12 feet of profiles indicated or required by conditions.

B. Material: Coil-coated metallic-coated steel sheet; base metal thickness of 0.022 inches (26 gauge).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 METAL FLASHING INSTALLATION

A. General: Secure sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

B. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

C. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of sealant.

D. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal. Space cleats not more than 12 inches apart. Secure each cleat with two fasteners. Bend tabs over fasteners.

E. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inch for nails and not less than 3/4 inch for wood screws. Use stainless-steel fasteners unless otherwise recommended by material manufacturer.

G. Seal joints with elastomeric or butyl sealant as required for watertight construction.

1. At concealed sealant joints, embed hooked flanges of joint members not less than 1 inch into butyl sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 degrees F and 70 degrees F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. At exposed sealant joints, prepare joints and apply elastomeric sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Coordinate installation of reglets and counterflashings with installation of base flashings. Install reglets at height so that inserted counterflashings overlap 4 inches over top edge of base flashings. Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings

3.3 CLEANING AND PROTECTION

A. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 076219
SHEET METAL FASCIA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fabricated sheet metal fascia.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles.

B. Shop Drawings: Detailed and dimensioned plans, elevations, large-scale details of sheet metal fascia. Distinguish between shop- and field-assembled work.

1. Include material, thickness, weight, and finish for each item and location in Project.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, securing, including layout and spacing of fasteners, clips, cleats, and other attachments.
4. Include details showing interface and relationship to adjacent materials.

C. Samples for Verification: 8 inches square sample for each type of exposed coil-coated, metallic-coated steel sheet.

D. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Quality Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Installer Qualifications:

1. Experience: Installer with not less than 5 years’ experience in performing specified Work similar to scope of this Project, with a record of successful in-service performance and completion of projects and with sufficient production capability, facilities, and personnel to produce required Work.
2. Supervision: Installer shall maintain a competent supervisor who is at Project site during times specified Work is in progress that is experienced in installing systems similar to type and scope required for Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal fascia materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store fascia materials away from uncured concrete and masonry.
2. Protect stored sheet metal fascia from contact with water.

1.5 WARRANTY

A. Manufacturer's Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal fascia that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a Number 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

B. Installer’s Special Warranty: Installer's warranty, signed by Installer, covering the Work of this Section, including all components of sheet metal fascia within two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal fascia assemblies, including cleats and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective fabrication, installation, or other defects in construction. Completed sheet metal fascia shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 METAL FLASHING MATERIALS

A. Coil-Coated Metallic-Coated Steel Sheet:

1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755.
2. Surface: Smooth, flat finish.
3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Color: As selected by Architect from manufacturer's full range.

4. Concealed Color and Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality, mill phosphatized for field painting, not less than 0.028 inches thick (24 gauge) nominal unless otherwise indicated.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D1970; stable after testing at 240 degrees F.
2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.

2.4 RELATED MATERIALS

A. General: Provide materials and types of fasteners, sealants, and other miscellaneous items as required for complete sheet metal fascia installation.

B. Fasteners: Suitable fasteners designed to withstand design loads.

1. Material: Same metal as sheet metal fascia or other noncorrosive metal as recommended by sheet metal manufacturer.
2. Finish: Match finish of exposed heads with material being fastened.
3. Exposed Fasteners: Self-drilling screws, gasketed, with hex washer head.
4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal fascia to comply with details indicated and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Do not use graphite pencils to mark metal surfaces.

B. Fabricate sheet metal fascia in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal fascia without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

D. Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply

with SMACNA recommendations.

E. Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal fascia, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

H. Fabricate inside and outside corners, intersections, and complex fascia conditions in shop with properly folded, constructed joints.

I. Exposed edges of metal flashing shall be folded and hemmed.

J. Fabrication Tolerances:

Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8 offset of adjoining faces and of alignment of matching profiles.

2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

2.6 FASCIA

A. Description: Formed-metal in section lengths not exceeding 12 feet.

1. Profile: As indicated on the Drawings.
2. Corners: Factory mitered, riveted and sealed with silicone sealant.
3. Accessories: As required by conditions.
4. Joint Style: Butted with expansion space and 6 inch wide, exposed cover plate.

B. Material: Coil-coated metallic-coated steel sheet; base metal thickness of 0.034 inches (22 gauge).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 METAL FASCIA INSTALLATION

A. Secure sheet metal fascia and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, separators, sealants, and other

miscellaneous items as required to complete installation.

B. Install exposed sheet metal fascia without excessive oil canning, buckling, and tool marks.

C. Install sheet metal fascia true to line and levels indicated. Provide uniform, neat seams with minimum exposure of sealant.

D. Install sheet metal fascia to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal. Space cleats not more than 12 inches apart. Secure each cleat with two fasteners. Bend tabs over fasteners.

E. Provide for thermal expansion of exposed fascia. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inch for nails and not less than 3/4 inch for wood screws. Use stainless-steel fasteners unless otherwise recommended by material manufacturer.

G. Seal joints with elastomeric or butyl sealant as required for watertight construction.

1. At concealed sealant joints, embed hooked flanges of joint members not less than 1 inch into butyl sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 degrees F and 70 degrees F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant joints at temperatures below 40 deg F.
2. At exposed sealant joints, prepare joints and apply elastomeric sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.3 CLEANING AND PROTECTION

A. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of fascia. Maintain in a clean condition during construction.

B. Replace sheet metal fascia that has been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077113
SHEET METAL COPINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured sheet metal parapet wall copings.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of copings, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:

1. Details for fastening, joining, supporting, and anchoring copings including fasteners, clips, cleats, and attachments to adjoining work.
2. Details for expansion and contraction.

C. Samples for Verification: 8 inches square sample for each type of exposed coil-coated, metallic-coated steel sheet.

D. Product Certificates: For each type of coping that is ANSI/SPRI/FM 4435/ES-1 tested.

E. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 WARRANTY

A. Manufacturer's Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace pre-manufactured metal copings that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a Number 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

B. Manufacturer's Special Wind Resistance Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace pre-manufactured metal copings that show evidence of failure due to winds up to and including 120 mph within 20 years from date of Substantial Completion.

1. Wind Resistance Warranty Period: 20 years from date of Substantial Completion.

C. Special Manufacturer's Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace pre-manufactured metal copings and related work that does not remain watertight within 20 years from date of Substantial Completion

1. Failures: Include, but are not limited to, following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: PAC-Clad - Petersen Aluminum Corp.
2. Product: PAC-Continuous Cleat Coping.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. Architectural Products Co.
2. Cheney Flashing Company.
3. Hickman, W. P. Company.
4. Johns Manville
5. Metal-Era, Inc.
6. MM Systems Corporation.
7. PAC-Clad - Petersen Aluminum Corp.

2.2 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install copings to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Wind Design Standard: Manufacture and install copings that have tested according to ANSI/SPRI/FM 4435/ES-1 and is capable of resisting design wind pressures as indicated on Drawings.

C. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.3 METAL FLASHING MATERIALS

A. Coil-Coated Metallic-Coated Steel Sheet:

1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755.
2. Galvanized Thickness: 0.034 inches nominal (22 gauge).
3. Surface: Smooth, flat finish.
4. Exposed Coil-Coated Finish:

    a. Two-Coat Fluoropolymer: AAMA 621, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Color: As selected by Architect from manufacturer's full range.

5. Concealed Color and Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality, mill phosphatized for field painting, not less than 0.028 inches thick (24 gauge) nominal unless otherwise indicated.

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.

2.5 PARAPET WALL COPINGS

A. Copings: Sloping formed-metal coping cap in section lengths not exceeding 12 feet, with pre-fabricated, mitered corner units and end cap units, fabricated of coil-coated metallic-coated steel sheet.

B. Concealed Continuous Anchorage: Two-piece hold down cleats fabricated of galvanized sheet steel, one for inside face and one for outside face.

C. Joints: Splice plates of same shape, material and color as coping.

1. Concealed plate installed below copings.
2. Exposed plate installed on top of coping.
3. Pre-applied neoprene strips between plates.

2.6 RELATED MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads; of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing.

1. Provide permanently elastic, non-sag, nontoxic, non-staining tape.

D. Elastomeric Sealant: Silicone sealant as specified in Division 07 Section “Joint Sealants.”

2.7 FINISH

A. Finish Quality Standards: In addition to standards specified elsewhere, perform work according to following, unless otherwise specified:

1. NAAMM’s "Metal Finishes Manual for Architectural and Metal Products".
2. AA’s DAF-45 Designation Systems for Aluminum Finishes.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved submittal samples.
2. Noticeable variations in same piece are not acceptable.
3. Variations in appearance of other components are acceptable if they are within range of approved submittal samples and they are assembled or installed to minimize contrast as determined by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions to verify conditions affecting performance of the Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General: Install copings according to manufacturer's written instructions. Anchor securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete parapet wall copings.

1. Install with provisions for thermal and structural movement.
2. Torch cutting is not permitted.

B. Install copings and accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks; and to result in watertight performance.

C. Mechanically fasten concealed continuous anchorage cleats to wood blocking at top of parapet wall at manufacturer's recommended spacing.

D. Provide for thermal expansion of copings. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

E. Anchor copings to resist uplift and outward forces according to performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.

3.3 CLEANING

A. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

3.4 ADJUSTING

A. Replace copings that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077116
SHEET METAL COUNTERFLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured sheet metal reglets and counterflashing.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation layouts, including plans, elevations, and keyed details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Fry Reglet Corporation.
2. Product: SprinkLok Flashing System.

2.2 METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality, mill phosphatized for field painting, not less than 0.022 in thick (26 gage) nominal unless otherwise indicated.

2.3 MANUFACTURED REGLETS AND COUNTERFLASHING

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory -mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Zinc-coated (galvanized) steel sheet.
2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

B. Counterflashing:

1. Where reglets are indicated, provide counterflashing.
2. Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashing with joints lapped.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Corrosion resistant fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General: Anchor sheet metal flashing and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, sealants, and other miscellaneous items as required to complete sheet metal flashing system.

B. Install exposed sheet metal flashing without excessive oil canning, buckling, and tool marks.

C. Install sheet metal flashing to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counter-flashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counter-flashing joints a minimum of 4 inches and bed with elastomeric sealant.

3.3 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

3.4 ADJUSTING

A. Replace sheet metal flashing rim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077233
ROOF HATCH

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof hatch.
2. Ladder safety post.
3. Safety railing.
4. Related materials to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Manufacturer's standard details for conditions to be encountered in the work.

1. Include dimensions, layout, joints, details, and interface with adjacent work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: BabcockDavis.
2. Products:

a. Roof Hatch: BG3636.
b. Ladder Safety Post: BSP.
c. Safety Railing: BSRCA.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. BabcockDavis.
2. The Bilco Company.
3. JL Industries, Inc.
4. Kingspan Light + Air, North America.
5. Milcor.
6. Nystrom, Inc.
7. Williams Bros. Corporation.

2.2 PRIMARY METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality, mill phosphatized for field painting, not less than 0.028 inches thick (24 gauge) nominal unless otherwise indicated.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, AZ50 coated.

2.3 ROOF HATCH AND ACCESSORIES

A. Roof Hatches: Metal roof-hatch units with single-leaf lid and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.

1. Loads: Minimum 40 foot pounds per square foot external live load and 20 foot pounds per square foot internal uplift load.
2. Hatch Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.
3. Size: 36 inches square.
4. Construction:

    a. Insulation: Glass-fiber board.
    b. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
    c. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
    d. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
    e. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.

5. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

B. Ladder Safety Post: Manufacturer's standard ladder safety post for attachment to roof access ladder.

1. Operation: Post locks in place on full extension; release mechanism to return post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8 inch diameter pipe.
5. Finish: Manufacturer’s standard baked enamel or powder coating; yellow.

C. Safety Railing: Manufacturer’s standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finish roofing.
2. Posts and Rails: Galvanized steel pipe, 1-1/4 inches in diameter or galvanized steel tube, 1-5/8 inches in diameter; include weep holes or other means to drain entrapped water in hollow sections of handrail and railing members.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: Constructed to prevent passage of a sphere 21 inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing

system; manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Joints: Fabricated to be watertight.
8. Fasteners: Manufacturer's corrosion resistant, finished to match railing system.
9. Finish: Manufacturer's standard baked enamel or powder coating; yellow.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153 or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive roof hatch and associated work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General:

1. Install roof hatch level, plumb, true to line and elevation.
2. Anchor securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof hatch to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Roof Hatch:

1. Install roof hatch so top surface of hatch curb is level.
2. Attach safety railing to roof hatch curb.
3. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Joint sealants, backing materials, and accessories necessary to complete their installation, including but not limited to:

1. Exterior Silicone Sealant – Class 50.
2. Interior Silicone Sealant.
3. Interior Acrylic Latex Sealant.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each joint sealant product and accessory indicated, specified, or required.

1. Include data to indicate performance criteria, limitations, substrate preparation, installation requirements, and curing requirements.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing full range of colors available for each product exposed to view.

C. Samples for Verification: Samples for each kind and color of joint sealants in 1/2 inch wide joints formed between two 6 inch long strips of material matching appearance of exposed surfaces adjacent to joint sealants.

D. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Installer Qualifications for Exterior Sealant Installations: Installer with minimum of 5 years specialized experience in performing specified Work similar in design, material and extent to scope of Project, and with a record of successful in-service performance.

1.4 FIELD CONDITIONS

A. Ambient Conditions: Do not proceed with installation of joint sealants under following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

B. Weather Conditions Limitation: Proceed with Work only when existing and forecasted weather conditions will permit installation according to manufacturer’s instructions and warranty requirements.

1.5 WARRANTY

A. Manufacturers Special Warranty for Silicone Sealants: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within 20 years' from date of Substantial Completion.

B. Installers Special Warranty: Installer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within 2 years' from date of substantial completion.

C. Exclusions: Includes, but not limited to, deterioration or failure of joint sealants from following:

1. Movement of structure caused by structural settlement or errors attributable to design or construction resulting in stresses on sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

B. Single Source Responsibility: Furnish each product from single manufacturer.

2.2 EXTERIOR ELASTOMERIC SEALANTS

A. Exterior Silicone Sealant – Class 50:

1. Product Quality Standard: ASTM C920, Type S, Grade NS, Class 50.
2. Description: Single component, non-sag, neutral cure, non-staining as determined by pre-construction stain testing, and non-bleeding, silicone sealant.
3. Joint Movement Capability: Plus 50 percent, minus 50 percent.
4. Primers: Product provided by sealant manufacturer if required by conditions.
5. Acceptable Manufacturers and Products:

    a. Dow Corning; 756 Silicone Building Sealant.
    b. Momentive Performance Materials, GE Silicones; Silpruf SCS2000.
    c. Pecora Corp.; 864NST.
    d. Sika Corp., Construction Products Div.; SikaSil 295.
    e. Tremco Commercial Sealants & Waterproofing; Spectrem 3.

6. Color: As selected from manufacturer's standard colors.

2.3 INTERIOR ELASTOMERIC SEALANTS

A. Acoustical Sealants: Specified in Division 09 Section "Gypsum Board."

B. Interior Silicone Sealant:

1. Product Quality Standard: ASTM C920, Type S, Grade NS, Class 25.
2. Description: Single component, non-sag, moisture curing, silicone sealant specially formulated with fungicide for use in sanitary non-porous applications.
3. Acceptable Manufacturers and Products:

    a. Dow Corning; 786 Silicone Sealant.
    b. Momentive Performance Materials, GE Silicones; Sanitary SCS1700.
    c. Pecora Corp.; 898.
    d. Sika Corp., Construction Products Div.; Sikasil GP or GN Plus.
    e. Tremco Commercial Sealants & Waterproofing; Tremsil 200.

4. Color: As selected from manufacturer's standard colors.

C. Interior Acrylic Latex Sealant:

1. Product Quality Standard: ASTM C834, Type and Grade as required by conditions.
2. Description: Single component, non-sag, moisture curing, general purpose, paintable, siliconized acrylic latex sealant.
3. Joint Movement Capability: Plus 7.5 percent, minus 7.5 percent
4. Acceptable Manufacturers and Products:

    a. Pecora Corp.; AC 20.
    b. Tremco Commercial Sealants & Waterproofing; Tremflex 834.

5. Color: As selected from manufacturer's standard colors.

2.4 JOINT SEALANT BACKING

A. Foam Backer Rods:

1. Product Quality Standard: ASTM C1330, Type C, Type O, Type B.
2. Description: As defined by ASTM C717, extruded polyethylene, polyurethane, or polyolefin in one of the following forms:

    a. Type C: Closed cell structure.
    b. Type B: Bicellular structure with surface skin (only for exterior applications).

3. Size: Diameter approximately 25 percent larger than joint width, unless otherwise directed by manufacturer.
4. Acceptable Manufacturers:

    a. Adfast.
    b. Alcot Plastics Ltd.
    c. BASF Corporation.
    d. Construction Foam Products; a Division of Nomaco, Inc.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 ACCESSORIES

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Non-porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive joint sealants and associated Work to which joint sealants will be applied for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Cleaning of Joints: Clean out joints immediately before installing joint backings and sealants to comply with joint sealant manufacturer's written instructions and following requirements:

1. Remove foreign material that could interfere with adhesion of joint sealant, including, but not limited to, dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean non-porous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer, or as indicated by prior experience, or as required by pre-construction compatibility and adhesion testing. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. ASTM C1193 for use of joint sealants as applicable to materials, applications, conditions indicated, and following profile configurations:

a. Fillet: Figure 5.
b. Bridge: Figure 6.
c. Butt: Figure 8A (concave tooling), generally hour-glass shape with 2:1 width-to-depth ratio.

2. Substrate material allowed by sealant's ASTM C920 Use Classification.
3. Respective manufacturer's written installation instructions.

B. Joint Sealant Backings: Install kind required to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear backings.
3. Install bond-breaker tape behind sealants where backings are not used between sealants and backs of joints.

C. Joint Sealants: Install at same time as backings using proven techniques that comply with following:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
4. Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

a. Remove excess sealant from surfaces adjacent to joints.
b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
c. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. In-Progress Cleaning: Remove excess sealant or sealant smears adjacent to joints as Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. General Requirements: Protect during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

3.6 JOINT SEALANT SCHEDULE

A. Exterior Elastomeric Sealant Schedule:

1. Exterior Silicone Sealant – Class 50: Moving joints on exterior side of exterior walls.

B. Interior Elastomeric Sealant Schedule:

1. Interior Silicone Sealant:

a. Non-moving joints in moist or damp areas which are susceptible to mildew.
b. Non-moving joints in toilet rooms.

2. Interior Acrylic Latex Sealant:

a. Non-moving joints where another type of sealant is not otherwise specified or scheduled.
b. Minimal moving joints due to temperature change.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hollow metal doors and frames and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each type of product indicated, specified, or required.

1. Include manufacturer's written installation instructions.
2. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Scaled and dimensioned drawings of products to be incorporated into Work:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and storage.

B. Storage:

1. Store hollow metal work under cover.
2. Place in stacks of 5 units maximum in vertical position with heads up, spaced by blocking, on minimum 4 in high blocking.
3. Do not store in a manner that traps excess humidity.
4. Provide minimum 1/4 in space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. Amweld Building Products, Inc.
2. Benchmark Commercial Doors.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company.
5. Masker Door.
6. Pioneer Industries; an Assa Abloy Group company.

7. Republic Doors and Frames; a part of Allegion.
8. Steelcraft; a part of Allegion.

B. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

2.2 METAL MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653, Designation CS, Type B; with minimum A60 metallic coating. Thickness indicated is for uncoated steel.

2.3 ACCESSORIES

A. Inserts, Bolts, and Fasteners: Device type and size required, hot-dip galvanized according to ASTM A 153.

B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

C. Grout: ASTM C 476, except with maximum slump of 4 in according to ASTM C 143.

D. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6 to 12 lb/cu ft density.

E. Primer: Fast-curing, corrosion-inhibiting, lead and chromate free, universal primer complying with ANSI A224.1 acceptance criteria; compatible with substrate and field-applied finish paint system specified in Division 09 Section “Painting.”

F. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing minimum of 94 percent zinc dust by weight.

2.4 FABRICATION, GENERAL

A. Fabrication Quality Standard: ANSI/NAAMM-HMMA 861.

B. General Requirements: Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant.

C. Accessories: Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to templates furnished as specified in Division 08 Section “Door Hardware.”

1. Locate hardware according to ANSI/NAAMM-HMMA 861.
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.5 HOLLOW METAL DOORS

A. Fabrication Provisions: Fabricate doors not less than 1-3/4 in thick, of seamless hollow construction unless otherwise indicated. Construct doors with smooth surfaces without visible joints or seams on exposed faces.

1. Provide weep-hole openings in bottom of doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

B. Door Face Sheets: Fabricated from metallic-coated steel sheet, minimum 0.0538 in (16 ga) thick.

C. Thermal-Rated (Insulated) Core Construction: Fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F by h by sq ft/Btu according to ASTM C 518.

D. Vertical Edges:

1. Single Acting Doors: Beveled 1/8 in in 2 in.
2. Double Acting Doors: Round vertical edges with 2-1/8 in radius.

E. Top and Bottom Channels: Closed with continuous channels, minimum 0.0538 in (16 ga) thick, of same material as face sheets and spot welded to both face sheets.

F. Hardware Reinforcement: Fabricate from same material as door. Minimum thickness of steel reinforcing plates for following hardware:

1. Hinges and Pivots: 0.167 in (26 ga) thick by 1-1/2 in wide by 6 in longer than hinge, secured by not less than 6 spot welds.
2. Strikes, Flush Bolts, and Closers: 0.093 in (12 ga).
3. Surface-Mounted Hold-Open Arms and Panic Devices: 0.093 in (12 ga).

2.6 HOLLOW METAL FRAMES

A. Fabrication Provisions:

1. Fabricate frames of construction indicated.
2. Close contact edges of corner joints tight with faces mitered and stops butted or mitered.
3. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

B. Joinery:

1. Fabrication Quality Standard: Head-to-jamb joints according to ANSI/NAAMM-HMMA 820-08 for either of following fabrication techniques with

a. Saw-mitered, continuously welded.
b. Machine-mitered, continuously welded.

2. Externally or internally weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and seamless.
3. Internally weld rabbet and soffits continuously; grind, fill, dress, and make smooth.
4. Use of gusset or splice plates as substitute for welding is not permitted.

C. Materials and Thickness: Fabricated from metallic-coated steel sheet, 0.067 in (14 ga) thick.

D. Grout Guards: At back of hardware cutouts, install 0.016 in (26 ga) thick grout guards or dust-cover boxes of same material as frame, welded to frame to close off interior of openings and prevent grout or other materials from obstructing hardware operation.

E. Hardware Reinforcement: Fabricate from same material as frame. Minimum thickness of steel reinforcing plates for following hardware:

1. Hinges and Pivots: 0.167 in (26 ga) thick by 1-1/2 in wide by 6 in longer than hinge, secured by not less than 6 spot welds.
2. Strikes, Flush Bolts, and Closers: 0.093 in (12 ga).
3. Surface-Mounted Hold-Open Arms and Panic Devices: 0.093 in.

F. Head Reinforcement: Provide minimum 0.093 in (12 ga) thick, steel channel or angle stiffener for opening widths more than 48 in.

G. Jamb Anchors:

1. Types: Fabricated of same material as frame:

a. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.0428 in (18 ga) thick.

2. Quantity and Location:

a. Stud-Wall Type: Locate anchors not more than 18 in from top and bottom of frame. Space anchors not more than 32 in on centers and as follows:

1) Three anchors per jamb up to 60 in high.
2) Four anchors per jamb from 60 to 90 in high.
3) Five anchors per jamb from 90 to 96 in high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 in or fraction thereof above 96 in high.
5) Two anchors per head for frames above 42 in wide and mounted in metal-stud partitions.

b. Masonry Type: Locate anchors not more than 18 in from top and bottom of frame. Space anchors not more than 32 in on centers and as follows:

1) Two anchors per jamb up to 60 in high.
2) Three anchors per jamb from 60 to 90 in high.
3) Four anchors per jamb from 90 to 120 in high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 in or fraction thereof above 120 in high.

H. Floor Anchors: Formed from same material as frames welded to bottom of jambs and mullions with not less than 4 spot welds, not less than 0.0428 in (18 ga) thick, clip type anchors, with two holes to receive fasteners, terminating bottom of frames at finish floor surface:

I. Spreader Bars: Attach two removable metal spreader bars across bottom of frames, tack welded to jambs and mullions.

2.7 STEEL FINISHES

A. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive hollow metal and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Spreader Bars: Remove welded-in shipping spreaders immediately prior to setting. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Pre-Installation Tolerances: Prior to installation, adjust and securely brace hollow metal frames for squareness, alignment, twist, and plumbness to following:

1. Squareness: Plus or minus 1/16 in, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 in, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 in, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 in, measured at jambs on a perpendicular line from head to floor.

C. Hardware Preparation: Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. ANSI/NAAMM-HMMA 840.
2. Respective manufacturer’s written installation instructions.

B. Hollow Metal Frames: Install of size and profile indicated.

1. Setting: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
b. Install frames with removable glazing stops located on secure side of opening.
c. Install door silencers in frames before grouting.
d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and

secure with postinstalled expansion anchors or powder actuated fasteners.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to following:

    a. Squareness: Plus or minus 1/16 in, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 in, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 in, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 in, measured at jambs at floor.

C. Hollow Metal Doors: Fit accurately in frames, within following clearances:

1. Jambs and Head: 1/8 in plus or minus 1/16 in.
2. Between Edges of Pairs of Doors: 1/8 in plus or minus 1/16 in.
3. Between Bottom of Door and Top of Threshold: Maximum 3/8 in.
4. Between Bottom of Door and Top of Finish Floor Covering or Top of Structure (No Threshold): Maximum 3/8 in.

3.4 ADJUSTMENTS

A. Final Adjustments: Remove and replace defective hollow metal work, including work that is warped, bowed, or otherwise unacceptable.

B. Prime Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of primer compatible with paint specified in Section 099100 - Painting.

C. Metallic-Coated Surfaces: Prepare and repair damaged galvanized coatings on fabricated and installed hollow metal work with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

SECTION 081233
KNOCK-DOWN STEEL DOOR FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Factory prefinished steel frames, knock-down type, for interior doors, and accessories indicated, specified, or required for installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product.

1. Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Detailed and dimensioned plans, elevations and large-scale details indicating frame types, profiles, conditions at openings, methods and locations of anchoring, glazing details, and reinforcement for hardware.

C. Samples for Verification: 12 inch long of manufacturer's standard frame profile showing full range of finish variations expected.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Rediframe Door Frames, a Division of Dunbarton Door & Entry Systems.
2. Product: Rediframe Door Frames.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. Rediframe Door Frames, a Division of Dunbarton Door & Entry Systems.
2. Timely Industries.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008 steel sheet; not less than 0.042 inch thick.

B. Brackets and Reinforcements: Manufacturer's standard steel with non-staining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to receive fastener threads.

2. Arrange fasteners, attachments, and jointing to ensure concealment from view. Use exposed steel fasteners with countersunk Phillips screw heads.

2.3 FABRICATION

A. General: Fabricate components that, when assembled, have following characteristics:

1. Profiles that are straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

2.4 STEEL FINISH

A. Manufacturer’s standard primed finish for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive frames and associated Work will be in compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Install frames plumb and square, free from warp or twist, securely anchored to substrates with fasteners.

B. Maintain dimensional tolerances and alignment with adjacent work.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Install glazing as specified in appropriate Division 08 Section “Glazing.”

E. Erection Tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing doors.
3. Factory fitting doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of door indicated.

1. Include door core materials and construction.
2. Include door edge construction
3. Include door face type and characteristics.
4. Include door trim for openings.
5. Include factory-finishing specifications.

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

1. Indicate door schedule indicating door location, type, size, and swing.
2. Indicate door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Indicate dimensions and locations of blocking for hardware attachment.
4. Indicate dimensions and locations of mortises and holes for hardware.
5. Indicate clearances and undercuts.
6. Indicate requirements for veneer matching.
7. Indicate doors to be factory finished and application requirements.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

D. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Quality Standard: AWI "Architectural Woodwork Standards."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.6 WARRANTY

A. Special Manufacturer’s Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace flush wood doors that fail in materials or workmanship within life of installation from date of Substantial Completion.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42 by 84 inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. Eggers Industries.
2. Lambton Doors.
3. Masonite Architectural.
4. Oshkosh Architectural Door Company.
5. VT Industries Inc.

2.2 FLUSH WOOD DOORS, GENERAL

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

2.3 DOOR CONSTRUCTION

A. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2.
2. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

2.4 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Face Veneer: Single-ply wood veneer not less than 1/50 inch thick.

    a. Species: Match existing.

3. Core: Particleboard.
4. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
5. Exposed Vertical Edges: Applied wood edges of same species as faces and covering edges of crossbands - Architectural Woodwork Standards edge Type D.

2.5 LIGHT FRAMES

A. Metal Frames: Manufacturer's standard frame formed of 0.048 inch thick, cold-rolled steel sheet; factory primed for paint finish.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section “Glazing.”

2.7 FACTORY FINISHING

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

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI System 11; catalyzed polyurethane system.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive flush wood doors and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section “Door Hardware.”

B. Installation: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 PROTECTION

A. Protect doors from construction damage. Replace doors that show damage prior to Substantial Completion.

END OF SECTION

SECTION 083113
ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors for walls and ceilings.
2. Access doors whether indicated or not shown; coordinate location of access panels with Architect prior to installation.
3. Accessories indicated, specified, or required to complete installation

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors.
2. ASTM E 119 or UL 263 for horizontal access doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products indicated below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

B. Other Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Elmdor Access Panels.
4. J. L. Industries, Inc.
5. Larsen's Manufacturing Company.
6. Milcor Inc.
7. Nystrom, Inc.
8. Williams Brothers Corporation of America.

2.2 STEEL MATERIALS

A. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.

B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

C. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304; remove tool and die marks and stretch lines, or blend into finish; No. 4 finish.

2.3 NON-FIRE-RATED ACCESS DOORS IN DRYWALL WALLS AND CEILINGS

A. Non-Fire-Rated Steel Access Doors with Exposed Doors and Frames:

1. Metal: Fabricated from steel or stainless steel sheet according to schedule at end of PART 3.
2. Door: Minimum 14 gage sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 16 gage sheet metal with 1-1/4 in wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Lock: Screwdriver cam lock.
6. Option: Gasketing at exterior locations.
7. Basis of Design:

    a. Manufacturer: Nystrom Building Products.
    b. Product: Model NT.
    c. Size: As required by conditions.

2.4 FIRE-RATED ACCESS DOORS IN DRYWALL WALLS AND CEILINGS

A. Fire-Rated Access Doors with Exposed Doors and Frames:

1. Metal: Fabricated from steel or stainless steel sheet according to schedule at end of PART 3.
2. Rating: 1-1/2 hours; B Label.
3. Door: Self-closing; minimum 20 gage sheet metal, set flush with exposed face flange of frame; 2 inches of fire rated insulation.
4. Frame: Minimum 16 gage sheet metal with 1-1/4 in wide, surface-mounted trim; fire-rated gasketing.
5. Hinges: Continuous piano.
6. Lock: Flush key operated lock.
7. Basis of Design:

    a. Manufacturer: Nystrom Building Products.
    b. Product: Model IT.
    c. Size: As required by conditions.

2.5 FABRICATION

A. General: Provide access doors manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors.

B. Set access doors accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

D. Furnish access doors that are required to access above ceiling equipment whether indicated on drawings or not.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors that are warped, bowed, or otherwise damaged.

3.4 SCHEDULE

A. Provide access doors, where indicated on the drawings, and where scheduled below.

1. Steel non-fire-rated at walls and ceilings not in damp locations.
2. Steel fire-rated at rated walls and ceilings not in damp locations.
3. Stainless steel non-fire-rated at ceramic tile and other damp locations.
4. Stainless steel non-fire-rated at exterior areas.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Conventionally glazed aluminum-framed storefront installed as stick assemblies and accessories indicated, specified, or required to complete installation.

1.2 DELEGATED ENGINEERING REQUIREMENTS

A. Contract Document Concept: Drawings and Specifications express concept of aluminum-framed storefront work, however, they may not indicate or specify total work that may be required, nor shall they be construed as engineered.

B. Delegated Engineering Responsibility: Require manufacturer to employ a delegated engineering professional to provide engineering for each member and component of aluminum-framed storefront work, including attachment to building structural frame, required to meet concept expressed in Contract Documents that includes, but is not limited to, following:

1. Comprehensive engineering analysis indicating location, type, magnitude, and direction of loads imposed on exterior wall and building structural frame.
2. Preparation of engineering calculations, shop drawings, and other submittals.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard aluminum-framed storefront representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Withstand movements of supporting structure indicated on Drawings from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.

B. Wind Loads: As indicated on Drawings.

C. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or

an amount that restricts edge deflection of individual glazing lites to 3/4 in, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 in.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to 2 times the length of cantilevered member divided by 175.
4. The center deflection of the window stool trim, when subjected to a 250 pound vertical concentrated load, shall not exceed 1/8 in.

E. Air Infiltration Resistance Criteria: Withstand not more than 0.06 cfm/sq ft of fixed area at static air pressure differential not less than 6.24 ft lbs/sq ft according to ASTM E 283.

F. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq ft.

G. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F.
3. Test Performance: No buckling, stress on glass, sealant failure, or excess stress on framing, anchors, and fasteners and no reduction of performance when tested according to AAMA 501.5.

1.4 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components, and profiles.

B. Shop Drawings: Detailed and dimensioned plans, elevations, sections, and large-scale details. Show adaptation of manufacturer's standard aluminum-framed storefronts to project; include attachments to other work.

1. Include details for assembly expansion and contraction.
2. Include details of how wall will accommodate infiltrated and condensate water.
3. Include vertical-to-horizontal intersection framing, including, but not limited to, following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Delegated-Design Submittal: Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

F. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company with not less than 5 years' experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

B. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated that have resulted in installations similar to this Project, and, that has a record of successful in-service performance.

1.6 WARRANTY

A. Special Installer Warranty: Installer agrees to repair or replace components of aluminum-framed storefront that does not comply with requirements or that fail in materials or workmanship within two years from date of Substantial Completion.

B. Special Manufacturer's Warranty on Finishes: Manufacturer agrees to repair finish or replace aluminum-framed storefront that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Kawneer North America.
2. System: TriFab VG 601T Framing System; Shear Block.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. CRL - United States Aluminum Corp.
2. EFCO.
3. Kawneer North America.
4. Oldcastle BuildingEnvelope.
5. Tubelite, Inc.
6. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308.

2.3 STOREFRONT

A. Framing Members: Manufacturer's standard formed- or extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Glazing Side: Inside.
5. Sightline: 2 inches.
6. Depth: 6 inches.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

2.4 GLAZING

A. Glazing: As specified in Division 08 Section “Glazing.”

2.5 ACCESSORY MATERIALS

A. Fasteners: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding device, type, and size required, sufficient to correctly attach or anchor specified item to substrate indicated without failure; compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Dead-soft, 0.018 inch thick stainless steel, ASTM A 240 of type recommended by manufacturer.

D. Exposed Flashing: Aluminum with same finish as storefront frames.

E. Framing Sealants: Manufacturer's standard sealants.

2.6 FABRICATION

A. Shop Fabrication: Fabricate aluminum extrusion framing that, when assembled, have following characteristics:

1. Straight, sharp profiles, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
6. Provisions for field replacement of glazing.

2.7 ALUMINUM FINISHES

A. Finish Quality Standards: In addition to standards specified elsewhere, perform work according to following, unless otherwise specified:

1. NAAMM's Metal Finishes Manual.
2. AA's DAF-45 Designation Systems for Aluminum Finishes.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved submittal samples.
2. Noticeable variations in same piece are not acceptable.
3. Variations in appearance of other components are acceptable if they are within range of approved submittal samples and they are assembled or installed to minimize contrast as determined by Architect.

Exterior Sprayed Fluoropolymer Aluminum Finish:

1. Finish Quality Standard: AA-C12C42R1x to comply with AAMA 2605.

Two Coat Opaque Finish: Fluoropolymer finish containing not less than 70 percent polyvinyldene fluoride (PVDF) resin by weight in color coat.

3. Color and Gloss: Match existing.
4. Acceptable Resin Manufacturers and Products:

a. AkzoNobel Coatings, Inc.; Trinar.
b. Arkema Englert Inc.; Kynar 500.
c. Ausimont USA, Inc.; Hylar 5000.
d. Morton International; Fluoroceram.
e. PPG Industries Inc.; Duranar.
f. Valspar Corporation; Fluropon.

EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions to verify actual locations, dimensions, and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General Requirements:

1. Comply with manufacturer's written installation instructions.
2. Do not install damaged components.
3. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
4. Fit joints to produce hairline joints free of burrs and distortion.
5. Rigidly secure non-moving joints.
6. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and impediments to movement of joints.
7. Seal joints watertight unless otherwise indicated.
8. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within wall to exterior.

B. Install glazing as specified in Division 08 Section “Glazing.”

END OF SECTION

SECTION 084333
ALUMINUM-FRAMED INTERIOR STOREFRONT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conventionally glazed aluminum-framed interior storefront installed as stick assemblies.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components, and profiles.

B. Shop Drawings: Detailed and dimensioned plans, elevations, sections, large-scale details, and attachments to other work.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company with not less than 5 years' experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Kawneer North America.
2. System: TriFab 400.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. CRL - United States Aluminum Corp.
2. EFCO.
3. Kawneer North America.
4. Oldcastle BuildingEnvelope.
5. Tubelite, Inc.
6. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

2.3 INTERIOR STOREFRONT

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Nonthermal.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.
4. Sightline: 1-3/4 inches.
5. Depth: 4 inches.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section “Glazing.”

2.5 ACCESSORY MATERIALS

A. Fasteners and Accessories: Manufacturer's standard fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to receive fastener threads.

2.6 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

2.7 ALUMINUM FINISHES

A. Finish Quality Standards: In addition to standards specified elsewhere, perform work according to following, unless otherwise specified:

1. NAAMM’s Metal Finishes Manual.
2. AA’s DAF-45 Designation Systems for Aluminum Finishes.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved submittal samples.
2. Noticeable variations in same piece are not acceptable.

3. Variations in appearance of other components are acceptable if they are within range of approved submittal samples and they are assembled or installed to minimize contrast as determined by Architect.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions to verify actual locations, dimensions, and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General Requirements:

1. Comply with manufacturer's written installation instructions.
2. Do not install damaged components.
3. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
4. Fit joints to produce hairline joints free of burrs and distortion.

B. Glazing: Install as specified in Division 08 Section “Glazing.”

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Items commercially known as finish or door hardware required for operation of doors.
2. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each item of door hardware indicated.

1. Including material descriptions, dimensions of individual components and profiles, finishes, and installation instructions.
2. Index product data according to hardware schedule by use of numbers or letters, or combination.

B. Hardware Set Schedules: Coordinate hardware sets with doors, frames, and related Work to ensure proper size, thickness, hand, function, and finish of item.

C. Maintenance Data: For inclusion in maintenance manual required by the appropriate Division 01 Section.

1. Include manufacturer’s instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.
3. Include name, address, and telephone number of manufacturers nearest authorized service representative.

1.3 QUALITY ASSURANCE

A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project’s vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

a. Upon completion of electronic security hardware installation, inspect and verify that components are working properly.

B. Architectural Hardware Consultant Qualifications: Person with not less than 10 years' experience in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and complies with following requirements:

1. DHI-certified, Architectural Hardware Consultant (AHC).
2. Consult with Owner and Architect to determine the following:

    a. Project requirements.
    b. Owner's requirements.

3. Can provide installation and technical data to Architect and other related subcontractors.
4. Can inspect and verify components are in working order upon completion of installation.
5. Capable of producing wiring diagrams.
6. Capable of coordinating installation of electrified hardware with Architect and Electrical Engineers.

C. Installer Qualifications: Company with not less than 5 years' experience in performing specified Work similar to scope of this Project; with a record of successful in-service performance; and sufficient capability, facilities and personnel, to produce required Work.

D. Accessibility Requirements: Comply with codes, regulations and standards indicated on the Drawings.

E. Keying Conference: Conduct conference at Project site.

1. Conference participants must include Architectural Hardware Consultant and Owner.
2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system, including, but not limited to, the following:

    a. Flow of traffic and degree of security required.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.5 WARRANTY

A. Manufacturer's Special Warranty: When available, provide manufacturers standard product warranties that agrees to repair or replace components of door hardware that fail in materials or workmanship within manufacturer's standard warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Door hardware set schedules at end of this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine doors and frames to receive door hardware and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer’s installation instructions.
2. ANSI/DHI A 115.IG.

B. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Hardware Installation: Set hardware items level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

1. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
2. Do not install surface-mounted hardware items until finishes have been completed on substrates involved.

3.3 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

END OF SECTION

HARDWARE GROUP NO. 01
For use on Door #(s):
107
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP1 OR DP2 AS REQUIRED	626	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
2	EA	OH STOP	450S	630	GLY
1	EA	MEETING STILE	41AA	AA	ZER

VERIFY KEYWAY REQUIRED

HARDWARE GROUP NO. 02
For use on Door #(s):
112
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4 NRP	630	IVE
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	LD-AX-99-EO	626	VON
1	EA	PANIC HARDWARE	LD-AX-99-L-NL-06	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	RIM CYLINDER	20-022	626	SCH
2	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DOOR SWEEP	8193AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	THRESHOLD	THRESHOLD AS DETAILED		
2	EA	SILENCER	SR64	GRY	IVE

VERIFY KEYWAY REQUIRED

HARDWARE GROUP NO. 03
For use on Door #(s):
114 117
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

VERIFY KEYWAY REQUIRED

HARDWARE GROUP NO. 04
For use on Door #(s):
115A 116
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	CDSI-AX-99-L-NL-06	626	VON
1	EA	MORTISE CYLINDER	20-001 X XQ11-949 36-083	626	SCH
1	EA	RIM CYLINDER	20-022	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

VERIFY KEYWAY REQUIRED

HARDWARE GROUP NO. 05
For use on Door #(s):
115B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	CDSI-AX-99-L-06	626	VON
1	EA	MORTISE CYLINDER	20-001 X XQ11-949 36-083	626	SCH
1	EA	RIM CYLINDER	20-022	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	GASKETING	328AA-S (AT JAMB LEGS)	AA	ZER
1	SET	GASKETING	429AA-S AT HEAD	AA	ZER
1	EA	DOOR SWEEP	8193AA	AA	ZER
1	EA	THRESHOLD	THRESHOLD AS DETAILED		

VERIFY KEYWAY REQUIRED

HARDWARE GROUP NO. 06
For use on Door #(s):
115C
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP1 OR DP2 AS REQUIRED	626	IVE
1	EA	ROLLER CATCH	335	626	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
2	EA	OH STOP & HOLDER	450H	630	GLY
1	EA	MEETING STILE	41AA	AA	ZER

VERIFY KEYWAY REQUIRED
ROLLER CATCH TO BE USED AT TOP OF INACTIVE DOOR

HARDWARE GROUP NO. E1
For use on Door #(s):
E101
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN

BALANCE OF EXISTING HARDWARE TO REMAIN

HARDWARE GROUP NO. E2
For use on Door #(s):
E100B
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	CDSI-AX-99-EO	626	VON
1	EA	PANIC HARDWARE	CDSI-AX-99-NL-OP-110MD	626	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
2	EA	MORTISE CYLINDER	20-001 X XQ11-949 36-083	626	SCH
1	EA	RIM CYLINDER	20-022	626	SCH

REMOVE INSIDE PUSH BAR AND EXISTING LOCKING SYSTEM
PROVIDE BLANK OUT PLATES AS REQUIRED FOR EXISTING HARDWARE PREPS
REUSE EXISTING HINGES, CLOSER AND EXTERIOR PULL HANDLES
ADJUST CLOSERS TO 5 POUND OPERATING FORCE
VERIFY KEYWAY REQUIRED

END OF SECTION

SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Glazing for the following applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Exterior storefront.
2. Interior storefront.
3. Interior borrowed lites.
4. Glazed entrances.

1.2 DELEGATED ENGINEERING REQUIREMENTS FOR EXTERIOR GLAZING

A. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E1300 by a qualified professional engineer licensed in the state the Project is located, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
4. Glazing Analysis: Prepared by manufacturer for primary glass or fabricator for fabricated glass units, analyze each glass type and glazing condition for following:

a. Thermal Analysis:

1) Evaluate effects of parital and full shading under expected service temperature ranges.
2) Evaluate effects of heat build-up and related thermal stresses on spandrel and/or shadow box areas under expected temperature ranges. Glass manufacturer to approve condition.
3) Evaluate that specified probability of breakage, glass statistical factor, will not be reduced.

b. Wind Load Analysis: Evaluate effects of wind loading.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each glass product and glazing material indicated.

B. Shop Drawings: Include following in shop drawings for aluminum-frames entrances and storefront:

1. Glass types, make-up, shape, sizes and thicknesses.
2. Glazing materials manufacturers, products, types, and profiles.
3. Glass bite, edge, clearance, and depth of glazing channel.
4. Sealant thickness, bit and profile.
5. Location by elevation of each type of glass, including safety glazing.

C. Glass Samples: For each type of glass product; 12 inches square.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Glazing Standards: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated glass manufacturer agrees to replace coated glass units that deteriorate within 10 years from date of Substantial Completion.

1. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions.
2. Defects include peeling, cracking, and other indications of deterioration in coating.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating glass manufacturer agrees to replace insulatingglass units that deteriorate within 10 years from date of Substantial Completion.

1. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions.
2. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Low-E-Coated Vision Glass: ASTM C1376.

2.2 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.

1. Sealing System: Dual seal with manufacturer's standard primary and secondary sealants of polyisobutylene and silicone.
2. Spacer: Standard aluminum black spacers.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C864.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: 100 percent silicone.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 ADJUSTING

A. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

3.5 PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect exterior glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-structural metal framing for gypsum board walls, partitions and furr-downs.
2. Pre-engineered suspended grid system for interior gypsum board ceilings.
3. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated.

B. Stud Determination: Written analysis of wall height, loads and installations indicating typical size, gauge and spacing and listing any areas in which gauge and spacing deviate from design. Obtain approval of Architect when stud size requires adjustment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

1. Pre-Engineered Suspended Grid System for Interior Ceilings:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; 640-C Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2. Steel Framing:

a. CEMCO - California Expanded Metal Co.
b. ClarkDietrich Building Systems.
c. Craco Manufacturing, Inc.
d. Marino\Ware.
e. Scafco Steel Stud Company.

2.2 PERFORMANCE REQUIREMENTS

A. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested according to ASTM E119/NFPA 251/UL 263 by one of following independent testing and inspecting agency as evidenced by design designation included in their associated approval manual:

1. UL – "Fire Resistance Directory", Category BXUV.
2. GA-600 – "Fire Resistance Design Manual".
3. Other agency acceptable to authorities having jurisdiction.

B. Horizontal Deflection: For non-composite wall assemblies, limited to L/240 of the wall height based on horizontal loading of the following:

1. Typical Partitions: 5 foot-pounds per square foot.

2.3 PRE-ENGINEERED SUSPENDED GRID SYSTEM FOR INTERIOR CEILINGS

A. Suspension Grid System:

1. Material Quality Standard: ASTM C645, heavy-duty rating.
2. Description: Manufacturer's standard direct-hung suspended grid system composed of main beams and cross furring members that interlock to form a modular supporting network for application of gypsum board.
3. Material: Sheet steel with corrosion protection coating.
4. Main Beams: Inverted T-shaped profile of single or double mounting flange; minimum 1-1/2 inch profile height with top bulb and minimum 1-3/8 inch wide knurled mounting flange; factory punched for hanger wire, and to receive cross furring members.
5. Cross Furring Members:

    a. Tees: Inverted T-shaped profile of single or double mounting flange; 1-1/2 inch profile height with top bulb and minimum 1-3/8 inch wide knurled mounting flange; with ends formed for positive interlocking with main beam.
    b. Channels: Inverted hat shaped profile; minimum 7/8 in inch profile height and minimum 1-3/8 inch wide knurled mounting flange; with ends formed for positive interlocking with main beam.

6. Wall Angle: Angle shaped profile with each leg not less than 1-1/4 inches.
7. Curved Members: Where curved ceilings are indicated, members shall be rolled by manufacturer; field fabricated curved members not permitted.
8. Accessories: Specifically designed as an integral part of suspended grid system.

B. Wire:

1. Material Quality Standard: ASTM A641, Class 1, zinc-coated, soft annealed, mild steel wire.
2. Hanger Wire Minimum Size: Not less than 0.1620 inch (8 gauge) diameter.

2.4 NON-STRUCTURAL METAL FRAMING FOR WALLS, PARTITIONS AND FURR-DOWNS

A. General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: ASTM C 645, cold-rolled, commercial-steel sheet.
2. Protective Coating: ASTM A 653, G40, hot-dip galvanized.

B. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks (equivalent gauge thickness).

1. Conventional Steel Studs and Tracks:

    a. Stud Description: C-shaped members formed from galvanized steel sheet with 1-1/4 inch flange edges bent back 90 degrees and bent again to form 3/16 inch wide minimum return lip; of web depth indicated on Drawings and uncoated base metal thickness indicated in Schedule at end of this Section; with web punchouts.
    b. Track (Runner) Description: U-shaped members formed from dimpled surface galvanized steel sheet with depth compatible with studs and flange dimension

indicated to hold studs by friction; of same web size and uncoated base metal thickness as studs.

2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional steel studs and tracks; of web depth indicated on Drawings and uncoated base metal thickness indicated in Schedule at end of this Section; with web punchouts.

    a. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements, but not less than 0.0190 inch.

C. Slip-Type Head Joints: Where indicated, provide one of the following, unless indicated otherwise:

1. Single Long-Leg Track System: ASTM C645 top track with 2 inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Track System: ASTM C645 top outer tracks, inside track with 2 inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
3. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Base-Metal Thickness: Not less than 0.0359 inch.

F. Cold-Rolled Channel Bridging: 0.0538 inch bare-steel thickness, with minimum 1/2 inch wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068 inch thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels:

1. Minimum Base Metal Thickness: Not less than 0.0179 inch.
2. Depth: 7/8 inch.

H. Cold-Rolled Furring Channels: 0.0538 inch bare-steel thickness, with minimum 1/2 inch wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
3. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, not less than 0.0625 inch diameter wire, or double strand of 0.0475 inch diameter wire.

I. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.5 FASTENERS

A. Metal Framing Screws: Screw fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten metal framing and furring members securely to substrates involved; complying with recommendations of gypsum board manufacturers for applications indicated.

2.6 RELATED MATERIALS

A. Foam Gasket Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Standards: ASTM C754.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Supplemental Accessories: Install supplementary framing, blocking, reinforcing, and bracing in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, hand rails, furnishings, or similar construction. Comply with details indicated and recommendations of installation quality standards or manufacturer.

3.3 INSTALLING PRE-ENGINEERED SUSPENDED GRID SYSTEM FOR INTERIOR CEILINGS

A. Installation Quality Standard: In addition to standards listed elsewhere, perform suspended ceiling work according to ASTM C636, unless otherwise specified in this Section.

B. Pattern: Lay out spaces and arrange suspension system in a regular pattern, parallel or perpendicular to surrounding walls.

C. Hangers for Ceiling System: Suspend hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with mechanical and electrical equipment, insulation or other objects within ceiling plenum that are not part of supporting structural frame or ceiling suspension system. Within limitations allowed by installation quality standards, splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers required to support suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by installation quality standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Install metal framing components for suspended ceilings so that members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
5. Do not connect or suspend any ceiling components from ducts, pipes or conduit.

D. Perimeters: Using wallboard screws through wallboard into metal studs, attach perimeter wall angle where suspended grid system meets vertical surfaces; cut main beams and cross furring members to fit into wall angle.

E. Main Beams:

1. Suspend main beams spaced 48 inch on center from structure with wire hangers spaced not greater than 48 inch on center.
2. Install main beams level within 1/8 inch in 12 feet with hanger wire taut and tightly wrapped to prevent vertical movement or rotation.
3. Do not make local kinks or bends in hanger wires as a means of leveling.

F. Cross Furring Members:

1. Install cross furring members at right angles to main beams, spaced as required and join to main beams with positive interlock.
2. Install cross furring members to within 1/32 inch of their required location and within 0.015 inch of same horizontal plane as main beam, and never below continuous member.
3. Install additional cross furring members at right angles to beams and cross furring members to support ends of recessed light fixtures, diffusers or grilles.

G. Concentrated Load Conditions: Provide additional hanger wires at each corner of recessed light fixtures and other concentrated load conditions to prevent excess deflection.

3.4 INSTALLING METAL FRAMING FOR WALLS, PARTITIONS AND FURR-DOWNS

A. Priority: Assemble various assemblies giving priority to partitions with higher rating; extend partition with higher rating intact through partition with lower rating.

B. Joinery and Connections: Install various metal framing components according to details indicated; for situations and conditions not indicated, comply first with installation quality standards, then second with respective manufacturers recommendations.

C. General Requirements: Construct partition framing of studs, tracks, and headers using screws

of number and spacing required.

1. Install studs of uncoated base metal thickness as determined by metal stud schedule at end of this Section.
2. Extend partition framing full height to underside of structure above, except where partitions are indicated to terminate at, or immediately above, suspended ceilings.
3. Continue framing over door frames and openings to provide support for wallboard.
4. Space studs as indicated on schedule at end of this section.
5. Cut studs 1 inch short of full height to provide deflection relief at head of wall conditions.
6. Install studs so that flanges point in same direction.
7. Attach with screws through each stud flange and track (runner) flange.
8. Avoid lapping studs; if unavoidable, lap studs minimum 8 inch and secure with screws.
9. At intersections and corners, locate studs no more than 2 inch from partition intersections and corners and secure with screws through both flanges of studs and tracks.
10. Install horizontal bridging at 48 inch on centers vertically where indicated or required by installation quality standard.

D. Metal Track (Runner) Requirements:

1. Floors: Install tracks (runners) using powder actuated fasteners spaced not more than 16 inch on centers.
2. Head of Wall: Install deep leg deflection tracks using powder actuated fasteners to laterally support assembly, and to avoid axial loading of assembly by deflection from building structure above.

E. Support for Wall Mounted Accessory/Equipment: Install back-up plate or track (runner) turned on its side, using screws as indicated or as required, to studs to properly transfer accessory/equipment load to metal framing.

F. Openings: Frame single door, double door, above ceiling openings, and below ceiling openings using studs, tracks (runners), clip angles, and headers.

1. Install 2 studs on each side of each opening in configuration indicated, including strap plates; extend from floor to underside of structure above; do not cut these studs under any circumstances.
2. Construct header of appropriate configuration for type of opening to be spanned and secure with clip angles; include sound attenuation blankets within cavity when partition is scheduled to have a sound resistance rating.
3. Install short intermediate studs 16 inch on center between top track and header.
4. At partitions indicated to terminate immediately above ceiling, install diagonal bracing at not less than spacing as indicated.

G. Supplementary Framing: Install around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by metal framing.

H. Penetrations: Maintain fire-resistance rating of assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

I. Chase Partitions:

1. Position double row of studs vertically in tracks (runners), opposite each other in pairs with flanges pointing in same direction.
2. Space as indicated on schedule at end of this section.

3. Attach with screws through each stud flange and track (runner) flange.
4. Cross brace between rows of studs with one of following at 48 inches on center maximum vertically, attached to stud webs with screws:

    a. Coated glass-mat gypsum board, 12 inch high by chase width.
    b. Metal studs turned on side, webs back-to-back.

J. Furred Walls:

1. Erect furring channels vertically, spaced 16 inches on centers maximum, unless otherwise indicated.
2. Attach with powder actuated fasteners, staggered on flanges.
3. Splice ends by nesting channels 8 inches and securely anchoring to surface.
4. Miter 24 inch long horizontal furring channels at corners and space 24 inches on centers vertically.
5. Locate furring channels around perimeter of openings and secure to surfaces.

K. Control Joints:

1. Construct metal framing as indicated by installation quality standard to allow wallboard control joints to function as intended.
2. For control joints located in fire resistance rated walls and partitions, construct of metal studs and mineral wool, full height of partition, according to assembly fire test reports.

L. Installation Tolerances: Install each metal stud metal framing and furring member so that fastening surfaces do not vary more than 1/8 inch from plane formed by faces of framing members.

M. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on centers.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.5 SCHEDULES

A. Metal Stud Schedule:

1. Stud Depth: As indicated on Drawings.
2. Spacing: Maximum 16 inches on centers, unless otherwise indicated, or, as required to comply with respective assembly test report.
3. Uncoated Base Metal Thickness: As determined by manufacturer's limiting height engineering data for L/240 at 5 pounds per square foot lateral load within following minimum parameters of uncoated base metal thickness:

    a. 0.0283 inch (22 gauge): Typical applications unless otherwise indicated.
    b. 0.0312 inch (20 gauge): Following applications:

        1) Typical at walls supporting ceramic tile.
        2) Typical at walls with wallboard on one side only.

3) Typical at door jambs.
4) Typical at walls supporting wall hung cabinets or shelving.

END OF SECTION

Fastwall WaterMaster Wall System
CSI Section 09 24 00

1 or 3-coat impact-resistant cement plaster stucco system incorporating enhanced water management.

INTRODUCTION

This specification has been assembled to enable the design professional to select or delete sections to suit the project requirements and is intended to be used in conjunction with LaHabra® typical details, product bulletins, technical bulletins, etc.

DESIGN RESPONSIBILITY

It is the responsibility of both the specifier and the purchaser to determine if a product is suitable for its intended use. The designer selected by the purchaser shall be responsible for all decisions pertaining to design, detail, structural capability, attachment details, shop drawings and the like. The LaHabra® brand of Sika Corporation US (herein referred to as "Sika") has prepared guidelines in the form of specifications, typical application details, and product bulletins to facilitate the design process only. Sika is not liable for any errors or omissions in design, detail, structural capability, attachment details, shop drawings or the like, whether based upon the information provided by Sika or otherwise, or for any changes which the purchasers, specifiers, designers or their appointed representatives may make to Sika published comments.

Designing and Detailing a LaHabra Fastwall WaterMaster Wall System

General: The system shall be installed in strict accordance with current recommended published details and product specifications from the system's manufacturer.

A. Wind Load

1. Maximum deflection not to exceed L/360 under positive or negative design loads.
2. Design for wind load in conformance with local code requirements.

B. Substrate Systems:

1. Acceptable substrates are PermaBase® Cement Board and other cement-boards conforming with ASTM C1325 (Type A-exterior); poured concrete/unit masonry; ASTM C1177 type sheathings, including, Weather Defense™ Platinum sheathing, GreenGlass® sheathing, e²XP™ sheathing, GlasRoc® sheathing, Securock™ glass-mat sheathing, and DensGlass® exterior sheathing, DensElement (sheathing only); gypsum sheathing (ASTM C79/C1396); Exposure I or exterior plywood (Grade C/D or better); or Exposure I OSB, Huber Zip (sheathing only).
2. Painted and otherwise coated surfaces of brick, unit masonry, and concrete shall be inspected and prepared as approved by Sika before application. The applicator shall verify that the proposed substrate is acceptable prior to the Fastwall WaterMaster system installation.
3. The substrate systems shall be engineered with regard to structural performance by others. Framing spacing for the LaHabra Fastwall WaterMaster system is a maximum 24" o.c. (610 mm); maximum 16" o.c. (406 mm) when SIKAWALL PERMALATH 1000 is used.
4. Refer to LaHabra's *Accepted Stucco Wall Systems Lath and Trim Accessories* bulletin for more detailed information regarding trim requirements, etc.

C. Moisture Control: Prevent the accumulation of water behind the Fastwall WaterMaster system, either by condensation or leakage through the wall construction, in the design and detailing of the wall assembly.

1. Provide flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, at the base of the wall and anywhere else required by local code or design at the time of installation.
2. The Finestop or WeatherSeal Spray & Roll-On air/water-resistive barrier must be installed over the substrate according to current LaHabra specifications and requirements.

3. Openings must be flashed prior to window/door, HVAC, etc. installation to provide moisture protection of the building frame and interior. Reference Finestop or WeatherSeal Spray & Roll-On published details and product data sheet.
4. Air Leakage Prevention: provide continuity of air barrier system at foundation, roof, windows, doors and other penetrations through the system with connecting and compatible air barrier components to minimize condensation and leakage caused by air movement.

D. Color Selection: The use of dark colors over EPS insulation trim shapes must be considered in relation to wall surface temperature as a function of local climate conditions. Select Finish Coat color with a light reflectance value (LRV) of 20% or higher. The use of dark colors (LRV less than 20%) is not recommended with trim shapes that incorporate expanded polystyrene (EPS). EPS has a sustained service temperature limitation of approximately 160°F (71°C).

E. Grade Condition: Fastwall WaterMaster system is not intended for use below grade or on surfaces subject to continuous or intermittent immersion in water or hydrostatic pressure. Ensure a minimum 4" (101.6mm) clearance above grade or as required by code, a minimum 2" (50.8mm) clearance above finished grade (sidewalk/concrete flatwork).

F. Trim, Projecting Architectural Features:

NOTE TO SPECIFIER: Installation of the Fastwall WaterMaster system with trim shapes that incorporate expanded polystyrene (EPS) outside the slope guidelines referenced in this specification may still qualify for a standard warranty; however, increased maintenance and premature deterioration of the trim shapes that incorporate expanded polystyrene (EPS) shall be expected and any deleterious effects caused by the lack of slope will not be the responsibility of Sika. The design professional has the option to build according to his/her project needs. The design professional must also consider geography, climate, building orientation, wall orientation and adjacent building components when designing with trim shapes that incorporate expanded polystyrene (EPS). The slope guidelines referenced below are provided to offer assistance to the owner and/or design professional. Final design of any building is the responsibility of the design professional.

1. Minimum slope for all projections shall be 1:2 (27º) with a maximum length of 12" (30.5 cm) [e.g. 6" in 12" (15 cm in 30.5cm)]. Increase slope for northern climates to prevent accumulation of ice/snow on the surface.
2. The Fastwall WaterMaster system was designed and tested to be applied to vertical surfaces. As the slope of the wall system application decreases, the chance for premature deterioration of any wall system increases.
3. Low sloping conditions are subject to more extreme heat. Low sloped areas are known to produce an increase in wall surface temperature which can lead to accelerated weathering of the low sloped surface.

G. System Joints:

1. Typical locations for system expansion joints are at building expansion joints, at prefabricated panel joints, floor lines of wood frame construction or slip tracks in steel frame construction, where substrates change and where structural movement is anticipated. Detail specific locations in construction drawings.
2. Control joints are recommended at a minimum of every 144 ft^2 (13 m^2) of wall surface area and where specified by the design professional. The maximum uncontrolled length or width is 18 lineal ft. (5.5 lineal m) and a maximum uncontrolled length to width ratio of 2 1/2: 1. Detail specific locations in construction drawings. For additional information reference the LaHabra *Accepted Stucco Wall Systems Lath and Trim Accessories* technical bulletin.
   NOTE TO SPECIFIER: It is the sole responsibility of the project design team, including the architect, engineer, etc., to ultimately determine specific expansion and control joint placement, width and design. Sealant joints are required at all penetrations through the LaHabra Fastwall WaterMaster system (windows, doors, lighting fixtures, electrical outlets, hose bibs, dryer vents, etc.). Refer to LaHabra Fastwall WaterMaster system typical details.
3. For a list of acceptable sealants refer to *Acceptable Sealants for use with LaHabra Wall Systems* technical bulletin.

H. Decks: Wood decks must be properly flashed prior to system application. For proper application, refer to LaHabra Fastwall WaterMaster system typical details. The Fastwall WaterMaster system must be

terminated a minimum of 2" (50.8 mm) above all decks, patios, sidewalks, etc.

I. Coordination with other trades:

1. Evaluate adjacent materials such as windows, doors, etc. for conformance to manufacturer's details. Adjacent trades shall provide scaled shop drawings for review.
2. Air Seals at any joints/gaps between adjoining components (penetrations, etc.) are of primary importance to maintain continuity of an air barrier system and must be considered by the design professional in the overall wall assembly design. Install air seals between the primary air/water-resistive barrier and other wall components (penetrations, etc.) in order to maintain continuity of an air barrier system.
3. Provide protection of rough openings in accordance with LaHabra typical details before installing windows, doors, and other penetrations through the wall.
4. Install copings and sealant immediately after installation of the Fastwall WaterMaster system and when LaHabra coatings are completely dry.

TECHNICAL INFORMATION

Consult Sika Facades' Technical Services Department for specific recommendations concerning all other applications. Consult the LaHabra website, usa.sika.com/lahabra, for additional information about products, systems and for updated literature.

PART 1 – GENERAL

NOTE TO SPECIFIER: Items in blue/underlined indicate a system option or choice of options. Throughout the specification, delete those which are not required or utilized.

1.01 SECTION INCLUDES

A. Refer to all project drawings and other sections of this specification to determine the type and extent of work therein affecting the work of this section, whether or not such work is specifically mentioned herein.

B. Fastwall WaterMaster Wall System: composite wall system of LaHabra air/water resistive barrier, slip sheet, SIKAWALL PERMALATH 1000 or acceptable expanded metal or wire lath, SIKAWALL STUCCO BASE, LaHabra Base Coat (if specified), SikaWall Reinforcing Mesh (if specified) and LaHabra Finish Coat.

C. SikaWall and LaHabra products are listed in this specification to establish a standard of quality. Any substitutions to this specification shall be submitted to and receive approval from the Architect at least 10 days before bidding. Proof of equality shall be borne by the submitter.

A. The system type shall be Fastwall WaterMaster system as manufactured by Sika Corporation US, Lyndhurst, NJ.

1.02 RELATED SECTIONS

A.	Section 03 00 00	Concrete substrate
B.	Section 04 00 00	Masonry substrate
C.	Section 05 40 00	Cold-formed metal framing
D.	Section 06 11 00	Wood framing
E.	Section 06 16 00	Sheathing
F.	Section 07 27 00	Air barriers
G.	Section 07 62 00	Sheet metal flashing and trim
H.	Section 07 65 00	Flexible flashing
I.	Section 07 90 00	Joint protection
J.	Section 08 00 00	Openings
K.	Section 09 22 00	Supports for plaster and gypsum board
L.	Section 09 22 16	Non-structural metal framing
M.	Section 09 22 36	Lath
N.	Section 09 29 00	Gypsum board

1.03 REFERENCES

A.	ASTM C150	Standard Specification for Portland Cement

B. ASTM C926	Standard Specification for Application of Portland Cement-Based Plaster
C. ASTM C1063	Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
D. ASTM C847	Standard Specification for Metal Lath
E. ASTM C933	Standard Specification for Welded Wire Lath
F. ASTM C1764	Standard Test Methods for Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
G. ASTM C1787	Standard Specification for Installation of Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
H. ASTM C1788	Standard Specification for Installation of Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
I. ASTM D226	Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
J. ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds
K. ICC-ES AC11	Cementitious Exterior Wall Coatings
L. ESR-2564	ICC Evaluation Service, Inc., ES Report™ (SIKAWALL STUCCO BASE)
M. CCRR 0249	Intertek Code Compliance Research Report (PERMALATH 1000)
N. ESR-2986	ICC Evaluation Service, Inc., ES Report™ (FINESTOP RA/RS)
O. ESR-2045	ICC Evaluation Service, Inc., ES Report™ (WEATHERSEAL SPRAY & ROLL)

1.04 SUBMITTALS

A. Submit under provisions of Section [01 33 00]
B. Product Data: Provide data on Fastwall WaterMaster system materials, product characteristics, performance criteria, limitations and durability.
C. Code Compliance: Provide manufacturer's applicable code compliance report.
D. Samples: Submit [two] [x] [millimeter] [inch] size samples of Fastwall WaterMaster system design illustrating Finish Coat color and texture range.
E. Certificate: System manufacturer's approval of applicator.
F. Sealant: Sealant manufacturer's certificate of compliance with ASTM C920.
G. System manufacturer's typical details, system design guide and related product literature which indicate preparation required, storage, installation techniques, jointing requirements and finishing techniques.

1.05 QUALITY ASSURANCE

A. Manufacturer: More than 10 years in the exterior wall systems industry, with more than 1000 completed cement plaster stucco projects.
B. Applicator: Approved by Sika in performing work of this section.
C. Regulatory Requirements: Conform to applicable code requirements.
D. Field Samples
   1. Provide under provisions of Section [01 43 36] [01 43 39].
   2. Construct one field sample panel for each color and texture, [x] [meters] [feet] in size of system materials illustrating method of attachment, surface Finish color and texture.
   3. Prepare each sample panel using the same tools and techniques to be used for the actual application.
   4. Locate sample panel where directed.
   5. Accepted sample panel [may] [may not] remain as part of the work.
   6. Field samples shall be comprised of all wall assembly components including substrate, LaHabra FINESTOP RA/RS/VB OR PAREX WEATHERSEAL SPRAY & ROLL-ON, slip sheet, SIKAWALL PERMALATH 1000 or metal plaster base, SIKAWALL STUCCO BASE, SikaWall Base Coat (if specified), SikaWall Reinforcing Mesh (if specified), LaHabra Finish Coat and typical sealant/flashing conditions.

E. Testing:

1. Finestop Air/Water-Resistive Barrier Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Air Leakage of Air Barrier Assemblies	ASTM E 2357	0.2 l/(s.m^2) @75 Pa (0.04 cfm/ft^2 @ 1.57 psf)	0.0007 l/s.m^2 (0.0001 cfm/ft^2) @ 75 Pa (1.57 psf) positive / post conditioning 0.0014 l/s.m^2 (0.0003 cfm/ft^2) @ 75 Pa (1.57 psf) negative / post conditioning
Air Permeance of Building Materials	ASTM E 2178	0.02 l/(s.m^2) @75 Pa (0.004 cfm/ft^2 @ 1.57 psf)	0.0049 l/s.m^2 @ 75 Pa (0.00098 cfm/ft^2 @ 1.57 psf)
Rate of Air Leakage	ASTM E 283		0.0185 l/s·m^2 @ 75 Pa (0.0037 cfm/ft^2 @ 1.57 psf)
Water Vapor Transmission	ASTM E 96	Report value	Finestop RA - 18 Perms (grains/Hr. in Hg. ft^2) @ 10 mils wet film thickness Finestop RS 18 Perms (grains/Hr. in Hg. ft2) @ 12 mils wet film thickness Finestop RA/RS - 14 Perms (grains/Hr. in Hg. ft^2) @ 20/24 mils wet film thickness Finestop -VB - 0.09 Perms (grains/Hr. in Hg. ft^2) @ 26 mils wet film thickness
Pull-Off Strength of Coatings	ASTM D 4541	Min. 110 kPa (15.9 psi) or substrate failure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood; PVC and galvanized flashing
Nail Sealability (without Sheathing Fabric)	ASTM D 1970	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass
Surface Burning	ASTM E 84	Flame Spread < 25 Smoke Development < 450	Meets Class A: Flame spread =15 Smoke developed = 95

2. Finestop Air/Water-Resistive Barrier ICC-ES AC-212:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	1. ASTM E 1233 Procedure A 2. ASTM E 72 3. ICC-ES AC-212 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing. No water penetration after 90 min @ 299 Pa (6.24 psf)
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC-212 2. ICC-ES AC-212 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Freeze-Thaw	ASTM E 2485 (Method B)	No sign of deleterious effects after 10 cycles	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Water Resistance	ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; PVC and galvanized flashing
Tensile Bond (after freeze-thaw)	ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass

3. Finestop Air/Water-Resistive Barrier ICC-ES AC 148:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: A. UV Light Exposure B. Accelerated Aging C. Hydrostatic Pressure Test	1. ICC-ES AC 148 2. ICC-ES AC 148 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Peel Adhesion	ASTM D 3330 Method F	After UV Exposure After Accelerated Aging	Pass - tested over ASTM C1177 glass-mat sheathing, OSB, plywood, PVC and

		After Elevated Temperature Exposure After Water Immersion	uncoated aluminum
Nail Sealability after Thermal Cycling	ASTM D 1970 (Modified), AAMA 711	No water penetration at galvanized roofing nail penetration under 31 mm (1.2") head of water after 24 hours at 4° C (40° F)	Pass
Tensile Strength after UV Exposure	ASTM D 5034, AAMA 711	Minimum 0.5 N/mm (2.9 lbs./in)	Pass
Cold Temperature Pliability	ASTM D 1970, AAMA 711	No cracking after bending around a 25 mm (1") mandrel after 2-hour exposure to -18° C (0° F)	Pass
Resistance to Peeling	AAMA 711	No signs of distress or failure after 24 hours of exposure at room temperature, 50° C (122° F), 65° C (149° F), 80° C (176° F)	Pass

4. WeatherSeal Spray & Roll-On Barrier Minimum Performance

TEST	METHOD	CRITERIA	RESULTS
Accelerated Weathering	AC 212	25 Cycles followed by Hydrostatic Pressure Test: No water penetration on the plane of the exterior facing side of the substrate.	Pass: no water penetration
Air Infiltration	ASTM E2178	Calculated flow Rate at 75 Pa (1.57 lb/ft2, 0.3 in H2O) = < 0.02 L/m2*s (< 0.004 cfm/ft2)	< .00001 L/m2*s (0.00001 cfm/ft2) at 75 Pa (1.57 lb/ft2, 0.3 in H2O)
Air Leakage of Air Barrier Assemblies	ASTM E2357	Pass < 0.2 L / s·m2 at 75 Pa) (< 0.04 cfm / ft2 at 1.57 psf)	Pass
Air Leakage	ASTM E283	No Criteria	< 0.004 cfm/ft2
Elongation	ASTM D412	No Criteria	360%
Flexibility	ASTM D522	No Criteria	No Cracking at 1/8" (3 mm)
Freeze-Thaw Resistance	ASTM E 2485	10 Cycles	Pass – No Deleterious Effects
Hydrostatic Pressure Test	AATCC 127 (Water Column)	Resist 21.6 in (55 cm) water for 5 hours before and after aging	Pass: no water penetration
Nail Seal ability, Head of Water	ASTM D1970	No Criteria	Pass 5 inches of water
Evaluation of Fire Propagation	NFPA 285	In Accordance with IBC Chapter 26	Meets requirements for use on all Types of construction
Radiant heat exposure	NFPA 268	In Accordance with IBC Chapter 26	No ignition upon 20-minute radiant heat exposure at 1.25 w/cm2.
Pull off Strength	ASTM D 4541	No Water Penetration	Pass - no water penetration
Racking	ASTM E72	Deflection at 1/8 in (3.2 mm)	Pass -No cracking at field, joints or flashing connection
Structural Loading	ASTM E1233 Procedure A	10 Cycles @ 80% design load	Pass -No cracking at field, joints or flashing connection
Restrained Environmental	ICC ES AC 212 / ASTM E2570	5 Cycles of and drying	Pass -No cracking at field, joints or flashing connection
Surface Burning Characteristics	ASTM E84	Flame Spread <25 Smoke Developed <450	Flame Spread =0 Smoke Developed =0
Tensile Bond Strength	ASTM E 2134/ ASTM C 297	Minimum 15 psi (104 kPa)	Pass all listed substrates and flashing materials
Water Resistance	ASTM D 2247	14 Days	Pass – No Deleterious Effects.
Water Penetration	ASTM E331	2.86 psf (137 Pa) for 15 minutes	Pass 25.4 psf (1216 Pa) for 165 minutes
Water Penetration	ASTM E331	Tested after Structural Loading, Racking and Restrained Environmental Cycling at 2.86 psf (137 Pa) for 15 minutes	No Water Penetration
Water vapor transmission	ASTM E96 Procedure B	Vapor Permeable	12.0 perms
Weathering	ICC ES AC 212 / ASTM E2570	210 hours of UV Exposure, 25 cycles of accelerated weathering, 21.6 in (549 mm) water column for 5 hours	Pass

Wind Driven Rain	F.S. TT-C-555B	No Criteria	Pass
VOC	EPA Reference Test Method 24	US EPA, South Coast AQMD and Greenseal Standard	10 g/L

5. Fastwall WaterMaster Wall System and Component Performance:

TEST	METHOD	CRITERIA	RESULTS
Accelerated Weathering	ASTM G153	2000 Hours	No Deleterious Effect
Freeze-Thaw Resistance	ICC AC 11	10 Cycles	Pass
Transverse Wind Load Resistance	ASTM E330	Meet Design Loads	Refer to ICC-ES ESR-2564
Fire Resistance Rated Assemblies	ASTM E 119	One Hour Fire No transmission of heat greater than 250°F above ambient; no passage of flame or hot gasses; no passage of water from hose stream test; for loadbearing walls – ability to withstand load under test conditions	Refer to ICC-ES ESR-2564
Surface Burning	ASTM E 84	Report Value	<25 Flame Spread <450 Smoke Developed Includes PermaLath 1000, SikaWall Stucco Base, and LaHabra Finishes

Reference Intertek Evaluation Reports CCRR-0230 and CCRR-0249 for more information

6. SikaWall Maxlastic Performance:

TEST	METHOD	CRITERIA	RESULTS
Elongation	ASTM D 412 (modified*)	Report Value	> 300%
Surface Burning	ASTM E84	Report Value	<25 Flame Spread <450 Smoke Developed
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hrs.	Pass
Water Vapor Transmission	ASRM E 96 B	Report Value	> 10 perms
Flexibility	ASTM D 522	Report Value	No cracking ½" mandrel
Wind Driven Rain Resistance	ASTM D 6904	Resists pressure equivalent to a 98-mph wind velocity without exhibiting water leaks or weight gain	Pass
Adhesion	ASTM D 4541	Min. 15.9 psi (110 kPa) or substrate failure	> 125 psi (862 kPa)

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products under provisions of Section [01 65 00] [01 66 00] [ ].
B. Deliver Sika materials in original unopened packages with manufacturer's labels intact.
C. Protect Sika materials during transportation and installation to avoid physical damage.
D. Store Sika materials in a cool, dry place protected from freezing. Store at no less than 40°F/4°C (50°F/10°C GRANITE & STONE finish).
E. Store MAXFLASH at a minimum of 40F. In cold weather, keep containers at room temperature for at least 24 hours before using.
F. Store insulation boards flat and protected from direct sunlight and extreme heat.
G. Store Reinforcing Mesh, Sheathing Fabric and Flash Seal NP flexible flashing in a cool, dry place protected from exposure to moisture.

1.07 PROJECT/SITE CONDITIONS

A. Do not apply Sika material in ambient temperatures below 40°F/4°C (50°F/10°C for GRANITE & STONE Finish). Provide properly vented, supplementary heat during installation and drying period when temperatures less than 40°F/4°C (50°F/10°C for GRANITE & STONE Finish) prevail. Do not apply in ambient temperature above 100°F (38°C) or surface temperature above 120°F (49°C).
B. Do not apply materials to frozen surfaces.
C. Maintain ambient temperature at or above 40°F/4°C (50°F/10°C for GRANITE & STONE Finish) during and at least 24 hours after material installation and until dry.

D. Under average conditions [70°F (21°C), 50% Relative Humidity] finish will be dry within 24 hours. Drying time is dependent on humidity, air temperature, sun exposure, surface conditions and finish thickness. Lower temperature, higher humidity and application in shaded areas will extend drying time. Protect finish from rain or other precipitation and temperatures less than 40°F (4°C) for a minimum of 24 hours or until dry.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate and schedule installation of Fastwall WaterMaster wall system with related work of other sections.
B. Coordinate and schedule installation of trim, flashing, and joint sealers to prevent water infiltration behind the system.

1.09 WARRANTY

A. Provide A Sika standard warranty for LaHabra Fastwall WaterMaster wall system installations under provisions of Section [01 70 00].
B. Comply with Sika Facades' notification procedures to assure qualification for warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. LaHabra Fastwall WaterMaster system components manufactured by Sika Corporation US.

2.02 MATERIALS

NOTE TO SPECIFIER: Items in blue/underlined indicate a system option or choice of options. Throughout the specification, delete those which are not required or utilized. Contact Sika Facades' Technical Service Department for further assistance.

A. Air/Water-Resistive Barrier Components:

1. Approved Air/Water-Resistive Barrier: ***(Required, Select One)***
   a. LAHABRA FINESTOP-RA: A one-component fluid-applied vapor permeable air/water-resistive barrier.
   b. LAHABRA FINESTOP RS: A one-component fluid-applied vapor permeable air/water-resistive barrier for use with airless spray equipment.
   c. LAHABRA FINESTOP VB: A one-component fluid-applied vapor impermeable air/water-resistive barrier.
   d. PAREX WEATHERSEAL SPRAY & ROLL-ON: A 100% acrylic elastomeric waterproof membrane and air barrier.
2. Rough Opening and Joint Treatment: **(Required, Select a or b)**
   a. SIKAWALL SHEATHING FABRIC: A spun-bonded non-woven reinforced polyester web for use with approved fluid-applied air/weather-resistive barriers.
   b. SIKAWALL MAXFLASH: A one-component elastomeric material for use as a flexible flashing membrane.
3. SIKAWALL FLASH SEAL NP Transitional Membrane / Expansion Joint Flashing: A 32-mil thick self-adhering and self-sealing composite membrane of polyester fabric and butyl adhesive. Compatible with approved liquid air/weather-resistive barriers.

B. Slip Sheet: One layer of building paper or equivalent or paper-backed lath.

C. Lath/Plaster Base: (Required, Select One)

NOTE TO SPECIFIER: Ensure selection of the appropriate Lath based on specified thickness of the LaHabra Fastwall WaterMaster wall system. Delete those products not utilized. Reference *LaHabra Lath & Trim Accessories System* support bulletin for additional information.

1. SIKAWALL PERMALATH 1000: An open weave, three-dimensional self-furring, nominal 1/4" thick glass fiber reinforcing lath is for use with a minimum thickness of 1/2" (12.7mm). Complies with ASTM C1764, C1787 and C1788.
2. Woven or Welded Wire Lath: A minimum No. 20 gauge, 1" (25.4 mm) galvanized woven wire fabric is for use with 3/8"-1/2" (9.5-12.7mm) thickness only. Other laths shall comply with ASTM C933

(welded) and ASTM C1032 (woven). The lath is self-furred or furred when applied over all substrates.

3. Expanded Metal Lath: The lath shall comply with ASTM C847. Furring and self-furring requirements shall be as set forth for wire lath. Minimum weight is 2.5 lbs./yd2 (1.36 kg/m2). Refer to ASTM C 1063 for additional information.

D. Fastening for Lath/Plaster Base: (Required, Select One or More)

1. SIKAWALL PERMALATH 1000: ULP-302 (1 3/4") or Lath Plate (1 1/4") Mechanical Fastening Systems by Wind-Lock Corp.
   a. Masonry: masonry type [M] fastener with ULP 302 diameter washer; or Lath Plate 25 mm (1") minimum penetration into masonry. Fastener spacing 6" o.c. vertically and 16" o.c. horizontally.
   b. Light Gauge Steel Framing/Furring (20 Gauge): light metal type [LM] bugle head screws with ULP 302 (1 3/4") diameter washer or Lath Plate 16 mm (5/8") minimum penetration into framing 6" o.c. vertically and 16" o.c. horizontally
   c. Heavy Gauge Steel Framing (18 to 12 Gauge maximum): metal type [S] bugle head screws with ULP 302 (1 3/4") diameter washer or Lath Plate or 32 mm (1 1/4") long x 2.5 mm (1/8") diameter VersaPin Gripshank® fasteners by Aerosmith Fastening Systems with Lath Plates; 16 mm (5/8") minimum penetration to framing 6" o.c. vertically and 16" o.c. horizontally.
   d. Wood framing: wood type [W] bugle head screws with ULP 302 (1 3/4") diameter washer or Lath Plate; 16 mm (5/8") minimum penetration into framing or minimum 16-gauge wire staples with minimum 3/4" crown and minimum 3/4" penetration into framing, 6" o.c. vertically and 16" o.c. horizontally.
2. Metal Plaster Base: Fasten per ASTM C1063
   a. Masonry: Power or powder actuated fasteners and/or concrete stub nails with minimum ¾" penetration. Fastener spacing not more than 7" o.c. vertically and 16" o.c. horizontally.
   b. Metal framing: Screws appropriate to framing gauge, not less than 3/8" penetration through framing with a minimum of 3 exposed threads. Fastener spacing not more than 7" o.c. vertically and 16" or 24" o.c. horizontally, based on metal plaster base type.
   c. Wood framing: nails, 1" wire staples penetrating wood framing not less than ¾" or screws penetrating wood framing not less than 5/8". Fastener spacing not more than 7" o.c. vertically and 16" or 24" o.c. horizontally, based on metal plaster base type.

E. Stucco Base Coat: (Required, Select One)

1. **Stucco Base Coat for 3/8-7/8" Stucco conforming to ICC-ES AC11 for 1-coat stucco:**
   a. SIKWALL STUCCO BASE CONCENTRATE: Factory-blended stucco mixture of Portland cement, reinforcing fibers, and proprietary ingredients. Mixed in the field with sand and water.
   b. SIKAWALL STUCCO BASE SANDED: Factory-blended stucco mixture of Portland cement, reinforcing fibers, sand, and proprietary ingredients. Mixed in the field with water.

OR

2. **Stucco Base Coat for 3/4-7/8" Stucco Only:**
   a. LAHABRA FIBER-47 CONCENTRATE: A factory-blended Portland cement, fibers, hydrated lime and proprietary ingredients, cement scratch and brown coat mixed in the field with sand, conforming to ASTM C926.
   b. LAHABRA FIBER-47 SANDED: A factory blend of Portland cement, lime, fibers, proprietary additives and sand, scratch and brown coat, mixed in the field with water, conforming to ASTM C926.

F. Plaster Sand: (Required if SIKAWALL STUCCO BASE CONCENTRATE or LAHABRA FIBER -47 CONCENTRATE is retained: Must be clean and free from deleterious amounts of loam, clay, silt, soluble salts and organic matter. Sampling and testing must comply with ASTM C897. Plaster sand

must be graded within the following limits:

Retained on U.S. Standard Sieve	Percent retained by weight ± 2 Percent	
	Minimum	Maximum
No. 4	-	0
No. 8	0	10
No. 16	10	40
No. 30	30	65
No. 50	70	90
No. 100	95	100

G. Water: Clean and potable without foreign matter.

H. SIKAWALL STUCCO SURFACE LEVELER: Polymer modified dry- mix leveling and embedment coat for a crack suppression system.

I. LaHabra Adhesive/Base Coat: (Required for Trim Shapes)

1. LAHABRA A/BC Base Coat: A 100% acrylic base coat, field-mixed with Type I, IL or Type II Portland cement. It has a creamy texture that is easily spread.
2. LAHABRA A/BC 1-Step Base Coat: A dry-mix polymer adhesive and base coat containing Portland cement and requiring only water for mixing.

J. Portland cement (Required if A/BC BASE is Selected): Conform to ASTM C150, Type I, IL, II, or I/II, grey or white; fresh and free of lumps.

K. SIKAWALL SRT MESH: a woven fiber glass mesh with high mechanical strength and dimensional stability for improved clack resistance. Must be used with a LAHABRA base coat or SIKAWALL STUCCO SURFACE LEVELER.

L. LAHABRA STANDARD MESH 4 Reinforcing Mesh (Required if EPS Trim Shapes Are Specified): A balanced, open-weave glass, fiber reinforcing mesh, twisted multi-end strands treated for compatibility with LaHabra acrylic base coats.

M. SIKAWALL STUCCO PRIME: A 100% acrylic-based primer; color [ ] to closely match the selected LaHabra Finish Color.

NOTE TO SPECIFIER: STUCCO PRIME is recommended for NATURAL SWIRL finish texture. Although optional in other applications, LaHabra recommends the use of STUCCO PRIME prior to application of LaHabra Finish over applications of LaHabra Fastwall WaterMaster wall system "brown coat". The application of STUCCO PRIME will enhance color uniformity, performance and ease LaHabra Finish application and will minimize the likelihood of read-through.

N. SIKAWALL TINTED PRIMER (Required if SIKAWALL GRANITE & STONE finish is selected): A 100% acrylic-based primer that helps alleviate shadowing and enhances the performance of the LaHabra wall systems. Color to closely match the selected LaHabra Finish Coat.

O. Finish Coat: ***(Required, Select One or More Finishes and Textures)***

1. PEBBLETEX Finish: 100% acrylic polymer finishes with advanced technology to improve long-term performance and dirt pick-up resistance; air cured, compatible with base coat; LaHabra finish color [ ] as selected; finish texture:
   a. NATURAL SWIRL: Has a medium "worm-holed" appearance which is achieved by the random aggregate sizes in the Finish. The "worm-holed" look can be circular, random, vertical or horizontal.
   b. LIMESTONE: Utilizes uniformly sized aggregates for a uniform, fine texture.
   c. FINETEX: Can achieve a wide variety of free-formed, textured appearances, including stipple and skip-trowel.
   d. MOJAVE: Provides a uniform, "pebble" appearance.
2. SIKAWALL MAXLASTIC Finish: 100% acrylic-based, textured elastomeric finish that provides excellent
   flexibility and breathability, air cured, compatible with base coat; LaHabra finish color [ ] as selected;

finish texture:
   a. R1.5: A medium worm-holed" appearance which is achieved by the random aggregate sizes in the Finish. The "worm-holed" look can be circular, random, vertical or horizontal.
   b. F1.5: Utilizes uniformly sized aggregates for a uniform, fine texture.
   c. T0.5: Can achieve a wide variety of free-formed, textured appearances, including stipple and skip-trowel.
   d. M1.5: Provides a uniform, "pebble" appearance.
3. PEBBLETEX TERSUS Finish: Modified acrylic based finish with water repellent properties, compatible with base coat; LaHabra finish color [ ] as selected; finish texture:
   a. NATURAL SWIRL: Has a medium "worm-holed" appearance which is achieved by the random aggregate sizes in the Finish. The "worm-holed" look can be circular, random, vertical or horizontal.
   b. LIMESTONE: Utilizes uniformly sized aggregates for a uniform, fine texture.
   c. FINETEX: Can achieve a wide variety of free-formed, textured appearances, including stipple and skip-trowel.
   d. MOJAVE: Provides a uniform, "pebble" appearance.
4. SikaWall Specialty Finishes: 100% acrylic polymer finishes that can be hand-troweled to simulate stone or create a time-honored, mottled tone-on-tone look that achieves a soft and weathered patina over time.
   a. SIKAWALL ENCAUSTO VERONA: Utilizes uniformly sized aggregate to achieve a free-formed, flat texture. It can be used to achieve a mottled look and unlimited tone on tone designs by combining multiple colors.
   b. SIKAWALL METALLIC: Has a pearlescent appearance. It utilizes uniformly sized aggregates for a uniform fine texture.
   c. SIKAWALL GRANITE & STONE: Is a factory-mixed, reflective stone finish consisting of colored aggregate and large black mica flakes in a 100% acrylic transparent binder that provides a classic granite or marble-like textured finished appearance.
5. SIKAWALL CHROMA Finish: 100% acrylic polymer-based finish with integrated high performance colorants for superior fade resistance, compatible with base coat; LaHabra Finish color [ ] as selected; finish texture:
   a. F1.0: Utilizes uniformly sized aggregates for a uniformly fine texture.
   b. M1.5: Provides a uniform "pebble" appearance.
   c. R1.5: Has a medium "worm-holed" appearance which is achieved by the random aggregate sizes in the Finish. The "worm-holed" look can be circular, random, vertical or horizontal.
6. LAHABRA PERMA-FLEX STUCCO FINISH: A 100% acrylic-based textured finish for stucco only.
   a. Finish texture and color as selected by the project designer.

2.03 ACCESSORIES

Trim: Casing bead, corner bead, expansion joint and weep screed accessories shall meet the requirements of ASTM C1063. Accessories shall be: vinyl, meeting ASTM D1784; galvanized, meeting ASTM A525 and ASTM A526; or zinc, meeting ASTM B69. Vinyl or zinc accessories are recommended where highly humid or salt-laden service conditions exist. Refer to LaHabra's Accepted Stucco Wall Systems Lath and Trim Accessories bulletin for additional information.

1. Foundation weep screed: Beveled edge designed to terminate finish system and drain internal moisture.
2. Casing bead: Square edge style.
3. Corner bead: Small radius nose style.
4. Control joints: W-shaped accordion profile style.
5. Expansion joints: [Two-piece type slip-joint design] or [pair of casing beads spaced for application of sealant bead]

PART 3- EXECUTION

3.01 EXAMINATION

A. Verify project site conditions under provisions of Section [01 89 00] [ ].

B. Walls:

1. Substrates:
   a. Acceptable substrates are PermaBase® Cement Board and other cement-boards conforming with ASTM C1325 (Type A-exterior) , poured concrete/unit masonry, e²XP™ sheathing (ASTM C1177), GlasRoc® sheathing (ASTM C1177), Securock™ glass-mat sheathing (ASTM C1177), DensGlass and DensElement (sheathing only) exterior sheathing (ASTM C1177), Weather Defense™ Platinum sheathing (ASTM C1177), GreenGlass® sheathing (ASTM C1177), gypsum sheathing (ASTM C79/C1396), Exposure I or exterior plywood (Grade C/D or better), Huber Zip (sheathing only), or Exposure I OSB.
   b. Sheathings must be securely fastened per applicable building code requirements and manufacturer's recommendations.
   c. Examine surfaces to receive system and verify that substrate and adjacent materials are dry, clean, and sound. Verify substrate surface is flat, free of fins or planar irregularities greater than 1/4" in 10' (6 mm in 3 m).
   d. When applying LaHabra Air/Water-Resistive Barriers to concrete/unit masonry, verify concrete/unit masonry is free of dust, dirt, grease, oils, laitance, efflorescence, biological residue, existing paint or coatings, curing compounds, form release agents, or any other contaminants which might affect the bond. Masonry walls should be properly cured to full load bearing capacity, laid true, and with joints tooled. Properly prepared concrete will have an open texture similar to fine grit sandpaper.
2. Flashings:
   a. All flashings are by others and must be installed in accordance with specific manufacturer's requirements. Where appropriate, end-dams must be provided.
   b. Openings must be flashed prior to window/door, HVAC, etc. installation.
   c. Windows and openings shall be flashed according to design and building code requirements.
   d. Individual windows that are ganged to make multiple units require continuous head flashing and/or the joints between the units must be fully sealed.
3. Roof: Verify that all roof flashings have been installed in accordance with the guidelines set by the Asphalt Roofing Manufacturers Association (ARMA).
4. Kick-out flashing: Kick-out flashing must be installed where required. The kick-out flashing must be leak-proof and angled (min 100˚) to allow for proper drainage and water diversion. Refer to LaHabra's Fastwall WaterMaster wall system typical details.

C. Do not proceed until all unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect all surrounding areas and surfaces from damage and staining during application of LaHabra Fastwall WaterMaster wall system.

B. Protect finished work at end of each day to prevent water penetration.

3.03 MIXING

General: No additives are permitted unless specified in product mixing instructions. Close containers when not in use. Prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

NOTE TO SPECIFIER: Keep only the products in this section which were selected in Section 2.02. Delete those not to be utilized.

A. Air/Water-Resistive Barriers:

1. FINESTOP-R/RS/VB and WeatherSeal Spray & Roll-On: Mix with a clean, rust-free paddle and drill until thoroughly blended. Do not add water.

B. Stucco Base Coat:

1. SIKAWALL STUCCO BASE CONCENTRATE: Use mixer which is clean and free of foreign substances. Add approximately 3 gal. (11.35 L) of clean potable water, one bag of STUCCO BASE CONCENTRATE and approximately 60 lbs. (27.2 kg) of plaster sand to mixer. Mix for 3-4 minutes

at normal mixing speed while adding an additional 140-180 lbs. (64-82 kg) of plaster sand and 1-3 gallons (3.8-11.35L) of water for workability. Total amount of sand needed per bag of STUCCO BASE CONCENTRATE equals 200-240 lbs. (91-109 kg). Allow material to set for 2-4 minutes and then remix adding water if necessary to achieve desired consistency. Desired consistency varies with type of application (trowel or gun), substrate (paper-backed lath or block) and whether the stucco is applied to a wall or a ceiling.

Note: Continuous mixing may cause excessive air entrainment.

2. SIKAWALL STUCCO BASE SANDED: Use mixer which is clean and free of foreign substances. Add 1.3 gallons (4.9 liters) of clean potable water to mixer. Slowly add one bag of STUCCO BASE SANDED, mix until mixture becomes homogeneous, then add additional 0.2 gallons (.75L) of water. Mix at low speed for a minimum of 3 minutes, until the mixture is smooth. Desired consistency varies with type of application (trowel or gun), substrate (paper-backed lath or block) and whether the stucco is applied to a wall or a ceiling. Note: Continuous mixing may cause excessive air entrainment.

   NOTE: Do not overmix; never mix more than five minutes. Mix each batch for the same amount of time. Mix batches of the same size, using the same amount of water, to ensure consistency.
3. LAHABRA FIBER-47 CONCENTRATE: Mix 5.5-6.5 gal. (20.5-24.5L) of water and 3-4.5 ft3 (240-360 lbs. or 109-163 kg) of sand that conforms to ASTM C926 requirements to each bag of LaHabra Fiber-47 Concentrate at the time of use. Mix at low speed for a minimum of 3 minutes, until the mixture is smooth. Do not overmix; never mix more than 5 minutes. Mix each batch for the same amount of time.
4. LAHABRA FIBER-47 SANDED: Add to plaster mixer 11/2-2 gal. (5.6-7.6L) of water for each 80 lbs. (36 kg) bag of LaHabra Fiber-47 Sanded to be mixed in a batch. Mixing water shall be cool potable at a uniform temperature above 40°F/5°C. Maintain same water parameters for all batches. Add LaHabra Fiber-47 Sanded to the mixer. Mix at low speed for a minimum of 3 minutes, until the mixture is smooth. Do not overmix; never mix more than 5 minutes. For hand applications, stop mixer and allow mix to slake for 8 minutes. Briefly re-mix for approximately 2 minutes before using.

C. SIKAWALL STUCCO SURFACE LEVELER: Mix and prepare each bag in a 5-gallon (19L) pail. Fill the container with approximately 1.3 gal. (4.9 L) of clean, potable water. Add a full bag of Stucco Surface Leveler to the pail in small increments, mixing after each addition. Mix with a low speed drill and a rust-free paddle at 400-500 rpm until thoroughly blended. Add an additional 0.3 gallons (1.1L) of water to adjust workability (for a maximum of 1.6 gal. (6 liters)). Let mixture stand for 5-10 minutes then remix for 1 minute.

D. LaHabra Base Coat:

1. A/BC Base Coat: Mix base coat with a clean, rust-free paddle and drill until thoroughly blended, before adding Portland cement. Mix one-part (by weight) Portland cement with one-part base coat. Add Portland cement in small increments, mixing until thoroughly blended after each additional increment. Clean, potable water may be added to adjust workability.
2. A/BC 1-Step Base Coat: Mix and prepare each bag in a 5 gal. (19 L) pail. Fill the container with approximately 1.5 gal. (5.6 L) of clean, potable water. Add base coat in small increments, mixing after each additional increment. Mix base coat and water with a clean, rust-free paddle and drill until thoroughly blended. Additional A/BC base coat or water may be added to adjust workability.

E. SIKAWALL STUCCO PRIME & TINTED PRIMER: Mix the factory-prepared material with a clean, rust-free paddle and drill until thoroughly blended. A small amount of clean, potable water may be added to adjust workability. Do not overwater.

F. Finishes:

1. PEBBLETEX, MAXLASTIC, PEBBLETEX TERSUS, PERMA-FLEX, CHROMA and ENCAUSTO VERONA: Mix the factory-prepared material with a clean, rust-free paddle and drill until thoroughly blended. A small amount of clean, potable water may be added to adjust workability. Do not overwater.

2. SIKAWALL GRANITE & STONE: Gently mix the contents of the pail for 1 minute using a low RPM 1/2” drill equipped with a mixing paddle such as a Demand Twister or a Wind-lock B-MEW, B-M1 or B-M9.

3.04 APPLICATION

A. Accessories: Attach Window/Door Drip Edge level and per manufacturer's instructions.

NOTE TO SPECIFIER: Keep only the products in this section that were selected in Section 2.02. Delete those not to be utilized.

B. Air/Water-Resistive Barrier:

1. All sheathing joints and windows/openings must be protected, and the air/water-resistive barrier applied in accordance with the published product date sheet and details.
2. Substrate shall be dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 1/4" in 10' (6.4 mm in 3 m).
3. Unsatisfactory conditions shall be corrected before application of the selected air/water-resistive barriers.
4. Apply the SHEATHING FABRIC and selected air/water-resistive barrier in accordance with the selected air/water-resistive barrier product bulletin.
5. Apply the MAXFLASH in accordance with MAXFLASH product bulletin.
6. Installed materials shall be checked before continuing system application.
7. Ensure SHEATHING FABRIC selected air/water-resistive barrier or MAXFLASH overlaps the top flange of the starter track.
8. Installed materials shall be checked before continuing system application.

C. Slip Sheet: Install slip sheet over dry Senergy Air/Water-Resistive Barrier per manufacturer's recommendations.

D. Trim: Refer to LaHabra Stucco Wall Systems Lath and Trim Accessories technical bulletin.

NOTE TO SPECIFIER: It is the sole responsibility of the project design team, including the architect, engineer, etc., to ultimately determine specific expansion and control joint placement, width and design.

E. Lath: Install in accordance with all local code requirements, applicable standards and application procedures.

1. SIKAWALL PERMALATH 1000:
   a. Apply with minimum 3" (76mm) overlap at vertical and horizontal edges and overlap on flange of trim accessories. PERMALATH 1000 can be applied horizontally or vertically and should be applied such that it is flat and free of ripples, wrinkles, etc. Fastener system type appropriate for application and substrate. Fastener spacing 6" o.c. (152 mm) vertically and 16" o.c. (406 mm) horizontally. Apply selected SikaWall stucco base product within 60 days of PERMALATH 1000 application.
2. Woven/Welded Wire Lath:
   a. Wire or lath shall be applied with minimum 1" (25 mm) end laps and side laps.
   b. Furring crimps shall occur at maximum 6" (152 mm) intervals each way.
   c. Refer to ASTM C1063 for additional fastening information.
3. Expanded Metal Lath
   a. The metal lath shall be applied with minimum 1/2" (13 mm) side laps and 1" (25 mm) end laps.
   b. When end laps occur between supports, lace or wire ties the ends of the sheets with 0.0475" (1.2 mm) galvanized annealed steel wire.
   c. Refer to ASTM C1063 for additional fastening information.

NOTE: Supplemental fasteners, in the framing or sheathing, can be used to secure lath prior to application of stucco base.

F. Stucco Base Coat:

1. SIKWALL STUCCO BASE CONCENTRATE or SANDED ONLY: 3/8"-1/2" thickness (9.5-12.7 mm) application.
   a. Following surface preparation and installation of the lath and accessories apply selected SikaWall stucco base mixture to the approved substrate by hand troweling or machine spraying to a thickness of 3/8" to 1/2" (9.5-12.77 mm), completely embedding the lath.
   b. Use rod and darby to level the applied base coat without exposing the lath.
   c. After initial set begins and surface has sufficiently hardened, use sponge or hard rubber float as required to fill voids, holes or imperfections, leaving the surface ready to receive LaHabra finish.

d. Damp cure for at least 48 hours by lightly and evenly fogging the surface with water at least twice a day. Direct sunlight, hot temperatures, low humidity and windy conditions may make additional fogging necessary.
e. Allow stucco base to cure a minimum of 6 days prior to application of EPS board shapes, acrylic base coats, STUCCO PRIME, TINTED PRIMER or LaHabra finish application.

2. LAHABRA FIBER-47 or SIKAWALL STUCCO BASE: 3/4"-7/8" thickness (19-22mm) application.
   a. Nominal plaster base coat thickness:
      i. First coat "scratch": 3/8" (9.5mm)
      ii. Second coat "brown": 3/8" (9.5mm)
   b. Apply selected SikaWall stucco base mixture to the approved substrate by hand troweling or machine spraying with sufficient force to develop full adhesion between the stucco base mixture and the substrate.
   c. Apply first coat to completely embed lath. Cross rake to provide key for second brown coat. Coat must be uniform in thickness. Ensure the first coat is properly "scratched" and sufficiently rigid to resist cracking prior to application and leveling of the second or "brown" coat.
   d. Dampen scratch coat, apply brown coat to provide the required total thickness. Trowel Stucco Base into trim to seat trim. The lath shall be fully embedded in the coating and shall be completely covered. Coat must be uniform in thickness. Rod off to desired thickness, leveled with screeds, to provide a true, flat plane. Follow this by wood floating or darbying the surface.
   e. After the surface has sufficiently hardened, use sponge or hard rubber float as required to fill voids, holes or imperfections, leaving the surface ready to receive LaHabra Finish.
   f. At subcontractor's option, the "double back" method of application, whereby the first and second coats are applied and cured as one system, may be used. If this system is used, the second coat (brown) should be applied as soon as the first coat is sufficiently rigid to resist cracking, the pressures of the second (brown) coat application and the leveling process.
   g. Damp cure for at least 48 hours by lightly and evenly fogging the surface with water at least twice a day. Direct sunlight, hot temperatures, low humidity and wind may make additional fogging necessary.
   h. Allow STUCCO BASE to cure a minimum of 6 days prior to application of EPS board shapes, acrylic base coat, SikaWall STUCCO SURFACE LEVELER, STUCCO PRIME, TINTED PRIMER or LaHabra finish application.

G. LaHabra Base Coat / SIKAWALL SRT MESH or LAHABRA STANDARD MESH 4 Reinforcing Mesh:

1. LaHabra base coat shall be applied to achieve reinforcing mesh embedment with no reinforcing mesh color visible. Apply mixed LaHabra base coat or STUCCO SURFACE LEVELER to entire surface of "brown coat" with a stainless-steel trowel to embed the reinforcing mesh.
2. Immediately place reinforcing mesh against wet base coat and embed the reinforcing mesh into the base coat by troweling from the center to the edges. Lap reinforcing mesh 2 1/2" (64 mm) minimum at edges.
3. Ensure reinforcing mesh is continuous at corners, void of wrinkles and embedded in base coat so that no reinforcing mesh color is visible.
4. If required, apply a second layer of base coat to achieve total nominal base coat/reinforcing mesh thickness of 1/16" (1.6 mm).
5. Allow base coat with embedded reinforcing mesh to dry hard (normally 8 to 10 hours).

H. Decorative Shapes:

1. Apply mixed selected adhesive/base coat to entire surface of insulation board using a stainless-steel trowel with 1/2"x 1/2" (13mm x 13mm) notches spaced 1/2" (13mm) apart or 3/8"x 3/8" (10mm x 10mm) notches spaced 3/8" (10 mm) apart.
2. Immediately set shape into place and apply pressure over entire surface of board to ensure positive uniform contact and high initial grab. Do not allow base coat to dry prior to installing.
3. Abut all joints tightly and ensure overall flush level surface.
4. Check adhesion periodically by removing a shape prior to set. Properly installed shapes will be difficult to remove, and Adhesive/Base Coat will be adhered to both the stucco base and the shape.
5. Fill 1/16" (1.6mm) and larger gaps between shapes with slivers of insulation board.

6. Allow application of shapes to dry (normally 8 to 10 hours) prior to application of base coat/reinforcing mesh.
7. Rasp flush any irregularities of the shapes greater than 1/16” (1.6 mm).
8. Apply selected LaHabra base coat to entire surface of insulation board with a stainless-steel trowel to embed the reinforcing mesh. Immediately place LaHabra STANDARD MESH 4 Reinforcing Mesh against wet base coat and embed the reinforcing mesh into the base coat by troweling from the center to the edges.
9. Lap reinforcing mesh 2 1/2” (64 mm) minimum at edges and 3” (75 mm) minimum onto stucco base.
10. Ensure reinforcing mesh is continuous at corners, void of wrinkles and embedded in base coat so that no reinforcing mesh color is visible. If required, apply a second layer of base coat to achieve total nominal base coat/reinforcing mesh thickness of 1/16” (1.6 mm).
11. Allow base coat with embedded reinforcing mesh to dry hard (normally 8 to 10 hours).

I. SIKWALL STUCCO PRIME / TINTED PRIMER:

1. Apply primer to cured stucco or base coat with a sprayer, 3/8” (10 mm) nap roller, or good quality latex paint brush at a rate of approximately 150-250 sq. ft. per gallon (3.6-6.1 m2 per liter). Primer must be dry to the touch before proceeding to the selected finish application.

J. Finish Coat: PEBBLETEX, MAXLASTIC, PEBBLETEX TERSUS, PERMA-FLEX and CHROMA.

1. Apply finish directly to the base coat with a clean, stainless steel trowel.
2. Apply and level finish during the same operation to a minimum obtainable thickness consistent with uniform coverage. Maintain a wet edge on finish by applying and texturing continually over the wall surface.
3. Work finish to corners, joints or other natural breaks and do not allow material to set up within an uninterrupted wall area. Float finish to achieve final texture.

F. SIKAWALL GRANITE & STONE Finish:

1. Apply SIKAWALL TINTED PRIMER to the substrate in accordance with the current product bulletin. Primer shall be of the corresponding color for the selected finish color. Allow the primer to dry to the touch before proceeding with finish application.
2. Apply a tight coat of finish with a clean, stainless steel trowel. Maintain a wet edge on finish by applying and leveling continually over the wall surface.
3. Work finish to corners, joints or other natural breaks and do not allow material to set up within an uninterrupted wall area. Allow first coat to set until surface is completely dry prior to applying a second coat of finish.
4. Use a stainless-steel trowel and apply the second coat of finish. Achieve final texture using circular motions. Total thickness of finish may be between 1/16" (1.6 mm) and 1/8" (3.2 mm).

3.05 CLEANING

A. Clean work under provisions of Section [01 74 00] [ ].
B. Clean adjacent surfaces and remove excess material, droppings, and debris.

3.06 PROTECTION

A. Protect materials from rain, snow and frost for 48–72 hours following application.
B. Protect installed construction under provisions of Section [01 76 00] [ ].

3.07 PROTECTION

A. Protect materials from rain, snow and frost for 48-72 hours following application.
B. Under average conditions [70 °F (21 °C), 50% Relative Humidity] finish will be dry within 24 hours. Drying time is dependent on humidity, air temperature, sun exposure, surface conditions and finish thickness. Lower temperature, higher humidity and application in shaded areas will extend drying time. Protect finish from rain or other precipitation and temperatures less than 40°F (4°C) for a minimum of 24 hours or until dry.
C. Protect installed construction under provisions of Section [01 76 00] [ ].

END OF SECTION

LaHabra Fastwall WaterMaster Wall System

WARRANTY

Prior to each use of any product of Sika Corporation, its subsidiaries or affiliates (“SIKA”), the user must always read and follow the warnings and instructions on the product’s most current product label, Product Data Sheet and Safety Data Sheet which are available at usa.sika.com/lahabra or by calling SIKA Facades’ Technical Service Department at 1-800-589-1336. Nothing contained in any SIKA literature or materials relieves the user of the obligation to read and follow the warnings and instructions for each SIKA product as set forth in the current product label, Product Data Sheet and Safety Data Sheet prior to use of the SIKA product.

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product’s shelf life. User determines suitability of product for intended use and assumes all risks. User’s and/or buyer’s sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs. NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS. Sale of SIKA products are subject to the Terms and Conditions of Sale which are available at https://usa.sika.com/.

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BUILDING TRUST

SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Sound attenuation blankets.
4. Related materials necessary to complete installation.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C11 for definitions of terms not defined in this Section or in other referenced quality standards.

B. Damage: Stored or installed materials are classified as defective and nonconforming Work according to following:

1. Wet or damp, or have been at any time.
2. Exhibit evidence of active or dormant mold or mildew.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified or required.

B. Rated Assembly Design Classification: Documentation issued by testing agency for each rated assembly design selected.

1. Fire Resistance Rated Assemblies.

1.4 FIELD CONDITIONS

A. Environmental Conditions: Comply with ASTM C840 requirements or respective wallboard manufacturers written recommendations, whichever are more stringent.

B. Do not install wallboards until installation areas are enclosed.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to

those tested according to ASTM E119 / NFPA 251 / UL 263 by one of following independent testing and inspecting agency as evidenced by design designation included in their associated approval manual:

1. UL – "Fire Resistance Directory", Category BXUV.
2. GA-600 – "Fire Resistance Design Manual".
3. Other agency acceptable to authorities having jurisdiction.

2.2 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products and assemblies (a) specified below, and, (b) as indicated on Drawings by reference to an independent laboratory test number, to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change intent of Contract Documents as judged by Architect.

B. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

INTERIOR GYPSUM WALLBOARDS

Sizes: Maximum lengths and widths available that will minimize short edge-to-short edge butt joints and to correspond to support system indicated.

Typical Paper-Faced Type X Gypsum Board:

1. Material Quality Standard: ASTM C1396, Type X.
2. Description: Noncombustible gypsum core with paper surfacing on face, back and long edges.
3. Thickness: 5/8 inch.
4. Long Edges: Tapered.
5. Acceptable Manufacturers and Products:

    a. CertainTeed Corp.; ProRoc Type X Gypsum Board.
    b. G-P Gypsum Corp.; ToughRock Fireguard Gypsum Board X.
    c. National Gypsum Co.; Gold Bond Brand Fire-Shield X Gypsum Board.
    d. USG Corp.; Sheetrock Mold-Tough Firecode X Core.

C. Moisture-Resistant Paperless Glass-Mat Gypsum Board:

1. Material Quality Standard: ASTM C1658, Type X.
2. Description: Mold- and moisture-resistant, noncombustible gypsum core with inorganic, embedded fiberglass mat on face, back and long edges.
3. Thickness: 5/8 inch.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D3273; score of 10 as rated according to ASTM D3274.
6. Basis of Design: National Gypsum Co.; Gold Bond Brand eXP Interior Extreme Gypsum Panels.

2.4 TILE BACKING WALLBOARD PANELS

A. Cementitious Backer Board:

1. Material Quality Standard: ANSI A118.9 or ASTM C1325.

2. Description: Cementitious panels composed of portland cement, aggregates, glass mesh on both faces, and manufacturer's proprietary ingredients; capable of remaining unaffected by prolonged exposure to water.
3. Thickness: 5/8 inch.
4. Acceptable Manufacturers and Products:

    a. CertainTeed; GlasRoc Tile Backer.
    b. Custom Building Products; WonderBoard.
    c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    d. National Gypsum Co.; PermaBase Cement Board.
    e. USG Corp.; DUROCK Interior Cement Board.

2.5 TRIM ACCESSORIES

A. Typical Drywall Trim Accessories:

1. Material Quality Standard: ASTM C1047.
2. Description: Trim profile fabricated of steel sheet with ASTM A653, minimum G40 hot-dip galvanized coating; of size suitable for wallboard thickness; with recessed, perforated flange formed to receive joint compound.
3. Trim Products:

    a. Cornerbead:

        1) Purpose: For protecting outside (external) corners.
        2) Basis of Design: USG Corp.; Dur-A-Bead Corner Bead, 103.

    b. LC-Bead (J-Bead):

        1) Purpose: For protecting exposed edges of wallboard where back flange can be used.
        2) Basis of Design: USG Corp.; J-Trim, 200-A.

    c. L-Bead:

        1) Purpose: For protecting exposed edges of wallboard where back flange cannot be used.
        2) Basis of Design: USG Corp.; L-Trim, 200-B.

    d. J-Stop:

        1) Purpose: For protecting edges of wallboard that does not require finishing.
        2) Basis of Design: USG Corp.; J-Stop, 402.

    e. Control Joint:

        1) Description: One-piece trim formed with V-shaped slot, with removable strip covering slot opening.
        2) Purpose: For conditions requiring expansion and contraction stresses of large areas of wallboard to be relieved.
        3) Basis of Design: USG Corp.; Control Joint, 093.

    f. Other Trim or Special Shapes: Product as required by condition.

4. Acceptable Manufacturers:

a. ClarkDietrich Building Systems.
b. Fry Reglet Architectural Metals.
c. Marino Ware.
d. Niles Building Products Co.
e. Superior Metal Trim.
f. USG Corp.

2.6 FASTENERS

Gypsum Wallboard Screws:

1. Material Quality Standards:

   a. Metal Framing Members less than 0.03 inch Thick: ASTM C1002, Type S.
   b. Metal Framing Members from 0.033 inch to 0.112 inch Thick: ASTM C954, Type S-12.

2. Description: Bugle head, self-drilling, self-tapping, steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective wallboard manufacturer; non-corrosive and non-oxidizing for shower and tub applications.

B. Gypsum Wallboard Nails:

1. Gypsum Board: ASTM C514, annular ring drywall nail; 12-1/2 gage, 19/64 inch diameter nail head, medium diamond point; length as required by conditions, but not less than 1-3/8 inches.
2. Cementitious Backer Units: Roofing nails; 11 gage, 7/16 inch diameter nail head; length as required by conditions, but not less than 1-3/8 inches.

C. Other Fasteners: For conditions not indicated, fasteners shall be type, finish, size, and holding power recommended by USG's "The Gypsum Construction Handbook" for conditions encountered.

2.7 WALL LABELS FOR RATED PARTITIONS

A. General: Permanently identify the following interior walls and partitions containing protected openings or penetrations, including, but not limited to the following:

1. Fire walls, barriers, or partitions.
2. Smoke barriers or partitions.

B. Wall Labels: Plastic plates, aluminum plates, or vinyl film with an adhesive back; not less than 7 by 10 inches; with primary words not less than 2 inches high, that identifies a wall as a fire-rated or smoke-rated wall in red lettering.

C. Acceptable Manufacturers:

1. Fire Wall Signs, Inc.
2. MySafetySign.com
3. Seton Signs, Labels and Safety Solutions.

2.8 RELATED MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced quality standards and recommendations of gypsum board manufacturer.

B. Fiberglass Sound Attenuation Blankets:

1. Material Quality Standard: ASTM C665, Type I.
   Description: Unfaced blankets produced by bonding inorganic glass fibers with a thermosetting binder; free of formaldehyde.
3. Surface Burning Characteristics: According to ASTM E84/NFPA 255/UL 723:

   a. Flame Spread: Class A – no greater than 25.
   b. Smoke Developed: No greater than 50.

4. Thickness:

   a. If not indicated: Not less than 2-1/2 inch.
   b. Interior walls surrounding mechanical and electrical rooms, pool pump room, trash chutes, demising walls between units (each stud cavity), and walls between units and corridors and other adjacent spaces: Not less than 3-1/2 inches.

5. Acceptable Manufacturers and Products:

   a. CertainTeed Corp.; CertaPro AcoustaTherm Batts.
   b. Johns Manville Building Insulation Div.; Sound Control Batts.
   c. Knauf Fiber Glass; QuietTherm.
   d. Owens Corning; Sound Attenuation Batts.

Acoustical Sealant:

1. Description: Non-skinning, non-hardening, permanently flexible, gun-grade sealant that is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E90.
2. Acceptable Manufacturers and Products:

   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
   b. Certainteed Saint-Gobain; SilentFX Noiseproofing Sealant.
   c. Franklin International; Titebond GreenChoice Professional Acoustical Smoke and Sound Sealant.
   d. Grabber Construction Products; Acoustical Sealant GSC
   e. Pecora Corp.:

      1) Fire-Rated Joints: AC-20 FTR Acoustical and Insulation Sealant.
      2) Non-Fire-Rated Joints: Pecora Corp.; BA-98.

   f. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
   g. USG Corp.; Sheetrock Brand Acoustical Sealant.

D. Isolation Strips: Adhesive-backed, closed cell neoprene or vinyl foam strips that allow fastener penetration with foam displacement, size as indicated, compressed 50 percent.

E. Water Resistant Sealants: Silicone mildew resistant sealant as specified in Division 07 Section “Joint Sealants”.

F. Firestopping Products at Penetrations: As specified in Division 07 Section “Penetration Firestopping.”

EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of conditions.

3.2 PREPARATION

A. Cleaning: Ensure ceiling and wall cavities are dry, clean and free of construction debris.

INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform gypsum board assemblies work according to following, unless otherwise specified in this Section:

1. Respective manufacturer’s installation written instructions.
2. GA 216 for application of gypsum board.
3. GA 600 for fire and sound rated assemblies.
4. ASTM C 840 for installation of gypsum board.
5. ANSI A108.11 for cement backer boards.

B. Resistance Rated Partitions: Construct fire resistance rated, smoke resistance rated, and sound resistance rated partitions according to respective assembly test reports. Ensure every material used within an assembly shall comply with manufacturers listed and product qualities indicated in respective assembly test report.

C. Penetrations and Openings: Construct within gypsum board assemblies work as required to properly form penetration or opening to receive firestopping materials specified in Division 07 Section “Penetration Firestopping”.

D. Control Joints: Form stress relieving joints, spaced not more than 24 feet in either direction for uninterrupted straight planes of ceilings, walls and partitions, to eliminate cracking of gypsum board assemblies, or finish, according to following:

1. Where ceiling, wall or partition framing changes direction within same plane.
2. Where wallboard of ceilings, walls or partitions abutting inside face of exterior walls.
3. Where wallboard of walls and partitions of differing fire ratings abut or align in same plane.
4. Where wings of L, U, or T shaped ceiling configurations are joined.
5. Less than ceiling height door frames and windows extending from both corners to ceiling.

3.4 INSTALLING TRIM ACCESSORIES

A. General: Fasten trim accessories continuously according to accessory manufacturer's instructions using fasteners; installation by clinch-on tool and staples not permitted.

B. Typical Trim Accessories:

1. Corner Beads: Install trim at external corners; use fasteners at each flange at 9 inches on centers, opposite each other.
2. Edge Trim: Install trim where wallboards abut dissimilar material, and where edge of wallboards would otherwise be exposed; use fasteners screws at flange at 9 inches on centers.

a. LC-Bead (J-Bead): Install trim at exposed conditions where back flange can be attached to framing or supporting substrate before wallboard installation.
b. L-Bead: Install trim at exposed conditions where trim can only be installed after wallboard installation.
c. J-Stop: Install trim at concealed conditions where trim can only be installed after wallboard installation.

3. Control Joints: Install trim at appropriate locations, ensuring wallboard is not continuous over joint; use fasteners at each flange at 6 inches on centers.

C. Accent Trim Accessories: Install at locations indicated, mitering corners and intersections to form tight, flush and uniform joints; use fasteners at each flange at 9 inches on centers.

D. Trim Accessories at Exterior Windows: Install at locations indicated, mitering corners and intersections to form tight, flush and uniform joints; use fasteners at each flange at 9 inches on centers.

INSTALLING WALLBOARDS

A. General Requirements:

1. Install type of wallboard at location indicated by wallboard schedule at end of this Section.
2. Avoid installing imperfect, damaged, wet, or damp wallboards.
3. Install ceiling wallboards before wall and partition wallboards.
4. Install wallboards with finishable face side out.
5. Butt wallboards together for a light contact at edges and ends with not more than 1/16 in of open space between panels.
6. Avoid forcing wallboards into place.
7. Avoid placing tapered edges against cut edges or ends.

B. Single-Layer Board Assemblies:

1. At typical conditions, install wallboard vertically (long dimension parallel to stud framing), to minimize short end-to-short end joints unless otherwise indicated or required by assembly fire test reports.
2. At interior of stairwells and other high walls, install wallboards horizontally, unless otherwise indicated or required by assembly fire test reports. Stagger abutting end joints not less than one framing member in alternate courses of wallboards.

C. Multilayer Board Assemblies: Apply base layers and face layers vertically (long dimension parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud space (16 inches) with base layer joints, unless otherwise indicated or required by assembly fire test reports. Stagger joints on opposite sides of partitions.

D. Ceiling Applications:

1. Apply wallboard at right angles to main beams of suspension framing to minimize number of abutting end joints and avoid abutting end joints in central area of each ceiling.
2. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Locate both edge or end joints of wallboards over intermediate supports or gypsum board back-blocking where framing is not present.

E. Typical Wall Applications:

1. Attach wallboards to studs so that leading edge or end of each board is attached to open

(unsupported) edges of stud flanges first.
2. Stagger vertical joints on opposite sides of partitions.
3. Do not make joints other than control joints at corners of framed openings.
4. Attach wallboards to framing provided at doors, openings and cutouts. Install wallboards over door heads and extend to not less than one stud space (16 inches) at each side of door or opening.
5. Cover both faces of framing with wallboards as indicated, except in chase walls that are braced internally.
6. Cut and fit wallboards around ducts, pipes, conduits, and other penetrations to form proper annular joint to receive firestopping.
7. Where partitions intersect open building structure members projecting below underside of floor slabs and roof decks, cut to fit profile formed by coffers, joists, beams, and other structural members; form proper annular joint to receive firestopping.
8. Support both edge and end joints of wallboards over framing.

F. Screw Fastening:

1. Attach wallboard to metal framing with screw fasteners for wallboard being installed:

   a. Type shall be appropriate for material and conditions.
   b. Length shall be as required by condition and penetrating metal framing not less than 1/2 inches.
   c. Spacing shall be as recommended by installation quality standard, wallboard manufacturer or respective assembly test report.
   d. Use properly adjusted, positive-clutch electric power tool equipped with adjustable screw-depth head and a Phillips bit. Nails and staples are not permitted.

2. Drive screws to slightly dimple surface without breaking face paper, fracturing core, or stripping metal framing member around screw shank.
3. Space screws for non-fire resistance rated partitions and ceilings as recommended by installation quality standards.
4. Space screws for fire resistance rated partitions as required by assembly fire test reports.
5. Start field screwing near center and work towards edges.
6. Space screws not less than 3/8 inches from wallboards edges.
7. Do not attach wallboards to top runner where wall or partition extends to building structure unless required by fire test reports.

G. Nail Fastening:

1. Attach wallboard to wood framing with nails for wallboard being installed:

   a. Type shall be appropriate for material and conditions.
   b. Length shall be as required by condition and penetrating wood framing not less than 1/2 inches.
   c. Spacing shall be as recommended by installation quality standard, wallboard manufacturer or respective assembly test report.

2. Drive nails to slightly dimple surface without breaking face paper, fracturing core, or stripping wood framing member around fastener shank.
3. Space nails for non-fire resistance rated partitions and ceilings as recommended by installation quality standards.
4. Space nails for fire resistance rated partitions as required by assembly fire test reports.
5. Start field nailing near center and work towards edges.
6. Space nails not less than 3/8 inches from wallboards edges.

H. Control Joints: Form control joints and expansion joints at locations indicated with required space between edges of adjoining wallboards.

I. Sound Attenuation Blankets: Install blankets within stud cavities set so that they are held in place by friction with studs; ensure blankets are secure within cavity and will not become displaced when second wallboard side is closed.

J. Sealant:

1. Comply with ASTM C 919 and manufacturers written recommendations for closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
2. Seal wall assemblies at perimeters, behind control joints, and at openings and penetrations with a continuous bead of sealant material according to following:

    a. Fire Resistance Sealant: Joints within fire resistance rated assemblies.
    b. Water Resistance Sealant: Joints within non-fire resistance rated assemblies exposed to possible water infiltration.
    c. Acoustical Sealant: All other joints.

3.6 INSTALLING WALL LABELS

A. Permanently identify both sides of each fire and smoke assembly.

B. Adhere wall labels identifying rating at 12 inches above the ceiling and at intervals not less than 15 feet on centers.

C. Locate labels where they will be seen and not obstructed by other construction.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

C. Repair of Gypsum Board:

1. Patch holes and voids in gypsum board utilizing mesh and bonding primer – hot patching is not acceptable.
2. Patch and Repair fire resistance rated gypsum board assemblies in accordance with Gypsum Association GA-225.

3.8 ADJUSTMENTS

A. Wet Materials: Materials and products that are wet or have been wet at any time during construction shall be replaced with new and dry materials and products.

3.9 SCHEDULE

Wallboard Schedule: Install gypsum board products as indicated in following Schedule unless otherwise indicated on Drawings:

1. Cementitious Backer Boards: Surfaces finished with wall tile.
2. Moisture-Resistant Paperless Glass-Mat Gypsum Board:

    a. Wall and ceiling surfaces in toilets and bathrooms not otherwise finished with wall tile.
    b. Wall and ceiling surfaces within Mechanical Rooms and Janitor Closets.
    c. Wall surfaces that will be within 48 inches of lavatories, sinks, urinals, water closets, and other plumbing fixtures not otherwise finished with wall tile.

3. Typical Paper-Faced Type X Gypsum Board: All other locations.

END OF SECTION

SECTION 092920
FINISHING GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finishing of gypsum board (taping and bedding).
2. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each product.

1.3 QUALITY ASSURANCE

A. Comply with requirements of GA 216 and ASTM C840.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 FIELD CONDITIONS

A. Environmental Conditions: Establish and maintain environmental conditions for finishing gypsum board to comply with ASTM C840 and with gypsum board manufacturer's recommendations.

B. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 JOINT TREATMENT MATERIALS

A. Material Quality Standard: ASTM C475.

B. Joint Tape:

1. Paper Tape: Nominal 2 inch wide cross-fibered paper tape with finish suitable for bonding, creased in center for easy folding, and compatible with joint compound.
2. Mesh Tape: Nominal 2 inch wide self-adhering 10-by-10 fiberglass mesh tape.

C. Joint Compound:

1. Setting-Type: Job-mixed powder for mixing with water, chemical-hardening compound; includes taping types.
2. Drying-Type: Ready-mixed or job-mixed powder for mixing with water, air-drying, vinyl based compounds; includes taping, topping, and all-purpose types.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 JOINT TREATMENT FINISHING GYPSUM BOARD

A. Treat gypsum board joints, interior and exterior angles, flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Gypsum Board: Finish gypsum board to levels indicated below according to ASTM C840 and GA-214:

1. Level 1: Not Used.
2. Level 2: Not Used.
3. Level 3: Not Used.
4. Level 4: Surfaces to receive paint.
5. Level 5: Not Used.

END OF SECTION

SECTION 093000
TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor, base, and wall tile.
2. Setting and grouting materials.
3. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each product indicated.

B. Shop Drawings: Detailed and dimensioned plans and large-scale details.

1. Include locations of each type of tile and tile pattern.
2. Include setting materials configurations.
3. Include widths, details, and locations of movement joints.

C. Samples for Verification:

1. Tile: Full-size units of each type and composition of tile and for each color and finish required.
2. Membranes: 6 inch square.
3. Stone Thresholds: 6 inch lengths.
4. Metal Edge Strips: 6 inch lengths.

D. Maintenance Data: For inclusion in maintenance manual required by appropriate Division 01 Section.

1. Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.3 QUALITY ASSURANCE

A. Tile Installer Qualifications: Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America with minimum 10 years’ specialized experience installing work similar to scope of this project and having record of successful in-service performance and completion of projects.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store liquid materials in unopened containers and protected from freezing.

FIELD CONDITIONS

A. Environmental Limitations: Install tile only when construction in room is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.6 WARRANTY

A. Special Manufacturer's Warranty for Membranes: Manufacturer's standard form in which manufacturer agrees to repair or replace membranes that fail in materials or workmanship within life of installation from date of Substantial Completion.

1.7 MAINTENANCE

A. Extra Materials: Furnish that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated**.**
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PRODUCTS

2.1 MANUFACTURERS

Basis of Design: Contract Documents are based on products specified below and on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Other Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section "Substitution Procedures."

2.2 TILE PRODUCTS

A. General: Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

ANSI Ceramic Tile Standard: Provide Standard Grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

SETTING AND GROUTING MATERIALS

A. Large Heavy Tile (LHT) Cementitious Mortar:

1. Product Quality Standard: ANSI A118.4HTE, ANSI A118.11, and ANSI A118.15HTE.
2. Description: Premium polymer modified product.

    a. For large and heavy tiles (dimension 15 in in any one direction).
    b. Non-sag capability for wall applications.
    c. Non-slump capability for floor applications.
    d. Suitable for bond coats from 3/32 in up to 3/4 in thick.

3. Basis of Design: Mapei Corporation; Ultraflex LFT.

B. Thin-Set Cementitious Mortar:

1. Product Quality Standard: ANSI A118.4 and ANSI A118.11.
2. Description: Professional-grade, single-component, polymer-modified product (no dimension in excess of 15 in in any direction).
3. Basis of Design: Mapei Corporation; Ultraflex 2.

C. Cementitious Grout:

1. Material Quality Standard: ANSI A118.7.
2. Description: Premium polymer modified product.

    a. Single component.
    b. Mold and mildew resistant.
    c. Rapid-setting.
    d. For joints 1/16 to 3/4 inches wide.

3. Basis of Design: Mapei Corporation; Ultracolor Plus FA.

D. Epoxy Grout:

1. Material Quality Standard: ANSI A118.3.
2. Description: Premium product.

    a. Two component, water-cleanable, 100 percent solids.
    b. Non-shrink and non-sag capability.
    c. Efflorescence free.
    d. Chemical and stain resistant.
    e. Mold and mildew resistant.

3. Basis of Design: Mapei Corporation; Kerapoxy CQ.

E. Acceptable Manufacturers:

1. Ardex Americas.
2. Bostik, Inc.
3. Custom Building Products.
4. Laticrete International Inc.
5. Mapei Corporation.
6. Merkrete Systems.
7. TEC Specialty Products Inc.

ACCESSORY MATERIALS

A. Stone Thresholds:

1. Description: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.
2. Marble Thresholds: Uniform, fine- to medium-grained white stone with gray veining according to ASTM C 503; minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241; with honed finish.

B. Metal Trim:

1. Description: Metal profiles suitable for thin-set application.
2. Basis of Design:

    a. Wall Outside Corner: Schluter Systems LP; Rondec.
    b. Wall Inside Corner: Schluter Systems LP; Dilex-AHK.
    c. Wall Top of Tile: Schluter Systems LP; Rondec.
    d. Floor to Wall: Schluter Systems LP; Dilex-AHK.
    e. Flooring Transition to Concrete: Schluter Systems LP; Reno-Ramp.
    f. Flooring Transition Edge (same thickness): Schluter Systems LP; Schiene.
    g. Flooring Transition to Carpet: Schluter Systems LP; Reno-TK.
    h. Flooring Transition to Resilient Floor: Schluter Systems LP; Reno-U.

3. Other Acceptable Manufacturers:

    a. Blanke Corporation.
    b. Ceramic Tool Co.
    c. Custom Building Products.
    d. Genesis APS International, Inc.
    e. Laticrete.
    f. Schluter Systems LP.

Movement Joint Materials:

1. Sealant:

    a. Product Quality Standard: ASTM C 920; Type S; Grade NS; Class 25; Uses T1, T2, NT, I, M, G, A, and O.
    b. Generic Type: Mildew-resistant silicone.
    c. Basis of Design: Mapei Corporation; Mapesil T.
    d. Color: As selected by Architect from manufacturer’s full range.

2. Foam Backer Rod:

    a. Product Quality Standard: ASTM C 1330, Type B.
    b. Description: As defined by ASTM Terminology C 717, extruded polyethylene, polyurethane, or polyolefin.
    c. Size: Diameter approximately 25 percent larger than joint width, unless otherwise directed by manufacturer.

Trowelable Patching Compounds:

1. Description: Latex-modified, portland cement-based formulation.

2. Basis of Design: Mapei Corporation; Mapecem Quickpatch.

E. Tile Cleaner:

1. Description: Neutral cleaner capable of removing soil and residue without harming tile and grout surfaces.
2. Basis of Design: Mapei Corporation; UltraCare Concentrated Tile and Grout Cleaner.

2.5 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions to verify actual locations, dimensions, and other conditions affecting performance of the Work.

a. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
b. Verify that concrete substrates for tile floors installed with thin set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

1) Verify that surfaces that received a steel trowel finish have been mechanically scarified.
2) Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

c. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
d. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions with trowelable patching compound according to tile-setting material manufacturer's written instructions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. General: Install underlayment products and setting materials according to manufacturer’s written installation instructions.

3.4 INSTALLATION OF TILE

A. Installation Standards:

1. Parts of ANSI A108 Series that apply to types of setting and grouting materials and to methods indicated in installation schedules.
2. TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in installation schedules.

B. Tiling Edges:

1. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated.
2. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
3. Lay out tile wainscots to next full tile beyond dimensions indicated.

C. Intersections and Returns:

1. Accurately form.
2. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items.
3. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern:

1. Lay tile in grid pattern, unless otherwise indicated.
2. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
3. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.
4. Provide uniform joint widths, unless otherwise indicated.

Joint Widths: Install tile with joint width as recommended by tile manufacturer.

Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets other floor coverings.

Movement Joints:

1. Locate movement joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

2. Locate joints in tile surfaces directly above joints in concrete substrates.
3. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
4. Installation Schedule:

    a. Expansion Joint: TCNA EJ171C.
    b. Contraction Joint: TCNA EJ171B.
    c. Construction Joint: TCNA EJ171A.
    d. Perimeter Joint: TCNA EJ171G,

Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

Tile Cleaner: Clean tile according to manufacturer’s written instructions.

Sealer for Cementitious Joints:

1. Apply according to manufacturer's written instructions.
2. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.5 ADJUSTING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

3.6 CLEANING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INSTALLATION SCHEDULE

A. Concrete Floors of Restrooms:

1. TCNA F122: Over on-ground concrete floors.

a. Epoxy grout.
b. Tile and thin-set cementitious mortar.

B. Walls of Restrooms:

1. TCNA W244C: Over cement backer board.

a. Epoxy grout.
b. Tile and thin-set cementitious mortar.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Exposed suspension system.
3. Vertical fascia trim.
4. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated, specified, or required.

Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

Acoustical Panels: Set of 6 inch square Samples of each type, color, pattern, and texture.

2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6 inch long Samples of each type, finish, and color.

C. Maintenance Data: For inclusion in maintenance manual required by appropriate Division 01 Section.

1. Include manufacturer's instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.4 FIELD CONDITIONS

Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Source Limitations: Obtain products through one source from a single manufacturer with the capacity and resources to provide products of consistent quality in appearance and physical properties.

ACOUSTICAL PANELS

Acoustical Panels:

1. Standard: Comply with ASTM E1264.
2. Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

2.3 METAL SUSPENSION SYSTEM

Metal Suspension System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635 and designated by type, structural classification, and finish indicated.

Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A641, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 inch diameter wire.

C. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A653, not less than G30 coating designation, with prefinished wide metal caps on flanges, width as indicated.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Butt-edge type.
3. Cap Material: Cold-rolled steel.

Cap Finish: Painted white.

5. Width: 15/16 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates, areas, and conditions to verify actual locations, dimensions, and other conditions affecting performance of the Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Installation Quality Standards: In addition to standards specified elsewhere, comply with the following:

1. ASTM C636.
2. CISCA's "Ceiling Systems Handbook."
3. Manufacturer's written installation instructions.

B. Layout: Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

C. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

Do not attach hangers to steel roof deck. Attach hangers to structural members.

7. Space hangers not more than 48 inches on centers along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to steel deck.

E. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

F. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.

Do not use exposed fasteners, including pop rivets, on moldings and trim.

G. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

H. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

Arrange directionally patterned acoustical panels as follows:

As indicated on reflected ceiling plans.

b. Install panels with pattern running in one direction parallel to **long** axis of space.

For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.

Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

3.4 ADJUSTING

A. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.
3. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Maintenance Data: For inclusion in maintenance manual required by appropriate Division 01 Section.

1. Include manufacturer’s instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.3 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

2.2 RESILIENT BASE

A. Resilient Base Standard: ASTM F1861.

1. Material Requirement: Type TP (rubber, thermoplastic).

2. Manufacturing Method: Group I (solid, homogeneous).
3. Inside and Outside Corners: Job formed.
4. Rolled/coiling products.

B. Minimum Thickness: 0.125 inch.

2.3 RESILIENT MOLDING ACCESSORY

A. Material: Rubber.

B. Profile and Dimensions: As indicated.

C. Colors and Patterns: Same as resilient base.

2.4 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

END OF SECTION

SECTION 096519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.
2. Luxury vinyl floor tile (planks).
3. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated, specified, or required.

B. Samples for Verification: Full-size units of each color and pattern of tile flooring required.

A. Maintenance Data: For inclusion in maintenance manual required by appropriate Division 01 Section.

1. Include manufacturer's instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed tile flooring installations similar in material, design, and extent to that indicated for this Project, who is acceptable to manufacturer, and whose work has resulted in installations with a record of successful in-service performance.

B. Mock-Ups: Before beginning Work of this Section, build as many mock-ups as required to verify selections made under submittals, to demonstrate constructed product and material qualities, to demonstrate execution of work qualities, and to verify compliance with Contract Documents.

1. Build mock-up approximately 100 sq. ft. for each type, color, and pattern.
2. Use same Subcontractors, including supervisors, which will perform work on Project.
3. Install products and materials according to specified requirements of respective Specification Sections.
4. Work results shall be representative of those to be expected for Work.
5. Obtain approval from Architect before starting Work of this Section.
6. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing.
7. Subject to compliance with requirements, approved mock-up may become part of the completed Work if undisturbed at time of Substantial Completion. Otherwise, demolish and remove mock-up from Project when directed by Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient

temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F or more than 90 degrees F. Store floor tile on flat surfaces.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.6 MAINTENANCE

A. Extra Materials: Furnish extra materials that match products installed and that are packaged with protective coverings for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

2.2 VINYL COMPOSITION FLOOR TILE

A. General: Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

B. Tile Standard: ASTM F1066, Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

2.3 LUXURY VINYL FLOOR TILE

A. Description: Click-and-lock style plank with AMP polyurethane finish coating, high performance core, and cork granule backing; embossed surface texture; microbeveled.

B. Product Standard: ASTM F3261, Class I, Type B, Grade 1, Backing Class B.

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

D. Wear Layer Thickness: 20 mils.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Prepare substrates according to following:

1. ASTM F710.
2. Manufacturer's written installation instructions.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

C. Perform preinstallation testing specified by Division 09 Section “Moisture Vapor Emission Control” and provide MVE-control systems products for those floor surfaces that do not comply with requirements.

D. Prepare substrates to comply with flatness tolerance of 1/4 inch in 10 foot as follows:

1. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

2. Remove concrete protrusions, bumps, and ridges by sanding or grinding.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by tile flooring.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay floor tiles parallel with room axis.

C. Match tile flooring for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay vinyl composition floor tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Scribe, cut, and fit tile flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, and door frames.

E. Extend tile flooring into toe spaces, door reveals, closets, and similar openings. Extend tile flooring to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.

H. Adhere tile flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING

A. Comply with manufacturer's written instructions for cleaning tile flooring.

B. Perform the following operations immediately after completing tile flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Do not wash floor until after waiting period recommended in writing by flooring manufacturer.

4. Damp mop floor to remove marks and soil using method and cleaner recommended in writing by flooring manufacturer.

3.5 PROTECTION

A. Protect tile flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

B. Do not move heavy or sharp objects directly over floor surfaces. Place hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Cover tile flooring until Substantial Completion.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Modular carpet tile and accessories indicated, specified, or required for installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required. Include manufacturer’s written installation instructions.

B. Samples for Verification: Full size Sample for each color and pattern of carpet tile required.

C. Maintenance Data: For inclusion in maintenance manual required by Division 01.

1. Include manufacturer’s instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Certified by Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.5 PROJECT CONDITIONS

A. General: Comply with CRI 104.

1.6 WARRANTY

A. Special Manufacturer's Warranty: Standard form in which manufacturer agrees to replace carpet tile that does not comply with requirements or that fails within 10 years from date of substantial completion. Warranty does not include deterioration or failure of carpet tile from unusual traffic, failure of substrate, vandalism, or abuse.

B. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1.7 MAINTENANCE

A. Extra Materials: Furnish extra materials equal to 5 percent of amount installed for each type indicated, but not less than 5 sq yd that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

2.2 MATERIALS

A. Carpet Tile: Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

2.3 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Manufacturer’s standard, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to which carpet tile will be applied for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

B. Verify that finishes of substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

3.2 PREPARATION

A. Moisture Vapor Emission Control: Evaluate concrete floors according to Division 09 Section “Moisture Vapor Emission Control” and apply MVE-control system on areas that do not comply with specified requirements.

B. Prepare substrates according to manufacturer's written instructions.

C. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION

A. Installation Quality Standards: In addition to standards listed elsewhere, perform work according to following, unless otherwise specified:

1. CRI 104.
2. Respective manufacturer's installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by manufacturer.

E. Extend into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING

A. Comply with manufacturer's written instructions for cleaning and protection.

B. Perform following operations immediately after completing installation:

1. Remove adhesive and other blemishes.
2. Sweep and vacuum thoroughly.

3.5 PROTECTION

A. Protect from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

B. Cover until substantial completion.

END OF SECTION

SECTION 097200
WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wall coverings and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of adhesive product indicated.

B. Samples for Verification: Full width by 36 inch long section of wall covering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

2.2 MATERIALS

A. Wall Covering: Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

2.3 INSTALLATION MATERIALS

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wallcovering manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Interior Painting" and recommended in writing by wall covering manufacturer for intended substrate.

C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall covering manufacturer.

D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to which wall coverings will be installed for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

G. Install wall liner, with no gaps or overlaps, where required by wall covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall covering installation until wall liner has dried.

3.3 INSTALLATION

A. Cut wall covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

B. Install strips in same order as cut from roll.

C. Install reversing every other strip.

D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

E. Match pattern 72 inches above the finish floor.

F. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall covering manufacturer.

END OF SECTION

SECTION 097763
TRANSLUCENT RESIN PANEL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Decorative translucent resin panels fabrications and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Submit product data for each product. Indicate product description, fabrication information, compliance with specified performance requirements.

B. Shop Drawings: Included plans, elevations, sections, details, and attachment to other work.

C. Samples: Submit 12 by 12 inch samples of each resin sheet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

2.2 RESIN FABRICATIONS

A. Description: Decorative resin panel combined with encapsulated decor.

2.3 FABRICATION

A. General: Fabricate resin fabrications to designs, sizes and thicknesses indicated.

B. Comply with manufacturer’s written recommendations for fabrications.

C. Shop fabricate panels to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to which resin fabrications will be installed for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Install panels, accessories, and components plumb, level, and in proper alignment.

3.3 CLEANING

A. General: Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

1. Clean and repair surfaces soiled or otherwise damaged in connection with work of this Section. Pay cost of replacing finishes or materials that cannot be satisfactorily cleaned or which have been damaged by improper cleaning materials and techniques.

END OF SECTION

SECTION 099113
INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and field painting of exposed interior surfaces.

1.2 SUBMITTALS

A. Product Data: Manufacturers technical literature for each paint system indicated, specified, or required.

1. Indicate each material and cross-reference specific coating, finish system, and application.
2. Identify each material by manufacturer's catalog number and general classification.
3. Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Detailed Painting Schedule:

1. Furnish "Detailed Painting Schedule" indicating type of surface, type of paint material, and number of coats required, as set forth in "Painting Requirements".
2. Submit brand designation and grade of indicated type produced by approved manufacturer for each application listed or required.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate, 8 by 10 inches.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Company with not less than 5 years' experience in performing specified work similar in design, products, and extent indicated for this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.

B. Mockups: Before work of this Section begins, apply coatings to demonstrate product and material qualities, to demonstrate execution of work qualities, and to verify compliance with Contract Documents. Duplicate finish of approved Sample Submittals.

1. Apply paint to following substrates:

a. Wall Surfaces: Apply coating on approximately 48 inch square substrate.
b. Linear Items: Apply coating on approximately 48 inch long substrate.

2. Use same Subcontractors, including supervisors, which will perform work on Project.
3. Install products according to specified requirements.
4. Work shall be representative of those to be expected for work.
5. Obtain approval from Architect before starting work of this Section.

6. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-up unless Architect specifically approves such deviations in writing.

Subject to compliance with requirements, approved mock-up may become part of the completed Work if undisturbed at time of Substantial Completion.

8. Final approval of colors will be from mockups.

1.4 DELIVERY AND STORAGE

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature recommended by manufacturer. Maintain storage containers in a clean condition, free of foreign materials and residue.

1.5 FIELD CONDITIONS

A. Apply paints only when temperatures of surfaces to be painted and surrounding air are between minimum and maximum range recommended by manufacturer.

B. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces unless otherwise permitted by manufacturer's printed instructions.

C. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature and humidity limits specified by manufacturer during application and drying periods.

1.6 MAINTENANCE

A. Extra Materials: Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish the Owner with an additional 3 percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied.
2. Label each container with color, color number, and texture in addition to manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products manufactured by Sherwin-Williams Co. listed under PART 3 below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. Benjamin Moore & Co.

2. PPG Paints.
3. Sherwin-Williams.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other listed acceptable manufacturers.

C. Colors: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine substrates to receive paint and associated Work for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

B. 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 shop applicators to ensure use of compatible primers.

3.2 PREPARATION

A. General:

1. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted.
2. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
3. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Surface Preparation: Prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition. Clean substrates of substances that could impair the bond of the various coatings.

1. Gypsum Board: Comply with Gypsum Association Publication GA 232.

a. Fill remaining cracks, depressions, holes and other irregularities with spackling compound.
b. Sand rough or high spots left by joint cement or spackling compound without damaging paper face.
c. Remove dust by wiping with damp cloths or vacuuming.

2. Ungalvanized Metal Surfaces:

    a. Clean surfaces that have not been shop coated to remove foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    b. 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.

3.3 MATERIAL PREPARATION

A. 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. Use only thinners approved by paint manufacturer and only within manufacturer’s recommended limits.

B. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.4 APPLICATION, GENERAL

A. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where 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.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

    a. Prefinished wood doors.
    b. Acoustical materials.
    c. Prefinished architectural woodwork and cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

    a. Furred areas.
    b. Ceiling plenums.
    c. Pipe spaces.

3. Finished metal surfaces.
4. Finished mechanical and electrical operating equipment.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

3.5 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. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
5. 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. Sand lightly between each succeeding enamel coat on metals.
9. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation.
10. Number of coats and film thickness required are the same regardless of application method.
11. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
12. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
13. Omit primer over metal surfaces that have been shop primed and touchup painted.
14. 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.
15. Ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
16. Allow sufficient time between successive coats to permit proper drying.

B. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve total dry film thickness of the entire system as recommended by manufacturer.

C. 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.

D. 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.

E. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.6 ADJUSTING

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

3.7 CLEANING

A. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.8 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repainting, repairing or replacing. Coordinate corrections with other trades involved.

3.9 INTERIOR PAINT SCHEDULE

A. Gypsum Board Walls - Latex - Eg-shel:

1. 1st Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2. 2nd Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex - Low Gloss Eg-Shel, B41-2600.
3. 3rd Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex - Low Gloss Eg-Shel, B41-2600.

B. Previously Painted Gypsum Board Walls - Latex - Eg-shel:

1. 1st Coat for new Gypsum Board Patches: Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2. 2nd Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex - Low Gloss Eg-Shel, B41-2600.
3. 3rd Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex - Low Gloss Eg-Shel, B41-2600.

C. Gypsum Board Ceilings - Latex - Flat:

1. 1st Coat: Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2. 2nd Coat: Sherwin Williams; ProMar 200 Zero VOC Latex Flat, B30-2600.
3. 3rd Coat: Sherwin Williams; ProMar 200 Zero VOC Latex Flat, B30-2600.

D. Ferrous Metal - Acrylic Polyurethane - Semi-Gloss:

1. First Coat: Sherwin Williams; Macropoxy 646 Fast Cure Epoxy, B58-600.
2. Second Coat: Sherwin Williams; Acrolon 218 HS Acrylic Polyurethane, B65-650.
3. Third Coat: Sherwin Williams; Acrolon 218 HS Acrylic Polyurethane, B65-650.

END OF SECTION

SECTION 099653
ELASTOMERIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and application of elastomeric coatings to the following exterior substrates:

1. Portland cement plaster.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated.

B. Samples for Initial Selection: Color chips representing manufacturer's full range of available colors.

C. Samples for Verification: For each type of elastomeric coating indicated and in each color and gloss.

1. Submit Samples on same type of substrate as that to receive application, 8 inches square.
2. Step coats on Samples to show each separate coat, including primers and block fillers as applicable.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.3 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

1. Maintain containers in clean condition, free of foreign materials and residue.

1.5 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 90 deg F unless otherwise permitted by manufacturer's written instructions.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before starting or continuing coating operation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace elastomeric coatings that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Water penetration through the coating.
b. Deterioration of coating beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

1.7 MAINTENANCE

A. Extra Materials: Furnish extra elastomeric coating materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish an additional 3 percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied.
2. Label each container with color, color number, texture, in addition to manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products manufactured by Sherwin-Williams Protective and Marine Coatings listed under PART 3 below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Division 01 Section “Substitution Procedures.”

1. Benjamin Moore & Co.
2. ICI Paints.
3. Kelly-Moore Paint Company Inc.
4. PPG Paints.
5. Sto Corp.
6. Tnemec Company, Inc.

2.2 COATINGS

A. Crack Fillers: Elastomeric coating manufacturers recommended, factory-formulated crack fillers or sealants, including crack filler primers, compatible with substrate and other materials indicated.

B. Block Fillers: Elastomeric coating manufacturers recommended, factory-formulated, high-performance latex block filler compatible with substrate and other materials indicated.

C. Primer: Elastomeric coating manufacturer's recommended, factory-formulated, alkali-resistant primer compatible with substrate and other materials indicated.

D. Elastomeric Coating: Factory-formulated, high build acrylic coating compatible with substrate and other materials indicated.

1. Surface Profile: Smooth.
2. Colors: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

    a. Begin coating only when moisture content of substrate is 12 percent or less when measured with an electronic moisture meter.
    b. Begin coating no sooner than 28 days after substrate is constructed and is visually dry on both sides.
    c. Verify that substrate is within the range of alkalinity recommended by manufacturer.

2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and applicable to substrates and coating systems indicated.

B. Remove hardware and hardware accessories, plates, machined surfaces, light fixtures, and similar items already installed that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
2. Perform cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

D. Crack Repair: Fill cracks according to manufacturer's written instructions before coating surfaces.

3.3 APPLICATION

A. Apply elastomeric coatings according to manufacturer's written instructions.

1. Use equipment and techniques best suited for substrate and type of material being applied.
2. Coat surfaces behind movable items the same as similar exposed surfaces.
3. Apply each coat separately according to manufacturer's written instructions.

B. Primers: Apply at a rate to ensure complete coverage.

C. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats similar to color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform finish, color, and appearance.

E. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

F. Apply coatings to prepared surfaces as soon as practicable after preparation and before subsequent surface soiling or deterioration.

G. Spray Application: Use spray equipment for application only when permitted by authorities having jurisdiction. Wherever spray application is used, do not double back with spray equipment to build up film thickness of two coats in one pass.

3.4 CLEANING

A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 ADJUSTING

A. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 CLEANING

A. After completing coating application, clean spattered surfaces. Remove spattered coating by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.7 PROTECTION

A. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

3.8 EXTERIOR COATING SCHEDULE

A. Acrylic Finish:

1. Block Filler: Sherwin Williams; ConFlex Block Filler, CF1W50.
2. Primer: Sherwin Williams; Loxon Concrete and Masonry Primer-Sealer, LX02W50.
3. Elastomeric Coating: Sherwin Williams; ConFlex XL Smooth High Build 100% Acrylic Coating, CF11W50 Series.

END OF SECTION

SECTION 101116
GLASS MARKERBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Glass markerboards and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Samples for Verification: Not less than 8-1/2 by 11 inches.

C. Maintenance Data: To include in maintenance manuals.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver glass markerboards completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

1. Best-Rite; MooreCo, Inc.
2. Claridge Products and Equipment.
3. Clarus Glassboards.
4. Egan Visual Inc.

2.2 GLASS MARKERBOARDS

A. Description: 6 mm thick tempered glass markerboard, magnetic, with smooth polished edge and eased corners; color coated on back surface.

1. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
2. Color: As indicated on the Drawings.

B. Mounting: Manufacturer’s concealed hardware.

C. Marker Tray: Glass, supported by stainless-steel clips.

D. Size: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General: Install glass markerboards in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb.

3.3 CLEANING

A. Clean glass markerboards according to manufacturer's written instructions.

END OF SECTION

SECTION 101423
ROOM IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Room identification signs that are directly attached to interior walls and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

B. Shop Drawings:

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size sample.
2. Full-size samples, if approved, will be returned to Contractor for use in Project.

D. Maintenance Data: For signs to include in maintenance manuals.

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

1. APCO Graphics, Inc.
2. Inpro Corporation.
3. Mohawk Sign Systems.

4. Seton Identification Products.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable accessibility provisions indicated on the Drawings.

2.3 ROOM IDENTIFICATION SIGNS

A. Room-Identification Sign: Signs with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Surface Mounting: Two face tape.
2. Text and Typeface: Accessible raised characters and Braille of typeface as selected by Architect from manufacturer's full range and variable content as scheduled.

2.4 SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign.

B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Method: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until date of Substantal Completion.

END OF SECTION

SECTION 101453
TRAFFIC CONTROL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Following non-illuminated signage and accessories indicated, specified, or required to complete installation:

1. Premanufactured post and panel signs.
2. Custom fabricated post and panel signs.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each product.

B. Shop Drawings:

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights.
3. Show message list, typestyles, and layout for each custom fabricated sign.

1.3 QUALITY ASSURANCE

A. Accessibility Standard: Comply with applicable provisions of standards indicated on the Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

2.2 PREMANUFACTURED POST AND PANEL SIGNS

A. Sign Description: Sign of single-panel configuration; and as follows:

1. Single-Panel Sign:

a. Material: Aluminum.
b. Material Thickness: Manufacturer’s standard.
c. Corner Condition in Elevation: Rounded.
d. Finish and Color: Black text over painted color background.
e. Sign Message: As indicated on the Drawings.

2. Sign Mounting: Single posts.
3. Posts: Galvanized steel.

a. Shape: Round.
b. Size: As indicated on the Drawings.

c. Installation Method: Direct burial.

4. Typeface: Arial.

B. Acceptable Manufacturers:

1. Road Traffic Signs.
2. Traffic Sign Store.
3. TrafficSigns.com.

2.3 CUSTOM FABRICATED POST AND PANEL SIGNS

A. Sign Description: Signs with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded-aluminum, hollow-box-type frame with vertical edges attached to supports. Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.

a. Hollow-Box Depth: 2 inches.
b. Profile: Square.
c. Corner Condition in Elevation: Square.
d. Finish and Color: Black text on clear anodized sign.
e. Sign Message: As indicated on the Drawings.

2. Painted Finish: Manufacturer's standard, factory-applied exterior-grade sign paint.
3. Typeface: Arial.

B. Acceptable Manufacturers:

1. 2/90 Sign Systems.
2. ASI.
3. CCSW Architectural Graphics and Sign Systems.

2.4 MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Steel Materials:

1. Steel Tubing or Pipe: ASTM A500, Grade B; hot-dip galvanized.
2. Bolts: ASTM A307 or ASTM F3125, Grade A325 as necessary for connection details.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible.
2. Mill joints to tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

B. Sign Panel: Construct sign panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

C. Post Fabrication: Fabricate posts designed for structural performance indicated and of lengths required for installation method indicated for each sign.

1. Steel Posts: Fabricate from steel tubing unless otherwise indicated. Include post caps.

a. Hot-dip galvanize post assemblies after fabrication according to ASTM A123.

2. Direct Burial: Fabricate posts 36 inches longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.

3.3 INSTALLING POSTS

A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet.

B. Direct-Burial Method:

1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
2. Setting in Earth: Set post in position, support to prevent movement, and backfill with satisfactory soil or well-graded aggregate as recommended in writing by manufacturer. Place and compact backfill in 6 inch lifts, compacting each lift.

3.4 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 102113
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Solid-plastic toilet compartments configured as toilet enclosures and urinal screens and accessories indicated, specified, or required to complete installation.

1.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable accessibility provisions in for toilet compartments designated as accessible.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: Include plans, elevations, sections, details, and attachment details.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6 inch square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

D. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Scranton Products.

2. Product: Hiny Hiders Toilet Partitions.
3. Color: As selected by the Architect from manufacturer's full range.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

A. Toilet-Enclosure Style: Floor mounted / overhead braced.

B. Urinal-Screen Style: Wall hung.

C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.

D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

E. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; polymer or extruded aluminum.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062 inch thick stainless-steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Plastic Material: Solid, high-density polyethylene (HDPE) material.

B. Aluminum Extrusions: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24 inch wide, in-swinging doors for standard toilet compartments and 36 inch wide, out-swinging doors with a minimum 32 inch wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster

with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102239
FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manually operated, acoustical panel partitions and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

B. Shop Drawings: For operable panel partitions.

1. Include plans, elevations, sections, and attachment details.
2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.

1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Textile Facing Material: Full width by not less than 36 inch long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
2. Panel Edge Material: Not less than 3 inches long.
3. Hardware: One of each exposed door-operating device.

E. Sample Warranty: For manufacturer's special warranty.

F. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
b. Seals, hardware, track, track switches, carriers, and other operating components.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

1.6 MAINTENANCE

A. Extra Materials: Furnish from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

1. Manufacturer: Hufcor.
2. Product: Series 642.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

1. Advanced Equipment Corporation.
2. Hufcor.
3. KWIK-WALL Company.
4. Moderco Inc.
5. Modernfold, Inc.
6. Panelfold, Inc.

2.2 OPERABLE ACOUSTICAL PANELS

A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.

B. Panel Operation: Manually operated, paired panels.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

1. Panel Width: Equal widths.

E. STC: Not less than 47.

F. Panel Thickness: Nominal dimension of 4 inches.

G. Panel Materials:

1. Steel Frame: Steel sheet, manufacturer's standard minimum thickness for uncoated steel.
2. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard minimum thickness for uncoated steel.
3. Medium-Density Fiberboard: ANSI A208.2.

H. Panel Closure: Manufacturer's standard unless otherwise indicated.

I. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

1. Hinges: Manufacturer's standard.

2.3 SEALS

A. Description: Seals that produce operable panel partitions complying with performance requirements and the following:

1. Manufacturer's standard seals unless otherwise indicated.
2. Seals made from materials and in profiles that minimize sound leakage.
3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.

B. Vertical Seals: Deep-nesting, interlocking[steel] astragals mounted on each edge of panel, with continuous, resilient acoustical seal.

C. Horizontal Top Seals: Continuous-contact, resilient seal exerting uniform constant pressure on track.

D. Horizontal Bottom Seals: Manufacturer's standard continuous-contact seal exerting uniform constant pressure on floor.

2.4 PANEL FINISH FACINGS

A. Description: Finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.

1. Apply facings free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with invisible seams complying with Shop Drawings for location, and with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
2. Match facing pattern 72 inches above finished floor.

B. Carpet Wall Covering: Manufacturer's standard[nonwoven, needle-punched carpet with fibers fused to backing], from same dye lot, treated to resist stains.

1. Color/Pattern: [Match Architect's samples] [As selected by Architect from manufacturer's full range] <Insert color/pattern>.

C. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:

1. Steel, Painted: Finished with manufacturer's color as selected by Architect from manufacturer's full range.

2.5 SUSPENSION SYSTEMS

A. Tracks: Steel or aluminum [mounted directly to overhead structural support,] [with adjustable steel hanger rods for overhead support,] designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.

B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

1. Multidirectional Carriers: Capable of negotiating intersections without track switches.

C. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

B. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

C. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.3 ADJUSTING

A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 102813
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Toilet accessories and other accessories necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product or component indicated, specified, or required.

1. Include construction details and dimensions.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include material and finish descriptions.
4. Include manufacturer's warranty.

B. Maintenance Data: For inclusion in maintenance manual required by the appropriate Division 01 Section.

1. Include manufacturer's instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

B. Other Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of manufacturers listed alphabetically below. If not listed, submit as substitution according to Conditions of the Contract and Division 01 Sections.

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031 inch minimum nominal thickness, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

C. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear glass mirrors, nominal 6.0 mm thick.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper- and theft-resistant where exposed, and of galvanized wteel where concealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf when tested according to ASTM F 446.

D. Install accessories tight to the wall and seal with sealant.

3.3 ADJUSTING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

3.4 CLEANING

A. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 102814
BABY CHANGING STATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Baby Changing Stations, Stainless Steel:

1. Recessed-mounted horizontal design.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for each product specified, including the following.

1. Installation instructions and recommendations, including templates and rough-in measurements.
2. Storage and handling requirements and recommendations.
3. Cleaning and maintenance instructions.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 5 years successful experience manufacturing similar products.

B. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA, ICC A117.1, International Building Code (IBC), and state building code requirements as applicable.

C. Product Standards: Provide products which comply with the following standards and requirements.

1. Antimicrobial Treatment: Changing surfaces embedded with Microban®, with antibacterial claim substantiated by Kirby-Bauer test or other manufacturer approved equivalent standard industry test methodology.
2. Americans with Disabilities Act (ADA).
3. ICC A117.1 - Accessible and Usable Building and Facilities.
4. ANSI Z535.4 - Product Safety Signs and Labels.
5. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
6. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
7. TAS – Texas Accessibility Standard
8. European Standards: EN 12221 Changing units for domestic use.
9. CPSIA: Conformity with the U.S. Product Safety Commission product safety rules, bans, standards and regulations that include applicable chemical compliance requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.5 WARRANTY

A. Manufacturer's Warranties: Submit manufacturer's standard 5 year warranty for materials and workmanship and include a provision for replacement caused by vandalism.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Koala Kare Products, a Division of Bobrick, www.koalabear.com. Location of manufacturing shall be the United States.

B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

2.2 BABY CHANGING STATIONS, STAINLESS STEEL

A. Recessed-Mounted Horizontal Design Stainless Steel Changing Station:

1. Basis of Design: Model KB310-SSRE with external stainless steel bag hook as manufactured by Koala Kare Products, a Division of Bobrick.
2. Handles: Station shall have two solid handles that allow operation with less than 5 lbs. of force. Handles rest below 27" for cane detection when unit is in the down position.
3. Front Panel shall be deep drawn, one-piece, seamless, 18-8, Type 304, 20 gauge (0.91mm) stainless steel with satin finish and laser etched logo with rounded corners.
4. Aesthetics: Unit shall have no plastic covering or visible plastic on the front of the unit and no adhesive labels applied to the front panel.
5. Flange: Deep drawn, one-piece seamless, 18-8, Type 304, 18 gauge (1.2 mm) stainless steel with satin finish. Flange edges and corners shall have radii that complements the arc on the top, bottom, and side edges of the front panel.
6. Frame and Hinge Mechanism: Concealed 11-gauge chassis, compromised of 1" diameter integral steel-tubing that supports the changing bed and interacts with 11-gauge steel wall mounting bracket to provide steel-on-steel hinge stop. The wall frame shall serve as wall-mounting bracket.
7. External Diaper Bag Hook: 18-8, Type 304, 3/4 inch (19mm) diameter, wall-mounted, solid stainless steel rod with satin-finish.
8. Bed Surface: injection molded polypropylene with Microban® antimicrobial additive, and ISO 22196 tested for efficacy.
9. Surface is contoured, concave and smooth. Bed surface shall be minimum 535 sq. in.
10. Performance: Unit has minimal deflection from 90 degrees with a 200 lbs. static load placed in the center of the changing surface. Unit exceeds ASTM Standard F2285 static load requirement of 100 lbs.
11. Complies with requirements applicable in the jurisdiction of the project, including but not limited to ADA, TAS, ICC A117.1, International Building Code (IBC), and state building code requirements as applicable. Also complies with ASTM Standard F2285, Standard Consumer Safety Performance Specification for Diaper Changing Stations for Commercial use and EN 12221 for changing units for domestic use.
12. Dual Cavity Dispenser: Includes integral spring tab to make dispensing bed liners and diaper disposal sacks easier. Total 50 liner capacity. Equipped with tumbler lock, keyed alike Bobrick restroom accessories.

13. Operation: Concealed pneumatic cylinder providing controlled opening and closing of the changing station bed.
14. Instruction Graphics: Universal instruction graphics and safety messages in multiple languages.
15. Safety Straps: Replaceable, restraining straps.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

1. Verify wall blocking has been installed properly.
2. Verify wall location does not interfere with door swings or use of fixtures.
3. Use fasteners and anchors suitable for wall substrate and project conditions.
4. Install units at location and height indicated on the Drawings.
5. Install units level, plumb and in proper relationship with adjacent construction.
6. Adjust for proper operation.

3.2 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 123619
WOOD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood countertops.
2. Shop finishing of wood countertops.
3. Accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

1. Detail fabrication and installation, including field joints.
2. Show locations and sizes of cutouts and holes for items installed in wood countertops.

C. Samples for Verification: Wood specified in fabricator's standard size.

D. Maintenance Data: For wood countertops to include in maintenance manuals. Include product data for wood-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep finished surfaces of countertops covered with protective covering during handling and installation.

1.5 FIELD CONDITIONS

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

B. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 WOOD COUNTERTOPS

A. Quality Standard: AWI's "Architectural Woodwork Standards."

B. Grade: Premium.

C. Wood Selection: As indicated on the Drawings.

2.2 MISCELLANEOUS MATERIALS

A. Installation Adhesive: Formulated for wood and that are recommended by fabricator for the application indicated.

2.3 FABRICATION

A. Fabricate wood countertops to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.4 SHOP FINISHING

A. General: Finish wood countertops at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Transparent Finish:

1. Grade: Premium.
2. Finish: System - 12, water-based polyurethane.
3. Staining: None required.
4. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. Before installation, condition wood countertops to average prevailing humidity conditions in installation areas for not less than 72 hours.

B. Before installing wood countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and application of backpriming.

3.3 INSTALLATION

A. Grade: Install wood countertops to comply with same grade as item to be installed.

B. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8 inch in 96 inches variation from a straight, level plane.
2. Secure backsplashes to walls with adhesive.
3. Seal joints between countertop and backsplash, and joints where countertop and backsplash abut walls with sealant specified in Section 079200 "Joint Sealants."

D. Shop Finishes: Touch up finishing after installation of wood countertops.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective wood countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean wood countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION

SECTION 123661
SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surfacing countertops.
2. Related materials necessary to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work. Show locations and sizes of cutouts and holes for plumbing fixtures, accessories and other items installed in countertops.

C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for simulated stone materials.

D. Samples for Verification Purposes: For simulated stone material, 6 in square, showing color and pattern selected.

E. Manufacturer’s Special Warranty: Sample of unexecuted warranty stating obligations, remedies, limitations, and exclusions.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Installer Qualifications: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.

1.4 FIELD CONDITIONS

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

B. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.5 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's written material and labor warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials and labor required to repair or replace work which exhibits material defects caused by manufacture or design and installation of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Warranty Period: Manufacturer shall warrant the products to be free from material and labor Defects for a period of 10 years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

1. Avonite Surfaces.
2. Corian.
3. E. I. du Pont de Nemours and Company.
4. Formica Corporation.
5. Hi-Macs.
6. LG Chemical, Ltd.
7. Meganite Inc.
8. Samsung Chemical USA, Inc.
9. Swan Corporation (The).
10. Transolid, Inc.
11. Wilsonart International.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer/fabricator. Provide secondary materials only as recommended by manufacturer/fabricator of primary materials.

2.3 COUNTERTOP MATERIALS

A. Solid Surface Material: Homogenous solid sheets of filled plastic resin complying with ANSI SS1.

2.4 ACCESSORIES

A. Adhesives: Manufacturers recommended adhesive.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Not more than 250 g/L.

B. Backsplash: Preformed 4 in high coved backsplash, to match countertop.

C. Front Edge Trim: Preformed 1-1/2 in, to match countertops.

D. Accessories: Provide joint seam adhesives and other items required for a complete installation as recommended in writing by simulated stone manufacturer.

E. Sealant: Mildew resistant silicone sealant as specified in Division 07 Section “Joint Sealants”.

2.5 FABRICATION OF COUNTERTOPS

A. Accurately cut holes and drill countertop panels to receive plumbing, fixtures, soap dispensers and other accessories. Obtain field measurements prior to fabrication and maintain minimum clearance at walls.

B. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with simulated stone manufacturer’s written recommendations for adhesives, sealers, fabrication, and finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

A. General: Comply with manufacturer’s instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.3 INSTALLATION

A. Install countertops over plywood sub-tops secured to sub-framing supports with full spread of silicone adhesive in accordance with manufacturer’s recommendations.

B. Set countertops to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.

C. Align adjacent countertops and form seams to comply with manufacturer’s written recommendations using adhesive in color to match countertop.

D. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Secure backsplashes to tops and walls with adhesive.

F. Caulk space between backsplash and wall with sealant specified in Division 07 Section “Joint Sealants”.

G. Prepare ends and edges of simulated stone pieces to be joined according to the manufacturer’s/fabricator's recommendations for position and angle of butted joint. Lightly sand and thoroughly clean to remove dirt and grease. Join pieces with adhesive clamped until fully cured. Buff and sand to produce a smooth uniform seamless surface.

H. Apply sealant and compress to form bond with simulated stone material and adjacent surfaces and tool sealant surface to clean, straight lines.

3.4 CLEANING

A. Promptly clean simulated stone as work progresses to minimize final cleaning. Do not leave adhesive or sealant to dry on simulated stone faces.

B. Final clean and protect installed countertops in accordance with manufacturer's instructions.

END OF SECTION

SECTION 126413
BENCH CUSHION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bench cushion.
2. Related materials necessary to complete installation

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical product literature for each type of product indicated, specified, or required.

B. Samples for Verification: 24 inch square Sample of fabric.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design for Fabric: Contract Documents are based on products specified on the Drawings to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in Contract Documents is not changed, as judged by Architect.

2.2 MATERIALS

A. Fabric: Products that are equivalent to color, texture, pattern, finish, appearance, and material quality characteristics indicated by basis of design selection.

B. Cushion Materials: Manufacturer's standard and as follows according to the Polyurethane Foam Association Standard 4.0:

1. Polymer Density for Seat Cushions: 3.4 lbs./cu. ft., minimum.

a. Thickness: As indicated on the Drawings.

2. Indentation Force Deflection (IFD) for Seat Cushions: 80 lbs.
3. Support Factor for Seat Cushions: 2.1.
4. Coils: 12 gauge, steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. Install bench cushion.

END OF SECTION

SECTION 211313
WET PIP SPRINKLER SYSTEMS FIRE PROTECTION

PART 1 - GENERAL

1.1 REFERENCES

A. AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

1. ASSE 1013 (2011) Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers
2. ASSE 1015 (2011) Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies

B. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C104/A21.4 (2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
3. AWWA M14 (2015) Manual: Recommended Practice for Backflow Prevention and Cross-Connection Control

C. ASTM INTERNATIONAL (ASTM)

1. ASTM A47/A47M (1999) Standard Specification for Ferritic Malleable Iron Castings
2. ASTM A53/A53M (2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
3. ASTM A183 (2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
4. ASTM A536 (1984) Standard Specification for Ductile Iron Castings

D. FM GLOBAL (FM)

1. FM APP GUIDE (updated on-line) Approval Guide http://www.approvalguide.com/
2. FM 1637 (2010) Flexible Sprinkler Hose with Threaded End Fittings

E. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 13 (2022) Standard for the Installation of Sprinkler Systems
2. NFPA 24 (2019) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
3. NFPA 291 (2019) Recommended Practice for Fire Flow Testing and Marking of Hydrants

F. UNDERWRITERS LABORATORIES (UL)

1.2 SYSTEM DESCRIPTION

A. Hydraulic Design

1. Basis for Calculations

a. A waterflow test was performed on xx/xx/xxxx for xxxx at xxxx and resulted in a static pressure of xx psi with a residual pressure of xx psi while flowing xxxx gpm. Perform a fire hydrant flow test prior to shop drawing submittal in accordance with NFPA 291.

Results must include hydrant elevations relative to the building and hydrant number/identifiers for the tested hydrants, including which were flowed, which had a gauge. This information must be presented in a tabular form if multiple hydrants were flowed. The results must be included with the hydraulic calculations. Hydraulic calculations must be based on flow test noted in this paragraph. Hydraulic calculations must be based upon the Hazen-Williams formula with a "C" value noted in NFPA 13 for piping.

2. Hydraulic Calculations

a. Water supply curves and system requirements must be plotted on semi-logarithmic graph.
b. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, minimum discharge pressures and minimum flows. Elevations of hydraulic reference points (nodes) must be indicated.
c. Documentation must identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe.
d. Where the sprinkler system is supplied by interconnected risers, the sprinkler system must be hydraulically calculated using the hydraulically most demanding single riser. The calculations must not assume the simultaneous use of more than one riser.
e. All calculations must include the backflow preventer manufacturer's stated friction loss at the design flow.
f. All calculations must be performed back to the actual location of the flow test, taking into account the direction of flow in the service main at the test location.
g. For gridded systems, calculations must show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. A flow diagram indicating the quantity and direction of flows must be included.

3. Design Criteria

a. Hydraulically design the system to discharge a minimum density as indicated on the drawings or must be in accordance with the Area/Density Method of NFPA 13. Add an allowance for exterior and interior hose streams as required by NFPA 13.

B. Sprinkler Coverage

1. Provide coverage throughout 100 percent of the area noted on the Contract drawings. This includes, but is not limited to, telephone rooms, electrical equipment rooms (regardless of the fire resistance rating of the enclosure), boiler rooms, switchgear rooms, transformer rooms, attached electrical vaults and other electrical and mechanical spaces. Coverage per sprinkler must be in accordance with NFPA 13. Provide sprinklers below all obstructions in accordance with NFPA 13.

2. Qualified Fire Protection Engineer (QFPE)

1. An individual who is a licensed professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience.

1.3 SUBMITTALS

A. Shop drawings, product data and calculations must be prepared by the designer and combined and submitted as one complete package. The QFPE must review the submittal package for completeness and compliance with the Contract provisions prior to submission.

B. Submit the following:

1. Shop Drawings
2. Product Data

    a. Pipe
    b. Fittings
    c. Valves, including gate, check, butterfly, and globe
    d. Alarm Valves
    e. Relief Valves
    f. Sprinklers
    g. Pipe hangers and Supports
    h. Sprinkler alarm switch
    i. Valve supervisory (tamper) switch
    j. Fire department connection
    k. Backflow prevention assembly
    l. Air vent
    m. Hose valve
    n. Seismic bracing
    o. Nameplates

3. Design Data

    a. Seismic bracing
    b. Load calculations for sizing of seismic bracing
    c. Hydraulic calculations

4. Test Reports

    a. Test procedures

5. Certificates

    a. Verification of Compliant Installation

6. Operation and Maintenance Data

    a. Operating and Maintenance (O&M) Instructions
    b. Spare Parts Data

7. Closeout Submittals

    a. As-built drawings

1.4 QUALITY ASSURANCE

A. Preconstruction Submittals - Within 36 days of contract award but no less than 14 days prior to commencing work on site, the prime Contractor must submit drawings, calculations and product data for review and approval.

1. Shop Drawing -copies of the shop drawings, no later than 28 days prior to the start of system installation. Working drawings conforming to the requirements prescribed in NFPA 13. Each set of drawings must include the following:

    a. A descriptive index with drawings listed in sequence by number. A legend sheet

identifying device symbols, nomenclature, and conventions used in the package.

b. Floor plans drawn to a scale not less than 1/8-inch equals 1-foot clearly showing locations of devices, equipment, risers, and other details required to clearly describe the proposed arrangement.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross mains and branch lines to finished floor and roof or ceiling.

d. Longitudinal and transverse building sections showing typical branch line and cross main pipe routing, elevation of each typical sprinkler above finished floor and elevation of "cloud" or false ceilings in relation to the building ceilings.

e. Plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance.

f. Riser layout drawings drawn to a scale of not less than 1/2-inch equals 1-foot to show details of each system component, clearances between each other and from other equipment and construction in the room.

g. Details of each type of riser assembly, pipe hanger, sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. The dimension from the edge of vertical piping to the nearest adjacent wall(s) must be indicated on the drawings when vertical piping is located in stairs or other portions of the means of egress.

h. Details of each type of pipe hanger, seismic bracing/restraint and related components.

i. Include fire pump curve with shop drawings and hydraulic calculations, if applicable.

2. Product Data

a. Annotated catalog data to show the specific model, type, and size of each item. The data must be highlighted to show model, size, options, and other pertinent information, that are intended for consideration. Data must be adequate to demonstrate compliance with all contract requirements. Product data for all equipment must be combined into a single submittal.

3. Hydraulic Calculations

a. Calculations must be as outlined in NFPA 13 except that calculations must be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings.

4. Operating and Maintenance Instructions

a. Provide 3 hard copy manuals and one pdf version on electronic media. The manuals must include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

B. Qualifications

1. Sprinkler System Designer

a. The sprinkler system designer must be certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Water-Based Systems Layout subfield of Fire Protection Engineering Technology.

2. Sprinkler System Installer

a. The sprinkler system installer must be regularly engaged in the installation of the type and complexity of system specified in the contract documents, and must have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

C. Regulatory Requirements

1. Equipment and material must be listed or approved. Listed or approved, as used in this Section, means listed, labeled or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of an item or equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation are mandatory requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect all equipment delivered and placed in storage from the weather, excessive humidity and temperature variations, dirt and dust, or other contaminants. All pipes must be either capped or plugged until installed.

1.6 EXTRA MATERIALS

A. Spare sprinklers and wrench(es) must be provided as spare parts in accordance with NFPA 13.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Standard Products

1. Provide materials, equipment, and devices listed for fire protection service when so required by NFPA 13 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for a classification of material. Material and equipment must be standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid.

B. Nameplates

1. Major components of equipment must have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new name plate permanently affixed to the item or equipment. Nameplates must be etched metal or plastic, permanently attached by screws to control units, panels or adjacent walls.

C. Identification and Marking

1. Pipe and fitting markings must include name or identifying symbol of manufacturer and nominal size. Pipe must be marked with ASTM designation. Valves and equipment markings must have name or identifying symbol of manufacturer, specific model number, nominal size, name of device, arrow indicating direction of flow, and position of installation (horizontal or vertical), except if valve can be installed in either position. Markings must be

included on the body casting or on an etched or stamped metal nameplate permanently on the valve or cover plate.

D. Pressure Rating

1. Valves, fittings, couplings, alarm switches, and similar devices must be rated for the maximum working pressures that can be experienced in the system, but in no case less than 175 psi.

2.2 ABOVEGROUND PIPING COMPONENTS

A. Steel Piping Components

1. Steel Pipe

a. Except as modified herein, steel pipe must be black as permitted by NFPA 13 and conform to the applicable provisions of ASTM A53, ASTM A135 or ASTM A153.
b. Steel pipe must be minimum Schedule 40 for sizes 2 inches and less; and minimum Schedule 10 for sizes larger than 2 inches.

2. Fittings

a. Fittings must be welded, threaded, or grooved-end type. Threaded fittings must be cast-iron conforming to ASME B16.4, malleable-iron conforming to ASME B16.3 or ductile-iron conforming to ASTM A536. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe, steel press fittings and field welded fittings are not permitted. Fittings, mechanical couplings, and rubber gaskets must be supplied by the same manufacturer. Threaded fittings must use Teflon tape or manufacturer's approved joint compound. Saddle tees using rubber gasketed fittings are permitted only when connecting to existing piping for additions or modifications. Saddle tees must use a connection method that completely wraps around the pipe. Reducing couplings are not permitted except as allowed by NFPA 13.

3. Grooved Mechanical Joints and Fittings

a. Joints and fittings must be designed for not less than 175 psi service and the product of the same manufacturer. Field welded fittings must not be used. Fitting and coupling housing must be malleable-iron conforming to ASTM A47, Grade 32510; ductile-iron conforming to ASTM A536, Grade 65-45-12. Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 2 inches and larger. Gasket must be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts must be heat-treated steel conforming to ASTM A183 and must be cadmium-plated or zinc-electroplated.

4. Flanges

a. Flanges must conform to NFPA 13 and ASME 816.1. Gaskets must be non-asbestos compressed material in accordance with ASME 816.21, 1/16-inch thick, and full face or self-centering flat ring type.

B. Flexible Sprinkler Hose

1. The use of flexible hose is permitted. Flexible sprinkler hose must comply with UL 2443 and FM 1637.

C. Pipe Hangers and Supports

1. Provide galvanized pipe hangers, supports and seismic bracing in accordance with NFPA 13. Design and install seismic protection in accordance with the requirements of NFPA 13 section titled "Protection of Piping Against Damage Where Subject to Earthquakes for Seismic Design Category as designated by the Structural Engineer of Record.

D. Valves

1. Provide valves of types approved for fire service. Valves must open by counterclockwise rotation.
2. Control Valve

a. Manually operated sprinkler control/gate valve must be outside stem and yoke (OS&Y) type or butterfly type as indicated on the drawings and must be listed.

3. Check Valves

a. Check valves must comply with UL 312

4. Hose Valve

a. Valve must comply with UL 668.

2.3 SPRINKLERS

A. Sprinklers must comply with UL 199 and NFPA 13. Sprinklers with internal 0-rings are not acceptable. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters must have temperature classification in accordance with NFPA 13.

B. Pendent Sprinkler

1. Pendent sprinkler must be recessed quick-response type with a nominal K-factor of 5.6. Pendent sprinklers must have an architect approved finish. Assembly must include an integral and matching escutcheon.

C. Upright Sprinkler

1. Upright sprinkler must be quick-response type and have a nominal K-factor of 5.6. Upright sprinklers must have an architect approved finish.

D. Sidewall Sprinkler

1. Sidewall sprinkler must be recessed quick-response type with a nominal K-factor of 5.6. Sidewall sprinkler must have an architect approved finish.

E. Concealed Sprinkler

1. Concealed sprinkler must be quick-response type and have a nominal K-factor of 5.6. Cover plate must have an architect approved finish.

2.4 ACCESSORIES

A. Sprinkler Cabinets

1. Provide spare sprinklers in accordance with NFPA 13 and must be placed in a suitable metal or plastic cabinet of sufficient size to accommodate all the spare sprinklers and wrenches in designated locations. Spare sprinklers must be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed as required by NFPA 13. At least one wrench of each type required must be provided.

B. Pendent Sprinkler Escutcheon

1. Escutcheon must be one-piece metallic type with a depth of less than 3/4-inch and suitable for installation on pendent sprinklers. The escutcheon must have a factory finish that matches the pendent sprinkler.

C. Pipe Escutcheon

1. Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

D. Sprinkler Guard

1. Listed guard must be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards must be provided on sprinklers located within 7 feet of the floor and/or as indicated.

E. Relief Valve

1. Relief valves must be listed and installed at the riser in accordance with NFPA 13.

F. Air Vent

1. Air vents must be of the automatic type and piped to drain to the building exterior.

G. Identification Sign

1. Valve identification sign must be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gage steel or 0.024-inch aluminum with red letters on a white background or white letters on red background. Wording of sign must include, but not be limited to "main drain", "auxiliary drain", "inspector's test", "alarm test", "alarm line", and similar wording as required to identify operational components. Where there is more than one sprinkler system, signage must include specific details as to the respective system.

PART 3 - EXECUTION

3.1 VERIFYING ACTUAL FIELD CONDITIONS

A. Before commencing work, examine all adjoining work on which the contractor's work that is dependent for perfect workmanship according to the intent of this specification section, and report to the Contracting Officer's Representative a condition that prevents performance of first class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

3.2 INSTALLATION

A. The installation must be in accordance with the applicable provisions of NFPA 13, NFPA 24 and

publications referenced therein. Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively affect or disrupt the sprinkler discharge pattern and coverage.

1. Piping offsets, fittings, and other accessories required must be furnished to provide a complete installation and to eliminate interference with other construction.
2. Wherever the contractor's work interconnects with work of other trades the Contractor must coordinate with other Contractors to ensure all Contractors have the information necessary so that they may properly install all necessary connections and equipment.
3. Provide required supports and hangers for piping, conduit, and equipment so that loading will not exceed allowable loadings of structure. Submittal of a bid must be a deemed representation that the contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated in furnishing required supports.

B. Waste Removal

1. At the conclusion of each day's work, clean up and stockpile on site all waste, debris, and trash which may have accumulated during the day as a result of work by the contractor and of his presence on the job. Sidewalks and streets adjoining the property must be kept broom clean and free of waste, debris, trash and obstructions caused by work of the contractor, which will affect the condition and safety of streets, walks, utilities, and property.

3.3 UNDERGROUND PIPING INSTALLATION

A. The fire protection water main must be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover must be 3 feet or the frost line, whichever is deeper. The supply line must terminate inside the building with a flanged piece, the bottom of which must be set not less than 1-foot above the finished floor. A blind flange must be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block must be provided at the elbow where the pipe turns up toward the floor. In addition, joints must be anchored in accordance with NFPA 24. Buried steel components must be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 5 feet outside the building walls must meet the requirements of Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.

3.4 ABOVEGROUND PIPING INSTALLATION

A. The methods of fabrication and installation of the aboveground piping must fully comply with the requirements and recommended practices of NFPA 13 and this specification section.

B. Protection of Piping Against Earthquake Damage

1. Seismic restraint is required.

C. Piping in Exposed Areas

1. Install exposed piping without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, must be installed to provide maximum headroom.

D. Piping in Finished Areas

1. In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping must be concealed above ceilings. Piping must be inspected,

hydrostatically tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas must be concealed.

E. Pendent Sprinklers

1. Drop nipples to pendent sprinklers must consist of minimum 1-inch pipe with a reducing coupling into which the sprinkler must be threaded.
2. Where sprinklers are installed below suspended or dropped ceilings, drop nipples must be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling must not extend below the underside of the ceiling.
3. Recessed pendent sprinklers must be installed such that the distance from the sprinkler deflector to the underside of the ceiling must not exceed the manufacturer's listed range and must be of uniform depth throughout the finished area.
4. Pendent sprinklers in suspended ceilings must be located in the center of the tile (plus or minus 2 inches).
5. Dry pendent sprinkler assemblies must be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the finished space.
6. Where the maximum static or flowing pressure, whichever is greater at the sprinkler, applied other than through the fire department connection, exceeds 100 psi and a branch line above the ceiling supplies sprinklers in a pendent position below the ceiling, the cumulative horizontal length of an unsupported arm-over to a sprinkler or sprinkler drop must not exceed 12 inches for steel pipe.

F. Upright Sprinklers

1. Riser nipples or "sprigs" to upright sprinklers must contain no fittings between the branch line tee and the reducing coupling at the sprinkler.

G. Pipe Joints

1. Pipe joints must conform to NFPA 13, except as modified herein. Not more than four threads must show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints must be provided where indicated or required by NFPA 13. Grooved pipe and fittings must be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools must be products of the same manufacturer. For copper tubing, pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field must be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe must be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances.

H. Reducers

1. Reductions in pipe sizes must be made with one-piece tapered reducing fittings. When standard fittings of the required size are not manufactured, single bushings of the face or hex type will be permitted. Where used, face bushings must be installed with the outer face flush with the face of the fitting opening being reduced. Bushings cannot be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2-inch.

I. Pipe Penetrations

1. Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors must be core-drilled and provided with pipe sleeves. Each sleeve must be Schedule 40 galvanized steel, ductile-iron or cast-iron pipe and extend through its respective wall or floor and be cut flush with each wall surface. Sleeves must provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe must be firmly packed with mineral wool insulation.
2. Where pipes and sleeves penetrate fire walls, fire partitions, or floors, pipes/sleeves must be firestopped.
3. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe must be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

J. Escutcheons

1. Escutcheons must be provided for pipe penetration in finished areas of ceilings, floors and walls. Escutcheons must be securely fastened to the pipe at surfaces through which piping passes.

K. Inspector’s Test Connection

1. Unless otherwise indicated, the test connection must consist of 1-inch pipe connected at the riser as a combination test and drain valve; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test". All test connection piping must be inside of the building and penetrate the exterior wall at the location of the discharge orifice only. The discharge orifice must be located outside the building wall no more than 2 feet above finished grade, directed so as not to cause damage to adjacent construction or landscaping during full flow discharge, or to the sanitary sewer. Discharge to the exterior must not interfere with exiting from the facility. Water discharge or runoff must not cross the path of egress from the building. Do not discharge to the roof. Discharge to floor drains, janitor sinks or similar fixtures is not permitted.
2. Provide concrete splash block at drain and inspector's test connection discharge locations if not discharging to a concrete surface. Splash blocks must be large enough to mitigate erosion and not become dislodged during a full flow of the drain. Ensure all discharged water drains away from the facility and does not cause property damage.

L. Backflow Preventer

1. Locate within the building or in a heated enclosure in locations subject to freezing. For heated enclosures, provide a low temperature supervisory alarm connected to the facility fire alarm system. Heat trace is not permitted to be used.
2. Install backflow preventers so that the bottom of the assembly is a minimum of 6 inches above the finished floor/grade. Install horizontal backflow preventers so that the bottom of the assembly is no greater than 24 inches above the finished floor/grade. Install vertical backflow preventers so that the upper operating handwheel is no more than 6 feet above the finished floor/grade. Clearance around control valve handles must be minimum 6 inches above grade/finished floor and away from walls.
3. Test Connection

    a. Provide downstream of the backflow prevention assembly UL 668 hose valves with 2.5-inch National Standard male hose threads with cap and chain. Provide one valve for each 250 gpm of system demand or fraction thereof. Provide a permanent sign

in accordance with paragraph entitled "Identification Signs" which reads, "Test Valve". Indicate location of test header. If an exterior connection, provide a control valve inside a heated mechanical room to prevent freezing.

M. Drains

1. Main drain piping must be provided to discharge at a safe point outside the building, no more than 2 feet above finished grade, or to the sanitary sewer where dictated by jurisdiction. Provide a concrete splash block at drain outlet. Discharge to the exterior must not interfere with exiting from the facility. Water discharge or runoff must not cross the path of egress from the building.
2. Auxiliary drains must be provided as required by NFPA 13. Auxiliary drains are permitted to discharge to a floor drain if the drain is sized to accommodate full flow (min 40 gpm). Discharge to service sinks or similar plumbing fixtures is not permitted.

N. Installation of Fire Department Connection

1. Connection must be mounted adjacent to and on the sprinkler system side of the backflow preventer. The piping between the connection and the check valve must be provided with an automatic drip in accordance with NFPA 13 and piped to drain to the outside or a floor drain within the same room.

O. Identification Signs

1. Signs must be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13.

3.5 ELECTRICAL

A. Alarm signal wiring connected to the building fire alarm control system must be by the fire alarm installer.

3.6 FIELD QUALITY CONTROL

A. Correction of Deficiencies

1. If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

3.7 MINIMUM SYSTEM TESTS

A. The system, including the underground water mains, and the aboveground piping and system components, must be tested to ensure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure must be tested in accordance with NFPA 13 and NFPA 24.

B. Underground Piping

1. Flushing

a. Underground piping must be flushed at a minimum of 10 fps in accordance with NFPA 24.

2. Hydrostatic Test

   a. New underground piping must be hydrostatically tested in accordance with NFPA 24.

C. Aboveground Piping

1. Hydrostatic Test

   a. Aboveground piping must be hydrostatically tested in accordance with NFPA 13. There must be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure must be read from a gauge located at the low elevation point of the system or portion being tested.

2. Backflow Prevention Assembly Forward Flow Test

   a. Each backflow prevention assembly must be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor must provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5-inch diameter hoses, playpipe nozzles or flow diffusers, calibrated pressure gauges, and pitot tube gauge. The Contractor must provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction loss) across the assembly must be recorded. A metal placard must be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop must be compared to the manufacturer's data and the readings observed during the final inspections and tests.

D. Main Drain Flow Test

1. Following flushing of the underground piping, a main drain test must be made to verify the adequacy of the water supply.

3.8 SYSTEM ACCEPTANCE

A. Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Contracting Officer for review and acceptance. Submit six sets of detailed as-built drawings. The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the final acceptance test.

1. Provide one set of full size paper as-built drawings and schematics. The drawings must be prepared electronically and sized no less than the contract drawings.
2. Provide operating and maintenance (O&M) instructions.

3.9 ONSITE TRAINING

A. Conduct a training course for the responding fire department and operating and maintenance personnel as designated by the Contracting Officer. The on-site training must cover all of the items contained in the approved Operating and Maintenance Instructions.

END OF SECTION

SECTION 220010
BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Plumbing Requirements specifically applicable to Division 22 Sections, in addition to Division 01 - General Requirements.

1.2 DESCRIPTION

A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.3 REFERENCES

A. Section 23 08 01 - Commissioning of Building Systems

1.4 WORK INCLUDED

A. The complete Plumbing systems (including Fire Protection systems), including but not limited to these major items.

1. Coordinate work of this Section with related trades.
2. Verify applicable dimensions and location of existing utilities at the jobsite.
3. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
4. Soil waste and vent system inside and outside the building including connections to fixtures, equipment, sewer connections, clean-outs.
5. Water piping systems inside and outside the building, including connections to fixtures, equipment, water meters and vaults; pressure regulating stations, backflow preventers.
6. Interruptible and non-interruptible fuel gas systems inside and outside the building, including connections, gas meters, earthquake valves, and pressure regulating stations.
7. Plumbing fixtures, carriers, fittings, trim, hose bibs, wall hydrants, and accessories.
8. Installation and connection of Owner furnished equipment.
9. Water heating systems, including water heating equipment, circulating pumps, connections.
10. Shop drawings.
11. Equipment identification.
12. Equipment and systems adjustments and balancing.
13. Written operating and maintenance instructions.
14. Record drawings.
15. Guarantee

1.5 WORK SPECIFIED ELSEWHERE

A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, access doors and Frames, Door Hardware, Paints and Coatings, Mechanical and Electrical.

1.6 SITE INSPECTION

A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall

observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.7 ORDINANCES, REGULATIONS AND CODES

A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.

1. AFI - Air Filter Institute
2. AMCA - Air Moving & Conditioning Association
3. ARI - Air Conditioning & Refrigeration Institute
4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME - American Society of Mechanical Engineers
6. ASTM - American Society of Testing Materials
7. AWSC - American Welding Society Code
8. ANSI - American National Standards Institute
9. CBC - California Building Code
10. CCR - California Code of Regulations
11. CEC - California Electrical Code
12. CFC - California Fire Codes
13. CMC - California Mechanical Code
14. CPC - California Plumbing Code
15. FIA - Factory Insurance Association
16. NAFM - National Association of Fan Manufacturers
17. NEMA - National Electrical Manufacturer's Association
18. NFPA - National Fire Protection Association
19. ORS - Office of Regulatory Services
20. SCAQMD - South Coast Air Quality Management District
21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
22. UFC - Uniform Fire Code
23. UL - Underwriter's Laboratories
24. UPC - Uniform Plumbing Code

B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

C. Codes and Standards:

1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
5. National Fire Protection Associations - National Fire Code.

D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.

F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed

per the testing agency's specifications.

1.8 PERMITS, FEES AND INSPECTIONS

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Architect's decision will be final on interpretation of the Drawings and Specifications.

B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

C. Piping and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.

D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.10 SUBMITTALS

A. Before starting work, the Contractor shall furnish for the review of the Architect and Engineer. Provide Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.

B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.

C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified.

D. Submittals shall include, but not necessarily be limited to the following which are mandatory:

1. Draw Equipment Layouts to ¼” scale, including equipment, piping accessories, and showing clearances for operating and servicing.
2. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
3. Specialties, valves, gauges and thermometers of all types.
4. Foundations, supports, hangers, inserts.
5. Earthquake supports and calculations.
6. Insulation.
7. Shop fabrication drawings and installation drawings of piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping to finish floor level.
8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
9. Automatic control system diagrams.
10. Access panels.
11. Clean-outs

12. Fixture carriers.
13. Hangers, inserts, supports, anchors.
14. Hose bibs.
15. Hot water circulators.
16. Pipe, fittings and specialties.
17. Pipe isolators.
18. Plumbing fixtures, fittings, trim, drains and receptors.
19. Pressure regulators.
20. Roof flashing.
21. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
22. Strainers
23. Water hammer arrestors.
24. Water heating equipment.
25. Expansion joints, guides and anchors.
26. Shop fabrications drawings and calculations.
27. Special and miscellaneous products furnished under this section and not listed herein.

1.11 RECORD DRAWINGS AND MANUALS

A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

C. Final Record Drawings: Conform to Division 1 requirements.

D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
2. Specifications
3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
4. Grouting requirements.
5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
6. Start-up and beginning operation procedures.
7. Operational procedures.
8. Shutdown procedures.

9. Maintenance and calibration procedures
10. Parts lists
11. Name, address and telephone number of each manufacturer's local representative.

H. “As-Built” drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

1.12 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.13 SEISMIC DESIGN

A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:

1. In accordance with Title 24, 2022 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. “Deferred Approval” items will not be permitted unless specifically approved by the plan check supervisor.

    a. Exception: Attachments of equipment weighting less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.

3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2022 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.14 SUBSTITUTIONS AND CHANGES

A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.

B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.

C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.

D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.

E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.15 SUBMITTAL REVIEWS

A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.16 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.17 LOCATIONS AND ACCESSIBILITY

A. Drawings show piping diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping to best suit field conditions after coordinating with other trades. Run exposed piping parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.

B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

C. Installation at valves, thermometers, gauges, clean outs, controls, steam and water specialties, access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.

D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

1.18 COORDINATION OF TRADES

A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.

B. No extras will be allowed for changes made necessary by interference or coordination between trades.

C. Submit Composite Coordination Drawings in accordance with Special Conditions. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect and Engineer reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.

1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
4. Concrete: Conform to Concrete Section of the Specifications.

1.19 GUARANTEES

A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.

B. Guarantee included in this section to cover:

1. Faulty or inadequate design of equipment or material installed
2. Improper assembly or erection
3. Defective workmanship or material
4. Incorrect or inadequate operation or other failure

C. The Contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise

D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period

E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.

F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.20 PROTECTION OF EQUIPMENT AND MATERIALS

A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.21 CLOSING-IN OF UN-INSPECTED WORK

A. Contractor shall not allow or cause any of the work, specifically piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, shall at their own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.22 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.23 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.24 EQUIPMENT LABELS

A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.25 EXCAVATION, TRENCHING AND BACK FILLING

A. Excavating, trenching and back filling for utilities within the building area shall be done in conformity with Division 31 - Site work. Piping shall be installed promptly after excavation in order to keep the trenches open as short a time as possible.

B. Excavating, trenching and back filling for utilities outside the building area shall be done in conformity with Division 31 - Earth work.

C. Any existing underground piping and conduit that is encountered shall be properly shored and protected from damage. Active piping shall be left intact and undamaged.

1.26 PRELIMINARY OPERATION

A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.27 MAINTAINING EXISTING SERVICES

A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.

B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Architect.

C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.

D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

1.28 ELECTRICAL WORK

A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.

C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.

D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.

E. All interconnecting power wiring and conduits shall be provided by Division 26.

F. Control wiring shall be provided by Division 22, unless otherwise indicated on the drawings.

G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufactures: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:

1. Advance Products & Systems, Inc
2. CALPICO, Inc
3. Metraflex Company
4. Pipeline Seal and Insulator, Inc
5. Proco Products, Inc

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

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 (50 mm) above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Comply with requirements for fire stopping specified in Section 078413 "Penetration Fire stopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

   a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

SECTION 220518
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron swing check valves with closure control.
7. Bronze gate valves.
8. Iron gate valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.4 Delivery, storage, and handling

A. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclouseres.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valves shall be provided on all supplies to equipment and fixtures.

C. Obtain each type of valve from single source from single manufacturer.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Bronze valves shall be made with dezincificaation-resistant materials. ronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.

H. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

I. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Nibco

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig (2760 kPa).
c. Body Design: One piece.
d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 400 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded or Solder.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hammond Valve.
b. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Regular.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded or Solder.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass or Stainless Steel.

j. Port: Full.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO, INC

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, nickel iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Composition.
g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: ASTM A351.
j. Gasket: Asbestos free.

2.6 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Stainless Steel.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Stainless Steel.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Shut-off valves shall be provided in main branches, runs to risers and where indicated on drawings

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm above finished floor.

1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Throttling Service: ball, or butterfly valves.
3. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two piece, full port, brass or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze or nonmetallic disc.
5. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
5. Iron Gate Valves: Class 125 OS&Y.
6. Iron Globe Valves: Class 125.

3.5 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
4. Iron Gate Valves: Class 125, OS&Y.

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.
4. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying and undue strain.
5. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers.

1.3 SUBMITTALS

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

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts. The total load of piping components imposed on trapeze spans shall not exceed manufacturer's design load rating. Load calculation and detail of each unit shall include a safety factor of two times the expected load.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa), ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 pipe stands

A. General Requirements for Pipe Stands: shop or field fabricated assemblies made of manufactured corrosion-resistant components ot support roof-mounted piping.

B. Compact pipe stand:

1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Hardware: Galvanized steel or polycarbonate.
4. Accessories: Protection pads.

C. Single-Base, Single-Pipe Stand:

1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Vertical Members: Two galvanized steel, continuous thread, 1/2 inch rods.
4. Horizontal Member: Adjustable horizontal, galvanized steel pipe support Chanel.
5. Pipe Supports: Roller
6. Hardware: Galvanized steel
7. Accessories: Protection pads.

2.6 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 acoustical noise and vibration isolation

A. Acoustical Isolation System: Consisting of loop hangers, J-hangers, through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material, associated support bracket, and fire

stop sleeve devices. For applications requiring acoustical isolation of tubing, piping, and equipment from building elements, such as floors, walls, and framing members.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Stainless Steel: ASTM A240/A240M.

C. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic 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.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger 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.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

O. Protect tubing and piping from damage caused by abrasion when passing through studs, joist,

and similar framing suing abrasion protection isolators.

P. Prevent damage to piping and tubing caused by contact between dissimilar metals using insert system designed specifically for this application.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

A. Touch up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touch up: Cleaning and touch up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting." And Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb (340 kg).
   b. Medium (MSS Type 32): 1500 lb (680 kg).
   c. Heavy (MSS Type 33): 3000 lb (1360 kg).
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.4 SUBMITTALS

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

B. Product Data: For each ty;e of product indicated, provide manufacturer's standard product data sheets. Data sheets must detail compliance with applicable standards for color and size and clearly define durability of no less than 4 years.

PART 2 - PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

2.3 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com.
2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Description: Laminated piece with up to three lines of text.

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving minimum 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Letter Height: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 200 deg F.

C. Equipment Nameplate Content: Each nameplate shall include equipment's Drawing designation or unique equipment number, consistent with the drawings.

2.4 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Brimar Industries, Inc: www.pipemarker.com.
4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
5. Seton Identification Products: www.seton.com.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges. The content of each tag shall include a 1/4 inch top-line abbreviation identifying the system Terminology shall match drawings. Content, second line shall include a unique sequential 1/2 inch number to identify the valve.

C. Tag Material: Brass, 0.032 inch or stainless steel 0.032 inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

D. Fasteners: Brass or stainless steel S-hook.

2.5 STENCILS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Stencils shall be identified as indicated below including direction of flow

1. Gravity Condensate - G.C.
2. Domestic Cold Water - D.C.W.
3. Domestic Hot Water - D.H.W.
4. Domestic Hot Water Return - D.H.W.R.
5. Natural Gas - GAS

C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

D. Stencil Ink: Interior stencil ink shall be compatible with interior surfaces and finishes.

2.6 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com/.
2. Craftmark Pipe Markers: www.craftmarkid.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. General Requirements for Manufactured Pipe Labels: Identify the content and directional flow of piping systems. Whenever possible select manufacturers standard preprinted, color-coded, pipe markers. Pipe marker sizes and colors shall comply with ANSI / ASME A13.1.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

2.7 CEILING TACKS

A. Manufacturers:

1. Craftmark: www.craftmarkid.com.
2. Brady Corporation: www.bradycorp.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. Plumbing Valves: Green.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints and encapsulate.

3.2 INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Install tags in clear view and align with axis of piping

E. Identify valves in main and branch piping with tags.

F. Identify piping, concealed or exposed, with stencilled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Glass fiber insulation.

C. Jacketing and accessories.

D. Insulating Covers for Accessible Lavatory / Sink Piping

1.2 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

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

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness. Inspect for damage.

B. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

C. Protect insulation from damage by securing areas and by leaving factory packaging in place until usage.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

B. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASME C81.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

2.2 GLASS FIBER INSULATION

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.
2. Johns Manville Corporation: www.jm.com.
3. Knauf Insulation: www.knaufusa.com.
4. Owens Corning Corporation: www.ocbuildingspec.com.

B. Insulation: ASTM C547 and ASTM C552; inorganic, incombustible, rigid, hermetically sealed cells supplied with manufacturer's recommended factory-applied jacket..

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc: www.aeroflexusa.com.
2. Armacell LLC: www.armacell.us.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation containing antimicrobial additive complying with ASTM C534/C534M Type I; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.4 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color, UV-resistant PVC complying with ASTM D1784.

a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Connections: Brush on welding adhesive.

B. ABS Plastic Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: Minus 40 degrees F.
b. Maximum Service Temperature: 180 degrees F.
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil, 0.03 inch.
e. Connections: Brush on welding adhesive.

C. Aluminum Jacket:

1. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.5 Tapes

A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive: suitable for indoor and outdoor applications.

1. Manufacturers:

a. 3M Industrial Adhesives and Tapes Division
b. Ideal Tape Col, Inc., an American Biltrite Company.

2. Width: 2 inches
3. Thickness: 6mils
4. Adhesion: 64 ounces force/inch in width
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers:

a. 3M Industrial Adhesives and Tapes Division.

b. Ideal Tape Co., Inc., an American Biltrite Company.

2. Width: 2 inches
3. Thickness: 3.7 mils
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.6 Insulating covers for accessible lavatory / sink piping

A. Insulating Covers for Exposed Trap and Drainage Piping, Hot-Water Supplies, and Cold-Water Supplies.

1. Manufacturer:

a. Plumberex Specialty Products, Inc.
b. IPS Corporation.

2. Descriptions: Manufactured plastic insulating covers fro trap and drainage piping, hot-water supplies and cold-water supplies. Thermal insulating properties protect from burns, cold temperature thermal shock, abrasions, or other physical harm from contact with exposed piping under accessible lavatories and sinks. Comply with Americans with Disabilities Act (ADA) and ANSI A117.1 accessibility requirements.
3. Comply with IBC Chapter 7 - Thermal - and Sound _ Insulating Materials. Insulating cover material tested in accordance with ASTM E84 or UL 723, and NFPA 255, resulting in a flame-spread index of 25 and smoke-developed index of 450, Class A, and ASTM C1822, Type L.
4. Comply with microbial and fungal resistance of "Zero growth" when tested in accordance with ASTM G21.
5. Comply with IBC Chapter 11 - Accessibility - General.
6. Comply with IPC Chapter 3 - General Regulations - Section: Washroom and Toilet Room Requirements - Subsection : Interior finish. Interior finish surfaces of toilet rooms shall comply with the International Building Code.
7. Comply with IPC Chapter 4 - Fixtures, Faucets and Fixture Fittings - Section: Accessible Plumbing Facilities - Subsection: Exposed Pipes and Surfaces.
8. Comply with UPC Chapter 4 - Plumbing Fixtures and Fixture Fittings - Section: Fixtures and Fixture Fittings for Persons with Disabilities - Subsection: Exposed Pipes and Surfaces.
9. Comply with ASTM C1822, Insulating Covers on Accessible Lavatory Piping.
10. The insulating cover shall be manufactured in a form suitable for application: no adhesive tapes shall be allowed as method for covering exposed piping.
11. Color as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces: free of voids throughout the length of piping, including fittings, valves, and specialties.

D. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Exposed Piping: Locate insulation and cover seams in least visible locations.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

I. Install insulation on piping accessories requiring future re-occurring access and service with factory fabricated insulation covers that are easily removed and reapplied

J. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

K. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

L. Inserts and Shields:

1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
2. Insert Location: Between support shield and piping and under the finish jacket.
3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

M. Continue insulation through walls, roof, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

N. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

O. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-

sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

P. Install manufactured preformed insulating cover around hot-water supplies, and cold-water supplies including supply stops, butted up to bottom surface of lavatory / sink, or up inside between wall and upper lavatory / sink cavity. ensure a straight precision cut fit and finish.

Q. Install manufactured preformed insulating cover around trap and tubing, including all drainage piping, butted up to bottom surface of lavatory and over escutcheon wall trim. Ensure a straight precision cut fit and finish.

R. Secure all covers with fasteners provided. Do not use cable tie fasteners, adhesives, or adhesive tapes for attachments. Do not use adhesives as a component to support the fastening system.

S. Do not use adhesives in any part of the method of construction of the insulation coverings.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.

B. Sanitary waste piping, above grade.

C. Domestic water piping, buried beyond 5 feet of building.

D. Domestic water piping, buried within 5 feet of building.

E. Domestic water piping, above grade.

F. Storm drainage piping, buried within 5 feet of building.

1. Sanitary sewer and vent.
2. Pipe flanges, unions, and couplings.
3. Pipe hangers and supports.
4. Ball valves.
5. Balancing valves.
6. Pressure reducing valves.
7. Pressure relief valves.
8. Strainers.

1.2 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.

F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

K. ASTM B32 - Standard Specification for Solder Metal; 2020.

L. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

O. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

P. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

Q. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2022.

R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

S. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

T. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

U. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2022.

V. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2022.

W. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

X. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; 2021.

Y. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

Z. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2020.

AA. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

BB. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core; 2023.

CC. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

DD. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

EE. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

FF. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

GG. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.

HH. AWWA C606 - Grooved and Shouldered Joints; 2022.

II. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.

JJ. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

KK. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

LL. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

MM. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

NN. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

OO. NSF 372 - Drinking Water System Components - Lead Content; 2022.

PP. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

QQ. ASME - Boiler and Pressure Vessel Code

RR. AGA - American Gas Association Code

1.3 SUBMITTALS

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

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Valve Repacking Kits: One for each type and size of valve.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, standards.

1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX. Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

E. Piping materials shall bear label, stamp, or other markings fo specified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

E. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping in accordance with requirements of authoritites having jurisdiction.

F. Protect and store PE pipes and valves from direct sunlight.

G. Handle, store, and protect equipmment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations. Replace all damaged or defective items.

1.6 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

B. Interruption of Existing Utility 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 Construction Manager no fewer thatn two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

C. Become familiar with details of the scope of work, verify dimensions in the field, and advise the Architect / Engineer of any discrepancy prior to performing any work.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 14, NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

C. Sanitary Waste and Vent Systems: Comply with NSF 14, "Plastics Piping Systesm Compontes and Related Materials," for plastic piping components. Include marking with "FSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

2.2 SANITARY SEWER AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. ABS Pipe: ASTM F628, Schedule 40.

1. ABS Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste and vent patterns.
2. Joints: Solvent welded with ASTM D2235 cement.

a. Solvent cement shall have a VOC content of 325 g/L or less.
b. Solvent cement shall comply with the testing and product requirments of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. PVC Schedule 40 DWV Pipe per ASTM D1785 and ASTM D 2665

1. Fittings: PVC DWV per ASTM D 2665
2. Joints: Solvent cement weld per ASTM F 656 and solvent cement per ASTM D2564

a. Solvent cement shall have a VOC content of 510 g/L or less.
b. Adhesive primer shall have a VOC content of 550 g/L or less.
c. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A888, CISPI 301, hubless, service weight.

1. Fittings: Cast iron, ASTM A888 or CISPI 301.
2. Sovent Stack fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aearator and deaerator drainage fittings.
3. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
4. CISPI, Hubless-Piping Couplings:

a. Standards: ASTM C 1277 and CISPI 310.
b. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices: and ASTM C 564, rubber sleeve with integral, center pipe stop.

5. Cast-Iron, Hubless-Piping Couplings:

a. Standards: ASTM C 1277 and ASTM C 1540.
b. Descrition: Stanless-steel shield with stainless-steel bands and tightening devices: and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110/A21.10, ductile or gray iron, standard thickness.

2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with 3/4-inch diameter rods.

B. Copper Pipe: ASTM B42, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

C. PVC Schedule 80 Pipe: ASTM D 1785.

1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.

2.5 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: Class 150 bronze unions with brazed joints below grade, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Copper Unions:

a. MSS SP-123
b. Cast-copper-alloy, hexagonal-stock body.
c. Ball-and-socket, metal -to-metal seating surfaces.
d. Solder-joint or threaded ends.

2.6 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

a. Manufacturers:
1) Anvil International: www.anvilintl.com/#sle.
2) Apollo Valves: www.apollovalves.com/#sle.
3) Grinnell Products: www.grinnell.com/#sle.
4) Viega LLC: www.viega.us/#sle.

2.7 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. ABS Pipe: ASTM D2680.

1. NSF Marking: Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm serwer piping.
2. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
3. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.
4. Fittings: ABS ASTM D2661, made to ASTM D3311, drain, waste, and vent patterns.
5. Joints: Solvent welded with ASTM D2235 cement.

a. Solvent cement shall have a VOC content of 325 g/L or less.
b. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using

Environmental Chambers."

2.8 STORM DRAINAGE PIPING, ABOVE GRADE

A. Hubless Cast Iron Pipe: ASTM A74 extra heavy weight.

1. Fittings: Cast iron ASTM C1277
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
3. Minimum working pressure: 10-ft head of water.
4. Minimum Working Pressure on Forced-Main Piping: 50 psig.
5. Description: Stainless steel corrugated shield with stainless stell bands and tightinening devices: and ASTM C564, rubber sleeve with integral, center pipe stop.

2.9 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

C. No-Hub Couplings:

1. Testing: In accordance with ASTM C1277 and CISPI 310.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.
4. Eyelet Material: Stainless steel.

D. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing gasket.

2.10 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

C. Plumbing Piping - Water:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.

2.11 BALL VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Apollo Valves: www.apollovalves.com.
3. Nibco, Inc: www.nibco.com/#sle.
4. Uponor, Inc: www.uponorengineering.com/#sle.
5. Viega LLC: www.viega.us/#sle.
6. Stockham: www.stockham.com

B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

C. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handlewith balancing stops, solder endswith union.

2.12 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.13 STRAINERS

A. Size 2 inch and Smaller:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Shut-off valves shall be provided on all main branches, runs to risers and where shown on drawings. Locate shut-off valves over T-Bar Ceiling when possible. Provide access panesl when shut-off valves are located over hard lid ceilings.

I. Provide access where valves and fittings are not exposed.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Color to be specified by architect.

K. Exposed, unfinished pipe, fittings, supports, and accessories shall be painted.

L. Exterior piping, fittings, supports and accessories shall have approved UV protection

M. Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.

N. Provide stem extension on all valves for piping requiring insulation to ensure valve can be cycled without damaging pipe insulation.

O. Install water piping to ASME B31.9.

P. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

Q. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install globe valves for throttling, bypass, or manual flow control services.

E. Provide spring-loaded check valves on discharge of water pumps.

F. Provide flow controls in water recirculating systems where indicated.

3.5 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:

1. Perform hydrostatic testing for leakage prior to system disinfection.
2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
3. General:

    a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.

C. Gas Distribution Systems:

1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
2. General Systems:

    a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
    b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.

3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:

    a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.
    b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with local jurisdiction. Potable water systems shall be disinfected and flushed prior to use by water-chlorination solution and have bacteriological examination made by an approved agency per 2019 California Plumbing Code section 609.9 and as prescribed in AWWA C651. Methods of cleaning / disinfecting for new or repair piping as described in C651 or NFPA 24.

B. Prior to starting work, verify system is complete, flushed, and clean.

3.7 INSTALLATION OF FLOW CONTROL VALVES

A. Install automatic flow control valve in each hot water recirculating loop, and elsewhere as indicated. Install a shutoff valve and strainer upstream and a union, check valve and shutoff valve downstream of each automatic flow control valve.

B. Set flow control valve flow rate as follows:

1. Preliminary Procedures For Hot Water Return System Balancing:

a. Before operating the system perform these steps:
1) Open Valves at recirculation pump and flow control valves to full open position.
2) Remove and clean all strainers.
3) Check recirculation pump rotation.
4) Set water heater temperature as indicated on the drawings.

2. Procedures For Hot Water Return System Balancing:

a. Refer to the drawings for required flow rate for each flow control valve.
b. Provide required instrumentation to obtain proper measurements. Instruments shall be properly maintained and protected against damage.
c. Apply instrument as recommended by the manufacturer.
d. Take readings with the eye at the level of the indicated valve to prevent parallax.
e. Mark flow control valve setting with memory stop. Mark with paint or other suitable, permanent identification materials.
f. Retest, adjust, and balance systems subsequent to significant systems modifications, and resubmit test results.

C. Reports: Prepare hot water return system balancing reports signed and submit to the architect upon completion of the project. Include the following information:

1. Valve tag number and description of location
2. Valve body size
3. Differential pressure reading from instrument in psi
4. Actual flow rate derived from the manufacturer’s charts and tablets for the valve size and measured differential pressure.

3.8 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and

water meter with by-pass valves, pressure reducing valve, and sand strainer.

1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
2. Provide 18 gauge, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

END OF SECTION

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Water hammer arrestors.

E. Trap Primer

F. Mixing valves.

G. Exterior penetration accessories.

1.2 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.

C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

F. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.

G. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

H. NSF 372 - Drinking Water System Components - Lead Content; 2022.

I. PDI-WH 201 - Water Hammer Arresters; 2017.

1.3 SUBMITTALS

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

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Certificates: Certify that grease interceptors meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

B. Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations. Replace all damaged or defective items.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Mifab: www.mifab.com

B. Drain Assemblies

1. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

C. Roof Drains:

1. Standard: ASME A112.6.4.
2. Description: Coated cast-iron roof drain, non-puncturing clamp ring with integral gravel stop, and sump with wide roof flange.
3. Body: Lacquered cast iron with sump.
4. Strainer: Removable polyethylene locking dome.
5. Outlet: Bottom no-hub, refer to drawings for size.

D. Overflow Drains:

1. Standard: ASME A112.6.4.
2. Description: Coated cast-iron roof drain, non-puncturing clamp ring with integral gravel stop, sump with wide roof flange.
3. Body: Lacquered cast iron with sump.
4. Strainer: Removable polyethylene locking dome.
5. Outlet: Bottom no-hub, refer to drawings for size.
6. Collar: 2 inch high solid clamping collar

E. Downspout Nozzles:

1. Description: Cast bronze downspout nozzle, loose wall flange and inlet threaded connection.

2. Body Material: Cast bronze
3. Connection Type: No-hub spigot outlet
4. Pipe Size: Refer to drawings.

F. Floor Drain:

1. Standard: ASME A112.6.3.
2. Description: Lacquered cast iron two piece body with double drainage flange, invertible non-puncturing flashing collar with weep holes and threaded to receive adjustable strainer.
3. Body: Lacquered cast iron with sump.
4. Outlet: Bottom no-hub outlet, reefer to plans for size.
5. Trap primer connection: 1/2 inch.
6. Strainer: Round adjustable nickel-bronze.

G. Floor Sink:

1. Standard: ASME A112.6.7
2. Description: Cast iron 8 inch square, 6 inch deep flanged receptor with seepage holes, loose set acid resistant coated cast iron grate.
3. Body: Cast iron with acid-resistant coated interior.
4. Outlet: Bottom no-hub, refer to drawings for size.
5. Strainer: Aluminum dome.
6. Trap Primer: 1/2 inch connection.
7. Grate Coverage Area: Half grate

H. Floor Sink:

1. Standard: ASME A112.6.7.
2. Description: Cast iron 16 inch square, 12 inch deep flanged receptor with seepage holes, loose set acid resistant coated cast iron grate.
3. Body: Cast iron with acid-resistant coated interior.
4. Outlet: Bottom no-hub, refer to drawings for size.
5. Strainer: Aluminum dome.
6. Trap primer: 1/2 inch connection.
7. Grate Coverage Area: Half grate.

2.3 CLEANOUTS

A. Cast-Iron Cleanout

1. Manufacturers:

a. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
b. Josam Company: www.josam.com.
c. Zurn Industries, LLC: www.zurn.com.
d. Mifab: www.mifab.com

2. Standard: ASME A 112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Frame and Cover: Round, stainless steel

2.4 HOSE BIBBS

A. Manufacturers:

1. Woodford: www.woodfordmfg.com.
2. Zurn Industries, LLC: www.zurn.com.
3. Mifab: www.mifab.com

B. Exposed Hose Bibbs:

1. Standard: ASME A112.18.1.
2. Description: Wall mounted hose bibb with integral mounting flange, chrome plated with metal handwheel, and operating tee key.
3. Body Material: Bronze with chrome finish
4. Supply Connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removable, hose-connection vacuum breaker complying with ASSE 1011.

C. Recessed Hose Bibbs:

1. Standard: ASME A112.18.1.
2. Description: Wall mounted hose bibb with lockable recessed box, chrome plated with metal hand wheel and operating tee key.
3. Body Material: Bronze with chrome finish
4. Supply Connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removeable, hose-connection vacuum breaker complying with ASSE 1011.
6. Recessed Box: Brass or chrome lockable box.

D. Roof Hose Bibbs:

1. Standard: ASME A112.18.1.
2. Description: Roof mounted hose bibb, chrome plated with metal hand wheel and operating tee key.
3. Body Material: Bronze with chrome finish.
4. Supply connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removeable, hose-connection vacuum breaker complying with ASSE 1011.

2.5 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Precision Plumbing Products: www.pppinc.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Mifab: www.mifab.com

B. Water Hammer Arrestors:

1. Standard: ASSE 1010
2. Type: Copper tube with piston.
3. Temperature Range: 33 degrees F to 200 degrees F
4. Systems exceeding 80 PSI shall have a pressure reducing valve installed upstream of the water hammer arrestor units.
5. All concealed water hammer arrestoers shall be accessible by means of access door or removable panel.

6. Vertical caped pipe columns will not be permiteted.

2.6 Trap primers

A. Manufacturers:

1. Precision Plumbing Products: www.pppinc.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Mifab: www.mifab.com

B. Pressure Drop Trap Primer

1. Description: Fully automatic, no adjustment required, activates on 3 PSI pressure differential.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Cabinet: All concealed trap primers shall be accessible by means of access door or removable panel. Recessed-mounted steel box with stainless-steel cover.
6. Inlet and Outlet Connection: 1/2 inch threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

C. Electronic Trap Primer

1. Description: Electronic Trap Primer floor drain trap priming device consisting of a solenoid valve, bronze air gap fitting, 3-prong cord, and timer factory set to discharge once every 24 hour period. Add EMS to interface with the facility's energy management system as required. Conforms to UL and CSA Standards. Installed to manufacturer's recommendations.
2. Standard: ASSE 1044.
3. Cabinet: All concealed trap primers shall be accessible by means of access door or removable panel. Recessed -mounted steel box with stainless-steel cover.
4. Inlet and Outlet size: 1/2 inch threaded or solder joint.

2.7 Mixing Valves

A. Thermostatic Master Mixing Valves:

1. Manufacturers:

a. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com.
b. POWERS, a WATTS brand: www.watts.com/our-story/brands/powers.
c. Symmons Industrie, Inc.: www.symmons.com.
d. Leonard Valve Company: www.leonardvalve.com.
e. Bradley Corporation: www.bradlycorp.com.

2. Construction:

a. Standard: ASSE 1017
b. Pressure Rating: 125 psig.
c. Type: Therostatically controlled, water mixing valve.
d. Material: Bronze body with corrosion-resistant interior compnents.
e. Connectons: Threade inlets and outlet.
f. Accessories: Check stops on hot-and cold water supplies, and adjustable,

temperature control handle.

g. Tempered-Water Setting: 110 deg F unless stated otherwise on plans.

h. Inlet / Outlet Connections: Refer to plans for sizes, provide ball valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for prodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on supply piping.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush valve water closets.

B. Lavatories.

C. Sinks.

D. Under-lavatory pipe supply covers.

1.2 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.

C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).

D. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

E. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

F. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

G. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).

H. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.

I. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.

J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

K. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, flow rate, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.4 QUALITY ASSURANCE

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

B. Service Support: The equipment shall be supported by service organizations. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage. Replace any damaged or defective items.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.2 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.

1. Bowl: ASME A112.19.2; 16.5 inches high for ADA compliant water closet, and 15 inches high for standard height water close, and with elongated rim.
2. Flush Volume: 1.28 gallon per flush, maximum.
3. Flush Valve: Exposed (top spud).
4. Flush Operateion: Sensor hard wired.
5. Handle height: 44 inches or less. Mounted height of flush valve shall not interfere wtih the hand rail in the ADA stalls.
6. Color: White.
7. Operating Pressure: Minimum 35 psi
8. Provide: Wax bowl ring including plastic sleeve.
9. Water closet must be Water Sense certified.
10. Manufacturers:

    a. American Standard Inc: www.americanstandard.com
    b. Sloan Valve Company: www.sloanvalve.com.
    c. Kohler Company: www.kohler.com.
    d. Toto USA: www.totousa.com

B. Flush Valves:

1. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com.
b. Sloan Valve Company: www.sloanvalve.com.
c. Zurn Industries, Inc: www.zurn.com.

2. Manual Operated:

a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, cover, tailpiece,and and accessories.
b. Supplied Volume Capacity: 1.28 gal/flush.
c. Finish: Polished Chrome

3. Sensor-Operated:

a. Mechanism: Electronic motor-actuated operator with hardwired powered with 120 volt transformer infrared sensor, and mechanical over-ride or over-ride push button.
b. Supplied Volume Capacity: 1.28 gal/flush.
c. Finish: Polished Chrome
d. Style: Exposed

C. Toilet Seats:

1. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com.
b. Bemis Manufacturing Company: www.bemismfg.com.
c. Church Seat Company: www.churchseats.com.
d. Olsonite: www.olsonite.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Solid plastic, antimicrobial.
4. Type: Commerical with extended back.
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining hinge.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

D. Water Closet Carriers:

1. Manufacturers:

a. Jay R. Smith MFG. Co: www.jrsmith.com.
b. JOSAM Company: www.josam.com.
c. Zurn Industries, Inc: www.zurn.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

E. Flush Valves:

F. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.

2. Sloan Valve Company: www.sloanvalve.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Sensor-Operated:

    a. Type: ASME A112.19.5; chloramine-resistant, clog-resistant dual-seat diaphragm valve with vacuum breaker, stops and accessories.
    b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.
    c. Supplied Volume Capacity: 0.125 gal per flush.

2.3 LAVATORIES

A. Manufacturers:

1. American Standard Inc.: www.americanstandard.com
2. Kohler Company: www.kohler.com

B. Wall-Hung Basin:

1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
2. Carrier:

    a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
    b. Manufacturers:
        1) Jay R. Smith MFG. Co: www.jrsmith.com.
        2) JOSAM Company: www.josam.com.
        3) Zurn Industries, LLC: www.zurn.com.

C. Vitreous China Counter Top Basin:

1. ASME A112.19.2; vitreous china self-rimming counter top lavatory, size as indicated on drawings with drillings on 4 inch centers, front overflow, seal of putty, calking, or concealed vinyl gasket.

D. Supply Faucet Manufacturers:

1. Chicago Faucets, a Geberit company: www.chicagofaucets.com.
2. Kohler Company: www.kohler.com.
3. Sloan: www.sloan.com

E. Metered Faucet:

1. ASME A112.18.1 chrome plated metered mixing faucet with self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallons per cycle, and cover plate, open grid strainer.
2. Spout Style: Standard.
3. Mixing Valve: None, single line for tempered water.
4. Water Supply: 3/8 inch compression connections.
5. Aerator: Vandal resistant, 0.5 gpm, non-aerating spray.

F. Manual Faucet:

1. ASME A112.18.1; chrome plated, combination supply fitting with open grid strainer, with single lever handle.
2. Spout Style: Standard.
3. Mixing Valve: External lever operated.
4. Water Supply: 3/8 inch compression connections.
5. Aerator: Vandal resistant, 0.5 gpm, non-aerating spray.

G. Sensor Operated Faucet:

1. Spout Style: Standard.
2. Power Supply:

   a. Wireless:
      1) Battery: Replaceable alkaline or lithium type with 200,000 cycles, minimum.
      2) Low Battery Warning: Provide red or yellow colored indicator to light periodically at 30 days of remaining capacity and continuously 2 weeks prior to get fully discharged.

3. Mixing Valve: Internal, automatic.
4. Water Supply: 3/8 inch compression connections.
5. Automatic Shut-off: 10 seconds.
6. Finish: Polished chrome.

H. Thermostatic Mixing Valve:

1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

I. Accessories:

1. Chrome-plated 17 gauge, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.

2.4 SINKS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Kohler Company: www.kohler.com.
3. Elkay: www.elkay.com.

B. Single Compartment Bowl:

1. ASME A112.19.3; 25 x 22 x 7 11/16 in outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

   a. Drain: 1-1/2 inch chromed brass drain.

C. Double Compartment Bowl:

1. ASME A112.19.3; 33 x 22 x 8 3/16 inch outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

a. Drain: 1-1/2 inch chromed brass drain.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

2.5 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:

1. Plumberex Specialty Products, Inc: www.plumberex.com.
2. Truebro: www.truebro.com
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.

a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
b. Comply with ICC A117.1.

3. Color: High gloss white.
4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key or integral stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 230010
BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 01 - General Requirements.

1.2 DESCRIPTION

A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.3 WORK INCLUDED

A. The complete Heating, Ventilating and Air Conditioning (HVAC) systems, including but not limited to these major items.

1. Coordinate work of this Section with related trades.
2. Verify applicable dimensions and locations of existing utilities, fans, and thermostats at the jobsite.
3. Duct systems; supply, return and exhaust complete with fire dampers, combination fire-smoke dampers, and manual dampers.
4. Diffusers and registers.
5. Exhaust supply, return fans and air curtains.
6. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
7. Duct lining and insulation.
8. Shop drawings.
9. Equipment identification.
10. Equipment and systems adjustments and balancing.
11. Air, water and gas systems testing, adjusting and balancing.
12. Written operating and maintenance instructions.
13. Record drawings.
14. Guarantee

1.4 WORK SPECIFIED ELSEWHERE

A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, Access Door and Frames, Acoustical Ceiling Tile, Door Hardware, Paints and Coatings, Plumbing and Electrical.

1.5 SITE INSPECTION

A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.6 ORDINANCES, REGULATIONS AND CODES

A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.

1. AFI - Air Filter Institute
2. AMCA - Air Moving & Conditioning Association
3. ARI - Air Conditioning & Refrigeration Institute
4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME - American Society of Mechanical Engineers
6. ASTM - American Society of Testing Materials
7. AWSC - American Welding Society Code
8. ANSI - American National Standards Institute
9. CBC - California Building Code
10. CCR - California Code of Regulations
11. CEC - California Electrical Code
12. CFC - California Fire Codes
13. CMC - California Mechanical Code
14. CPC - California Plumbing Code
15. FIA - Factory Insurance Association
16. NAFM - National Association of Fan Manufacturers
17. NEMA - National Electrical Manufacturer's Association
18. NFPA - National Fire Protection Association
19. ORS - Office of Regulatory Services
20. SCAQMD - South Coast Air Quality Management District
21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
22. UFC - Uniform Fire Code
23. UL - Underwriter's Laboratories
24. UPC - Uniform Plumbing Code

B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

C. Codes and Standards:

1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
5. National Fire Protection Associations - National Fire Code.

D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.

F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.7 PERMITS, FEES AND INSPECTIONS

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.8 DRAWINGS AND SPECIFICATIONS

A. The Architect's decision will be final on interpretation of the Drawings and Specifications.

B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.

D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.9 SUBMITTALS

A. Before starting work, the Contractor shall furnish for the approval of the Architect, Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.

B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.

C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified

D. Submittals shall include, but not necessarily be limited to the following which are mandatory:

1. Draw Equipment Layouts to ¼" scale, including equipment, piping accessories, and showing clearances for operating and servicing.
2. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
3. Specialties, valves, gauges and thermometers of all types.
4. Foundations, supports, hangers, inserts.
5. Earthquake supports and calculations.
6. Insulation.
7. Ventilation and air conditioning equipment, specialties and the air control systems.
8. Fans, fan characteristic curves, fan tests.
9. Dampers, louvers, grilles, registers, diffusers.
10. Shop fabrication drawings and installation drawings of ductwork and piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping and ductwork to finish floor level.
11. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
12. Automatic control system diagrams.
13. Exhaust, supply and return fans.
14. Access panels.
15. Hangers, inserts, supports, anchors.
16. Pipe, fittings and specialties.
17. Pipe isolators.
18. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
19. Expansion joints, guides and anchors.
20. Shop fabrications drawings and calculations.

21. Special and miscellaneous products furnished under this section and not listed herein.

1.10 RECORD DRAWINGS AND MANUALS

A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

C. Final Record Drawings: Conform to Division 01 requirements.

D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
2. Specifications
3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
4. Grouting requirements.
5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
6. Start-up and beginning operation procedures.
7. Operational procedures.
8. Shutdown procedures.
9. Maintenance and calibration procedures
10. Parts lists
11. Name, address and telephone number of each manufacturer's local representative.

H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.

I. “As-Built” drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be

of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.12 SEISMIC DESIGN

A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:

1. In accordance with Title 24, 2019 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
2. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2019 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.13 SUBSTITUTIONS AND CHANGES

A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.

B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.

C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.

D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.

E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.14 SUBMITTAL REVIEWS

A. The Architect and / or Engineer will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet the construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.16 LOCATIONS AND ACCESSIBILITY

A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.

B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.

D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

1.17 COORDINATION OF TRADES

A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.

B. No extras will be allowed for changes made necessary by interference or coordination between trades.

C. Submit Composite Coordination Drawings in accordance with Submittal Procedures. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural

interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.

1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation subbase and support.
2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
4. Concrete: Conform to Concrete Section of the Specifications.

1.18 GUARANTEES

A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.

B. Guarantee included in this section to cover:

1. Faulty or inadequate design of equipment or material installed
2. Improper assembly or erection
3. Defective workmanship or material
4. Incorrect or inadequate operation or other failure

C. The contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise

D. Furnish the parts and labor to replace any items found to be defective in the mechanical equipment with the guarantee period.

E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.

F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.19 PROTECTION OF EQUIPMENT AND MATERIALS

A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.20 CLOSING-IN OF UNINSPECTED WORK

A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered

up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.21 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.22 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.23 EQUIPMENT LABELS

A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.24 PRELIMINARY OPERATION

A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.25 ELECTRICAL WORK

A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.

C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.

D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.

E. All interconnecting power wiring and conduits shall be provided by Division 26.

F. Control wiring shall be provided by Division 23, unless otherwise indicated on the drawings.

G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION

SECTION 077233
ROOF HATCH

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Division 05 for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.
3. Division 23 Section "Mechanical Vibration and Seismic Controls" for vibration isolation devices.
4. Division 23 Section "Pipe Expansion Fittings and Loops" for flexible pipe.
5. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems. Not allowed for this project.
4. Pipe positioning systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding and brazing certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: ANSI/MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: ANSI/MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation inserts encased in sheet metal shield.

B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Before Installation: Verify suitability for use in lightweight concrete or concrete slabs less than 4 inches thick with project structural engineer.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

1. Submit: Calculations and details of each pipe stand unit.
2. Available Manufacturer: MIRO Industries.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Base: Stainless steel.
2. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

3. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturer: Portable Pipe Hangers.
2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Available Manufacturer: HOLDRITE Corp.; Hubbard Enterprises.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes or struts.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, non-corrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with ANSI/MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for bare piping for noise abatement.

F. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members notching. Provide such members with reinforcement steel straps of Kees Protecta-Plate or equal.

G. For fastening to wood rafters and beams, or joists, furnish Grinnell figure 128 or 202 or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2 inch x 2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 and larger, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 and larger.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.
b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

2. Side-Beam Brackets (MSS Type 34): For sides of wooden beams.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

N. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger 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. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Each trapeze pipe hanger requires submittal of calculations and details.
2. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
3. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

1. Each metal framing system requires submittal of calculations and details.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Each pipe stand in requires submittal of calculations and details.
2. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
3. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 for curbs specifications.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

1. Each equipment support requires submittal of calculations and details.

J. Install hangers and supports to allow controlled thermal and seismic 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.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

D. Commissioning activities.

1.2 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.3 SUBMITTALS

A. The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems. The independent agency shall be certified and in good standing with the AABC.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Architect.
2. Submit to the Commissioning Authority.
3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with Architect and other installers to sufficiently understand the design intent for each system.
5. Include at least the following in the plan:

    a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    c. Identification and types of measurement instruments to be used and their most recent calibration date.
    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.
f. Expected problems and solutions, etc.
g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
h. Details of how TOTAL flow will be determined; for example:
   1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
   2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
j. Confirmation of understanding of the outside air ventilation criteria under all conditions.
k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
l. Method of checking building static and exhaust fan and/or relief damper capacity.
m. Time schedule for deferred or seasonal TAB work, if specified.
n. False loading of systems to complete TAB work, if specified.
o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
p. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
q. Procedures for formal progress reports, including scope and frequency.
r. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to the Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
7. Include the following on the title page of each report:

   a. Name of Testing, Adjusting, and Balancing Agency.
   b. Address of Testing, Adjusting, and Balancing Agency.
   c. Telephone number of Testing, Adjusting, and Balancing Agency.
   d. Project name.

e. Project location.
f. Project Architect.
g. Project Engineer.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. SMACNA (TAB).
4. Maintain at least one copy of the standard to be used at project site at all times.

B. A minimum of two air balance test shall be completed for the project. One shall be completed prior to any demolition is made to test existing systems in scope of work. Second test shall begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Certified by the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.

11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner and / or project inspector.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches negative static pressure in chemical storage rooms.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7 COMMISSIONING

A. Perform prerequisites prior to starting commissioning activities.

B. Include cost for commissioning requirements in the contract price.

C. Attend commissioning meetings scheduled by the CxA when requested. TAB will need to be present 2 weeks prior to the start of TAB to review the TAB plan/procedures and weekly/bi-weekly during the on-site TAB work.

D. Submit the TAB plan/procedures to the CxA for review at least two weeks prior to beginning TAB work.

E. Notify the CxA a minimum of two weeks in advance of scheduled TAB work.

F. Where applicable, complete the Certificate(s) of Acceptance per the contract documents.

1. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site
2. Provide copies of all Certificate(s) of Acceptance to the CxA.
3. Certificate(s) of Acceptance shall be conducted by companies who are certified as a Mechanical Acceptance Test Technician employer and only completed by those employees of said company who are certified to complete the respective acceptance test.

G. Monitor and respond to Resolution Tracking Forms distributed by the CxA in order to expedite corrective actions necessary to achieve design intent.

H. Participate in the Functional Performance Tests as required to achieve design intent.

I. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

J. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ___ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
2. Use the same test instruments as used in the original TAB work.
3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
4. For purposes of re-check, failure is defined as follows:

    a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    c. Temperatures: Deviation of more than one degree F.
    d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.

5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

K. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.8 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps.
2. HVAC Pumps.
3. Forced Air Furnaces.
4. Air Cooled Water Chillers.
5. Centrifugal Water Chillers.
6. Induced Draft Cooling Tower.
7. Blow Through Cooling Tower.
8. Air Cooled Refrigerant Condensers.
9. Packaged Roof Top Heating/Cooling Units.
10. Packaged Terminal Air Conditioning Units.
11. Unit Air Conditioners.
12. Computer Room Air Conditioning Units.
13. Air Handling Units.
14. Fans.
15. Air Filters.
16. Air Terminal Units.
17. Air Inlets and Outlets.

3.9 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:

1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Combustion Equipment:

1. Boiler manufacturer.
2. Model number.
3. Serial number.
4. Firing rate.
5. Overfire draft.
6. Gas pressure at meter outlet.
7. Gas flow rate.
8. Heat input.
9. Burner manifold gas pressure.
10. Percent carbon monoxide (CO).
11. Percent carbon dioxide (CO2).
12. Percent oxygen (O2).
13. Percent excess air.
14. Flue gas temperature at outlet.
15. Ambient temperature.
16. Net stack temperature.
17. Percent stack loss.
18. Percent combustion efficiency.
19. Heat output.

E. Air Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

F. Chillers:

1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Evaporator entering water temperature, design and actual.
7. Evaporator leaving water temperature, design and actual.
8. Evaporator pressure drop, design and actual.
9. Evaporator water flow rate, design and actual.
10. Condenser entering water temperature, design and actual.
11. Condenser pressure drop, design and actual.
12. Condenser water flow rate, design and actual.

G. Cooling Tower:

1. Tower identification/number.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Rated capacity.
6. Entering air WB temperature, specified and actual.
7. Leaving air WB temperature, specified and actual.
8. Ambient air DB temperature.
9. Condenser water entering temperature.
10. Condenser water leaving temperature.
11. Condenser water flow rate.
12. Fan RPM.

H. Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.

I. Heating Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.

9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

J. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

K. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

L. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

M. Flow Measuring Stations:

1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.

7. Design Flow rate.
8. Actual/final pressure drop.
9. Actual/final flow rate.
10. Station calibrated setting.

N. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

O. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.2 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.3 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation: www.knaufinsulation.com.
2. Johns Manville: www.jm.com.
3. Owens Corning Corporation: www.ocbuildingspec.com.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

2.3 DUCT LINER

A. Manufacturers:

1. Knauf Insulation: www.knaufinsulation.com.
2. Johns Manville: www.jm.com.

B. Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.

C. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.

1. Apparent Thermal Conductivity: Maximum of .24 at 75 degrees F.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Finish with tape and vapor barrier jacket.
2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

D. Insulated Ducts Conveying Air Above Ambient Temperature:

E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section.

F. External Duct Insulation Application:

1. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

G. Duct and Plenum Liner Application:

1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
2. Seal and smooth joints. Seal and coat transverse joints.
3. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 R-VALUE FOR INSULATION ON DUCTS SHALL BE PER TITLE-24 REQUIREMENTS

END OF SECTION

SECTION 230719
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency. Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.3 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. Permanently flexible, elastomeric sealant.
   a. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
   b. Color: White or gray.

C. Metal Jacket Flashing Sealants:

1. Fire- and water-resistant, flexible, elastomeric sealant.
2. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
3. Color: Aluminum.

2.4 TAPE

A. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches (50 mm)
2. Adhesion: 100 ounces force/inch (1.1N/mm)
3. Elongation: 5
4. Tensile Strength: 34 lbf/inch (6.2 N/mm)
5. Thickness: 3.7 mils (0.093)

2.5 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A240/A240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with closed seal.

2. Aluminum: ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with closed seal.
3. Springs: Twin spring set constructed of stainless steel, with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

2.6 GLASS FIBER, RIGID

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.
2. Johns Manville Corporation: www.jm.com.
3. Knauf Insulation: www.knaufinsulation.com.
4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com.

B. Insulation: ASTM C547and ASTM C795; rigid molded, noncombustible.

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

2.7 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Armacell LLC: www.armacell.us.
2. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com.
3. BFG Industries: www.bfg.com.
4. Rubatex: www.rbxcorp.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
2. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

a. Thickness: 0.016 inch sheet.
b. Finish: Smooth.
c. Joining: Longitudinal slip joints and 2 inch laps.
d. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
e. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Install insulation continuously through hangers and around anchor attachments.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.

L. Install multiple layers of insulation with longitudinal and end seams staggered.

M. Exposed Piping: Locate insulation and cover seams in least visible locations.

N. Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

O. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

P. Install insulation on piping accessories requiring future re-occurring access and service with factory fabricated insulation covers that are easily removed and reapplied.

Q. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

R. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

S. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

T. Insulation Installation at Roof and exterior wall penetrations continuously through penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof or exterior 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 roof or exterior wall flashing at least 2 inches (50 mm) below top of roof or wall flashing.
4. Seal jacket to roof or wall flashing with flashing sealant.

U. Insulation Installation at Underground Exterior Wall Penetrations. Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

V. In fire rated and non-fire rated installation install insulation continuously through walls, floors, and partitions.

W. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

X. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

END OF SECTION

SECTION 230802
INSTALLATION & ACCEPTANCE TESTING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 INTRODUCTION

A. Title 24 requires the completion of applicable Certificates of Installation and Certificates of Acceptance for mechanical systems. This shall include applicable mechanical systems as defined in the energy compliance sheets included with the contract documents.

1.2 RELATED DOCUMENTS

A. Contract drawings and specifications, general provisions of the contract, including general and supplementary conditions, mechanical provisions and Division-1 Specification sections apply to work of this section.

1.3 DESCRIPTION OF WORK

A. Complete Title 24 required Certificate(s) of Installation (NRCI) and Certificate(s) of Acceptance (NRCA) to be completed per the contract documents.

1.4 RESPONSIBILITIES OF INSTALLING CONTRACTORS

A. General Contractor (GC)

1. Ensure that contractors identified as the contractor responsible for acceptance testing and completion of the Title 24 Certificate(s) of Acceptance are certified by the State of California or its designated body to conduct each respective test.

B. Mechanical Contractor (MC)

1. Verify proper installation and performance of mechanical services provided.
2. Complete Title 24 Certificate(s) of Installation and manufacturer’s pre-start checklists prior to scheduling startup/programming of mechanical control equipment.

    a. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site
    b. Make Certificate(s) of Installation available for building inspector’s review.
    c. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.
    d. Correct labeling of circuits with connected equipment.

3. Complete the Certificate(s) of Acceptance per the contract documents.

    a. The company installing the mechanical systems must be an authorized Mechanical Controls Acceptance Test Employer certified by a Mechanical Controls Acceptance Test Technician Certification Provider or include in their bid the cost of retaining and overseeing a contractor who is an authorized Mechanical Controls Acceptance Test Employer to complete the acceptance testing.
    b. At the discretion of the GC, the Mechanical Controls Acceptance Testing may be completed by the Testing & Balancing (TAB) Contractor if the TAB contractor' s company and personnel meet requirements in this specification section.
    c. Required acceptance testing must be completed by a Mechanical Controls Acceptance Test Technician employed by the Mechanical Controls Acceptance Test

Employer.

d. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site
e. Provide copies of Certificate(s) of Acceptance to the GC for review by the building inspector
f. Upload Certificate(s) of Acceptance to the California Title 24 Certificates of Acceptance database, if, at the time of project completion, the database is available to the public.

4. Successful completion of the required Acceptance Tests is the responsibility of the installing contractor. Any costs associated with modifications necessary to obtain compliance and re-testing of systems shall be included in the base bid of this project.

END OF SECTION

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compressed-Air Stations:

B. Control panels.

C. Damper Operators:

D. Wall-, Surface-, and Duct-Mounted Sensors:

1. Static air pressure sensors.

E. Thermostats:

1. Electric thermostats.
2. Room-mount thermostat accessories.

F. Pipe-Mounted Sensors and Transmitters:

1.2 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

1.3 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Automated Logic.

B. Alerton.

C. Distech Controls.

2.2 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.3 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

2.4 DAMPER OPERATORS

A. General:

1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.
3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. See Section 25 35 13 for field-mount damper actuators and operators.

2.5 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors

1. Use thermistor, RTD, or thermocouple type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Temperature Sensing Device: Compatible with project DDC controllers.
3. Performance Characteristics:

a. RTD:
   1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
   2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
   3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
   4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
   5) Range: Minus 40 degrees F through 220 degrees F minimum.

b. Thermistor:
   1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
   2) Range: Minus 25 degrees F through 122 degrees F minimum.
   3) Heat Dissipation Constant: 2.7 mW per degree C.

c. Temperature Transmitter:
   1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.

d. Wire Resistance:
   1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.

e. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
f. Temperature Averaging Elements:
   1) Use on duct sensors for ductwork 10 sq ft or larger.

g. Insertion Elements:
   1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
   2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Static-Air Pressure Sensors:

1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

2.6 THERMOSTATS

A. Electric Thermostats:

1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
2. Service: Cooling only.
3. Covers: Locking with set point adjustment, with thermometer.

B. Room-Mounted Thermostat Accessories:

1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

C. Airstream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.

2.7 PIPE-MOUNTed SENSORS AND TRANSMITTERS

1. Self-contained transducer for monitoring of pneumatic, gas, liquid, or steam service with proportional range scaled over selected electronic output.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that systems are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

E. Ensure installation of components is complementary to installation of similar components.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 26 27 26.

C. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

D. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

E. Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3 SCHEDULES

A. Control Valve Schedule

1. Valve Size
2. Valve CV
3. Normal Position

B. Control Damper Schedule

1. Drawing Code
2. Height
3. Width
4. Airflow
5. Air Pressure Drop

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal ducts.

1.2 RELATED REQUIREMENTS

A. Section 23 01 30.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

B. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

C. Section 23 33 00 - Air Duct Accessories.

D. Section 23 33 19 - Duct Silencers.

E. Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

F. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; 2021.

G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

A. Product Data: Provide data for duct materials, duct liner, and duct connections.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 33 19.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

F. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.2 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. VOC Content: Not more than 250 g/L, excluding water.

3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.

a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -20 degrees F to 210 degrees F.

D. Insulated Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.

a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -20 degrees F to 210 degrees F.

E. Low Pressure Supply (System with Cooling Coils): 1 inch w.g. pressure class, galvanized steel.

F. Medium and High Pressure Supply: 6 inch w.g. pressure class, galvanized steel.

G. Return and Relief: 1 inch w.g. pressure class, galvanized steel.

H. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

I. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 DUCTWORK FABRICATION

A. Fabricate ductwork gauge in accordance with current (CMC) California Mechanical Code and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Tee's, bends, and elbows: Construct according to (CMC) California Mechanical Code and SMACNA (DCS).

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4 DUCT MANUFACTURERS

A. Metal-Fab, Inc: www.mtlfab.com.

B. SEMCO Incorporated: www.semcoinc.com.

C. United McGill Corporation: www.unitedmcgill.com.

2.5 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

D. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

E. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

F. Locate ducts and dampers with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

J. Connect diffusers or return air boots to low pressure ducts with 5 feet maximum length of flexible duct.

K. Flexible air ducts shall not be used in lieu of ridged elbows or fittings. Flexible air ducts shall be permitted to be used as an elbow at a terminal device

1. Elbow at a terminal device shall be provide with straps and support, "FlexRight" (Durable Elbow Support).

2. Shall be a universal-mount, 1-piece, fully adjustable, radius forming brace
3. Classified: UL 2043
4. Material: 100 percent recycled copolymer polyporpylene
5. Support Frame Radius: 8 Inches
6. Compliance for Flexible Duct Radius with SMACNA HVAC Duct Construction Standards and ASHRAE Advanced Energy Design Guides
7. Manufacturer: Build Right Products or equal

L. Install flexible duct elbow supports in accordance with manufacturer's instructions.

M. Install flexible duct elbow supports over outer jacket of flexible ducts to form smoot, 90-degree bends to eliminate flexible duct kinks and airflow restrictions

N. Make bends in flexible ducts with minimum of 1-duct diamter centerline radius

O. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

P. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 CLEANING

A. Clean thoroughly each duct system. See Section 23 01 30.51.

B. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Duct access doors.

D. Duct test holes.

E. Flexible duct connectors.

F. Volume control dampers.

1.2 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

E. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

1.4 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.
2. PCI Industries, Inc; Pottorff Brand; : www.portorff.com.
3. Ruskin Company: www.ruskin.com/#sle.
4. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.

B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with worm drive mechanism with removable key operator.

2.2 BACKDRAFT DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com/#sle.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 DUCT ACCESS DOORS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com/#sle.
2. Ruskin Company: www.ruskin.com/#sle.
3. SEMCO LLC: www.semcohvac.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.5 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.6 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com/#sle.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ceiling exhaust fans.

1.2 REFERENCE STANDARDS

A. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

B. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

1.4 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Greenheck Fan Corporation: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

2.2 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. A backward-inclined, non-overloading centrifugal wheel to generate high efficiency and minimal sound.

C. Roof Curb: 12 inch highself-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-

position; fan shaft with self-aligning pre-lubricated ball bearings.

2.3 INLINE CENTRIFUGAL FANS AND BLOWERS

A. Manufacturers:

1. Greenheck Fan Corporation: www.greenheck.com.
2. Loren Cook Company: www.lorencook.com.

B. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm gets reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:

1. Install flexible connections between fan and ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Diffusers:

B. Rectangular ceiling diffusers.

C. Registers/grilles:

1. Ceiling-mounted, exhaust and return register/grilles.
2. Ceiling-mounted, supply register/grilles.

D. Fabric air distribution devices.

1.2 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit sheets indicating materials of construction, finish, and mounting deatils; and performance data including throw and drop, static-pressure drop, and nose ratings.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Krueger: www.krueger-hvac.com.

B. Price Industries: www.price-hvac.com.

C. Titus: www.titus-hvac.com.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in four

way pattern with sectorizing baffles where indicated.

B. Frame: T-Bar and Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame. In T-Bar ceiling provide filler panel.

C. Fabrication: Steel with baked enamel off-white finish.

2.3 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.5 FABRIC AIR DISTRIBUTION DEVICES

A. General Requirements:

1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.
2. Air Dispersion Method:
3. Hanger Supports:

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.2 SCHEDULES SHOWN ON SHEET M0.1

END OF SECTION

SECTION 237416
PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

PART 2 - PRODUCTS

2.1 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. Manufacturers:

1. Carrier Corporation; _____: www.commercial.carrier.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. General: Roof mounted units having gas burner and electric refrigeration that are 6 tons and smaller in capacity.

C. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.2 PACKAGED, LARGE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. Manufacturers:

1. Carrier Corporation; _____: www.commercial.carrier.com/#sle.

B. General: Roof mounted units having gas burner and electric refrigeration that are 25 tons and larger in capacity.

C. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.3 PERFORMANCE REQUIREMENTS

A. See Mechanical equipment Schedule

2.4 CASING

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.

2.5 FANS

2.6 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and

larger.

2.7 COMPRESSORS

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.8 Air Filters:

A. 1-inch thick, glass fiber disposable media in metal frames. - MERV -13

2.9 OPERATING CONTROLS

A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.

1. Include system selector switch heat-off-cool and auto-on fan control switch.

B. Provide remote-mounted auto-on fan control switch.

2.10 ROOF CURBS

A. Roof Mounting Curb: 14 inches high, galvanized steel, channel frame with gaskets, nailer strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.4 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of packaged rooftop units for one year from Date of Substantial Completion.

D. Provide routine maintenance service with a two-month interval as maximum time period between calls.

E. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

F. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

SECTION 260010
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE:

A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the electrical specifications and drawings. Refer to all bid documents including Civil, Architectural, Structural, and Mechanical documents which may designate Work to be accomplished. The intent of the Specifications is to provide a complete and operable electrical system, which shall include all documents that are a part of the entire Project Contract.

1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this division complete as shown or noted on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Refer to all sections in the general contract conditions, Contract Requirements and Division 1, General Requirements.

C. Work Installed but Furnished by Others:

1. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

1.2 GENERAL REQUIREMENTS:

A. Guarantee See General Conditions:

1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guarantee period, from date of final completion. Guarantee all work against defective workmanship, material, and improper installation. Upon notification of failure, correct deficiency immediately and without additional cost to the Owner.

2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Division 01.

B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.

C. Codes and Regulations:

1. Design, manufacturer, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:

   a. Institute of Electrical and Electronic Engineers - IEEE

   b. National Electrical Manufacturers' Association - NEMA

   c. Underwriters' Laboratories, Inc. - UL

   d. National Fire Protection Association - NFPA

   e. American Society for Testing and Materials - ASTM

   f. American National Standards Institute - ANSI

   g. California Electrical Code - CEC, Title 24, Part 3

   h. California Code of Regulations, Title 8, Subchapter 5

   i. California Building Code-CBC, Title 24 Parts 1 &2

   j. State & Municipal Codes in Force in the Specific Project Area

   k. Occupational Safety & Health Administration - OSHA

   l. California State Fire Marshal

   m. California Fire Code- CFC, Title 24 Part 9

   n. National Electrical Testing Association - NETA

2. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.

D. Requirements of Regulatory Agencies:

1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply. The most stringent condition shall be as interpreted by the Engineer.

   a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Contractor at his expense shall obtain the Work, unless otherwise specified.

   b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.

E. Shop Drawings:

1. See Division 01 for additional requirements.

2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.

3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.

4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.

5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. "It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces". Failure to add the above written statement for compliance will result in return of submittals without review.

    a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" (275 mm x 435 mm) or smaller, in sets with covers neatly showing titles.

    b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.

    c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.

    d. Include complete catalog information such as construction, ratings, insulation systems, as applicable.

    e. For any material specified to meet UL or trade standards, furnish the manufacturers or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.

    f. Reference listings to the specifications' Sections and Article to which each is applicable.

    g. Equipment Floor Plans: After approval of material is secured prepare a floor plan of each electrical and communication equipment space, room or yard, drawn to scale at 1/2 inch equals 1 foot and submit for approval in the same manner as for shop drawings. The layout drawings shall be exact scale.

6. Contractor shall prepare coordinated drawings when required by Division 01 or where noted otherwise.

F. Interpretations: The Contractor through the Architect must make Requests for interpretations of drawings and specifications. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.

G. Standard of Quality

1. The contract Drawings and Specifications establish the “MINIMUM STANDARD OF QUALITY” each product and/or system must meet to be considered acceptable. Products of other manufactures will be considered if the product and/or system meet or exceed the “MINIMUM STANDARD OF QUALITY” established by this Contract Document.

2. Items for similar application shall be of the same manufacturer.

3. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.

4. Where codes as listed in Section General Requirement Section of the Specifications that establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.

5. Provide the type and quantity of electrical materials and equipment necessary to complete Work and all systems in operation, tested and ready for use.

6. Provide and install all incidental items that belong to the Work described and which are required for complete systems.

7. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.

8. All wiring devices such as switches and receptacles shall be of the same manufacturer.

H. Substitutions: Refer to Division 01

I. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:

1. General Requirements:

a. Main service and distribution switchboards.

b. Panelboards.

c. Conduits

d. Conductors, include all selected insulation types.

e. Fuses

f. Disconnect switches and Starters.

g. Pullboxes, manholes and handholes.

h. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).

i. Control devices, standard and special receptacles, switches, outlets and finish device plates.

j. Cabinets for signal and telephone system, special terminals and cabinets. Include all cabinet dimensions.

k. Fire alarm system.

l. Transformers

J. Utility Service:

1. Contractor shall verify the locations shown on the drawings and shall include extensions of lines to building service from locations which are acceptable to the Owner.

2. Verify electrical, civil, architectural and structural, dimensional and other requirements with the Owner.

3. Should any major modifications to the work indicated be necessary to comply with the Owner requirements, notify the Architect.

4. Contractor shall contact the utility company representatives to establish pre-construction coordination, obtain all necessary meters and/or approvals, and schedule utility work to coordinate with the construction schedule.

5. All utility services shall be installed per the utility company requirements. Verify final construction requirements with utility company service planners prior to construction.

K. Record Drawings: Refer to Division 01, Contract Closeout.

L. Work Responsibilities:

1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, junction boxes and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of his work. Where conflicts occur in plans and/or specifications, the most stringent application shall apply and shall be part of the base bid.

2. Locations shown on architectural plan or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect.

3. In the event minor changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment or due to interference with other trades, such changes shall be made without extra cost.

4. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.

5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the furnished equipment will fit into the spaces provided without violation of applicable Codes.

6. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect.

7. Contractor shall be responsible for coordination of coordinated drawings when required by the Architect.

8. Replace or repair, without additional compensation any work which does not comply with or which is installed in violation of any of these requirements.

M. Installation General: For special requirements, refer to specific equipment under these requirements.

1. Unless otherwise specified elsewhere in the specifications, do all excavating necessary for the proper installation of the electrical work.

2. Locations of Openings: Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Cutting or drilling in any structural member is prohibited without approval of the Architect. Furnish all access panels to make all boxes, connections and devices accessible as required by CEC.

3. Location of Sleeves: Where conduits pass through concrete walls, suspended slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations.

4. Wherever conduit extends through roof, install flashings in accordance with drawings and details.

5. Contractor shall be responsible for cutting and patching which may be required for the proper installation of the electrical work.

6. Protect work, materials and equipment and provide adequate and proper storage facilities during the progress of the work. Storage outdoors shall be weather protected and shall include space heaters to prevent condensation. Provide for the safety and good condition of all work until final acceptance of the work. Replace all damaged or defective work, materials and equipment before requesting final acceptance.

7. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, spattered paint, cement and dirt on both exterior and interior. All underground conduits shall be mandrelled prior to pulling wire.

8. Conduit and Equipment to be Painted: Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

9. Items with Factory Finish: Remove cement, plaster, grease and oil, and leave surfaces, including cracks and corners, clean and polished. Touch up scratched or bare spots to match finish.

10. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish on a weekly basis. Vacuum out all cabinets, switchgear and panels and junction boxes prior to pulling any conductors.

11. Electrical equipment and materials exposed to public and in finished areas shall be finish-painted after installation in accordance with the Painting Section. All exposed screw-type fasteners, exterior, or interior in restrooms, shall be vandal-resistant spanner type; include tool.

N. Excavation, Cutting and Patching:

1. Excavating, trenching and backfilling required for the work of this Division in accordance with the applicable requirements of Division 2. Excavating and backfilling connected with electrical work, repaving cuts and providing and maintaining protective measures for the electrical work excavation required by the governing authorities having jurisdiction shall be performed as a part of the work of this Division.

2. Verify openings indicated on the drawings. Provide all cutting, patching and reinforcement of the construction of the building as required to install electrical work.

O. Tests

1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.

2. Resistance to ground tests shall be accomplished by a qualified independent testing firm to measure resistance to ground at grounding electrodes. Make tests before slabs or affected areas are poured in order that corrective measures, if required, may be taken. Submit a report showing the results of these measurements. If the resistances exceed values specified elsewhere or NETA test procedure recommendations, perform corrective measures required to reduce resistance to acceptable values.

3. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.

4. Measure the three-phase voltage at no load and at maximum load conditions and submit to the engineer a report showing the results of these measurements.

5. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Owner's Representative. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.

6. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.

7. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.

P. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.

Q. Cleaning Up:

1. Upon completion of the work and at various time during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.

2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.

3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.

4. Leave the entire installation in a clean condition.

R. Completion:

1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.

2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.

S. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. As specified in Division 01

T. Inspection and Acceptance Procedures: The Architect will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.

U. Final Completion of Electrical Systems:

1. Prior to Final Completion of operating electrical systems, the Contractor shall:

a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.

b. Furnish the required Operating and Maintenance Data/Manuals.

c. Clean up of the project pertaining to this Division of the work.

d. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Architect that systems are complete and operating in conformance with Contract Documents.

e. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.

f. Submission of warranties and guarantees.

2. Final Completion of Work Shall be Contingent On:

a. Contractor replacing defective materials and workmanship.

b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as Architect directs. Conduct test in presence of authorized representative of Architect and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.

c. Contractor shall provide the necessary training programs and instructions to the Owner's representative. Number of hours shall be a minimum of four (4) hours for each system or days as required under separate Sections of these Specifications. Complete operation and maintenance manuals shall be provided at least two (2) weeks prior to training.

d. Submit copies of manufacturer's instructions and maintenance of electrical equipment including replacement parts lists. Each set shall include one set of shop drawings of equipment installed.

V. Submittals for Change Orders: When changes are made during the construction phase, deletions and additions shall be presented in a manner that will indicate the cost of each item of material and corresponding labor. Markup shall be then added in accordance with the requirements of the General Conditions as modified by the Supplementary Conditions.

W. The Contractor at a time convenient to the Owner shall provide instruction to the Owner's operating personnel in the proper operation and maintenance of all equipment and systems. The instructors shall have received factory training and shall be thoroughly familiar with the equipment installed. The operating personnel shall receive the number of days instruction as indicated in other sections.

1.3 PROJECT RECORD DOCUMENTS:

A. Record Drawings: CAD: Use a computer aided drafting (CAD) system in the preparation of record drawings for this Project. Acceptable CAD systems shall be capable of producing files in AutoCAD Version 2012 compatible DWG or DXF format. Owner's consultant will furnish CAD backgrounds for use by the Contractor after construction is 85% complete except where prohibited by Contract.

B. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

C. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

D. Final Record Drawings: Conform to Division 01 requirements.

E. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

F. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

G. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

H. At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies, a complete separate, clean, undamaged set of the latest stamped, actioned submittals. As work progresses, maintain records of "as installed" conditions on this set in suitable ink or chemical fluid. Update the set daily. After successful completion of Project Site testing specified herein, and after completion of Punch List corrections, copy all records of "as installed" conditions on to originals.

I. Quantity:

1. Review sets: As for Shop and Field Drawings.

2. Record set: Refer to Division 01.

J. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition. Where room designations according to Project permanent signage differ from construction designations in the Contract Documents, show both designations.

K. Warranty Certificates: Comply with Division 01.

PART 2 – COMMISSIONING:

2.1 COMMISSIONING OF ELECTRICAL SYSTEMS

A. Include cost for commissioning requirements in the contract price.

B. Attend commissioning meetings scheduled by the CxA.

C. Prepare preliminary schedule for indoor lighting system inspections, O&M manual submission, training sessions, lighting controls testing, system verification, performance testing, and system

completion for use by the CxA. Update schedule as appropriate throughout the construction period and provide updated schedule to the commissioning team.

D. Verify proper installation and performance of all electrical services provided.

E. Complete Title 24 Certificate(s) of Installation and manufacturer's pre-start checklists prior to scheduling startup of HVAC and electrical equipment.

1. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site

2. Make Certificate(s) of Installation available for CxA review upon request.

3. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.

F. Where applicable, complete the Certificate(s) of Acceptance per the contract documents.

1. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site

2. Provide copies of all Certificate(s) of Acceptance to the CxA.

3. Certificate(s) of Acceptance shall be conducted by companies who are certified as California Advanced Lighting Controls Training Program Acceptance Technician (CALCTP-AT) employer and only completed by those employees of said company who are certified to complete the respective acceptance test.

G. Monitor and respond to Resolution Tracking Forms distributed by the CxA in order to expedite corrective actions necessary to achieve design intent.

H. Participate in the Certificate(s) of Acceptance and Functional Performance Tests as required to achieve design intent.

I. Participate in the opposite-season testing as required to achieve design intent.

J. Participate in O&M Training as required by project specifications.

K. Ensure participation of major equipment manufacturers and their representatives as applicable.

L. Obtain O&M data on all equipment and assemble in binders using tabs as required.

M. Conduct a maintenance orientation and inspection with hands on training per the contract documents.

N. Provide written certification and completed Certificate(s) of Installation forms and checklists documenting that the following work has been completed in accordance with the plans and specifications and that they are functioning as designed.

1. Correct labeling of all circuits with connected equipment.

2. Lighting system controls operations, including occupancy sensors, automatic time controls or Energy Management control, override timers, manual dimming controls, exterior lighting controls, multi-level switching, as applicable to the Work.

END OF SECTION

SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - EXECUTION

1.1 EXAMINATION:

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Beginning of demolition means installer accepts existing conditions.

1.2 PREPARATION:

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK:

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

2.1 SECTION INCLUDES:

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Heat shrink tubing.

E. Wire pulling lubricant.

F. Cable ties.

2.2 RELATED REQUIREMENTS:

A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

2.3 REFERENCE STANDARDS:

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

2.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

2.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

2.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

2.7 DELIVERY, STORAGE, AND HANDLING:

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

3.1 CONDUCTOR AND CABLE APPLICATIONS:

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

3.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS:

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

4) 20A exterior circuits: 10 AWG..

2. Control Circuits: 14 AWG.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

b. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

3.3 SINGLE CONDUCTOR BUILDING WIRE:

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.

c. Southwire Company: www.southwire.com/#sle.

d. Rome Wire and Cable.

e. Okonite Wire

f. Pirelli Wire and Cable

g. Carol Cable

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

b. Installed Underground: Type XHHW-2.

3.4 WIRING CONNECTORS:

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

3.5 ACCESSORIES:

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 - EXECUTION

4.1 EXAMINATION:

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

4.2 PREPARATION:

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

4.3 INSTALLATION:

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

G. Install conductors with a minimum of 12 inches of slack at each outlet.

H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

    a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

    a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

    b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Identify conductors and cables in accordance with Section 260553.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section Firestopping.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

4.4 FIELD QUALITY CONTROL:

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

1.2 RELATED REQUIREMENTS:

A. Section 096500 - Resilient Flooring: Static control flooring.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS:

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

B. Field quality control test reports.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS:

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

   a. Provide continuous grounding electrode conductors without splice or joint.

   b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

   b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

   c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Rod Electrode(s):

   a. Provide two electrodes unless otherwise indicated or required.

   b. Space electrodes not less than 10 feet from each other and any other ground electrode.

   c. Provide ground access well for each electrode.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost transformers).

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.

5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

   b. Metal gas piping.

   c. Metal process piping.

8. Provide bonding for interior metal air ducts.

9. Provide bonding for metal building frame.

10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

K. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

2.2 GROUNDING AND BONDING COMPONENTS:

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.

    a. Exceptions:

        1) Use bare copper conductors where installed underground in direct contact with earth.

        2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

F. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.

2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.

4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL:

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 REFERENCE STANDARDS:

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.4 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.5 QUALITY ASSURANCE:

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS:

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

A. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

B. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

C. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

2. Comply with MFMA-4.

3. Channel Material:

a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

D. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

E. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. New Concrete: Use preset concrete inserts.

3. Existing Concrete: Use expansion anchors.

4. Solid or Grout-Filled Masonry: Use expansion anchors.

5. Hollow Masonry: Use toggle bolts.

6. Hollow Stud Walls: Use toggle bolts.

7. Steel: Use welded threaded studs complying with AWS D1.1/D1.1M with lock washers and nuts or Beam clamps (MSS Type 19 21 23 25 or 27) complying with MSS SP-69.

8. Sheet Metal: Use sheet metal screws.

9. Wood: Fasten with lag screws or through bolts.

10. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

11. Plastic and lead anchors are not permitted.

12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

b. Comply with MFMA-4.

c. Channel Material: Use galvanized steel.

13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 - EXECUTION

4.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

4.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners in accordance with manufacturer's recommended torque settings.

K. Remove temporary supports.

4.3 CONCRETE BASES:

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete or Cast-in-Place Concrete (Limited Applications)" as applicable.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturers written instructions.

4.4 FIELD QUALITY CONTROL:

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Galvanized steel rigid metal conduit (RMC).

B. PVC-coated galvanized steel rigid metal conduit (RMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Reinforced thermosetting resin conduit (RTRC).

1.2 REFERENCE STANDARDS:

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

F. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

G. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

J. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

K. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

L. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.4 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

B. Project Record Documents: Record actual routing for conduits installed underground and conduits 2 inch (53 mm) trade size and larger.

1.5 QUALITY ASSURANCE:

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 CONDUIT APPLICATIONS:

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use rigid PVC conduit.

2. Exterior, Direct-Buried: Use rigid PVC conduit.

3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.

4. Where rigid polyvinyl (PVC) conduitlarger than 2 inch (53 mm) trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.

5. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

6. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit.

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

L. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), stainless steel electrical metallic tubing (EMT), or reinforced thermosetting resin conduit (RTRC).

M. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

N. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

O. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.2 CONDUIT - GENERAL REQUIREMENTS:

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Branch Circuit Homeruns: 3/4-inch trade size.

3. Control Circuits: 1/2-inch trade size.

4. Flexible Connections to Luminaires: 3/8-inch trade size.

5. Underground, Exterior: 1-inch trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC):

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 STAINLESS STEEL RIGID METAL CONDUIT (RMC):

2.5 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC):

2.6 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC):

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.

3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.

4. Material: Use steel or malleable iron.

5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.7 FLEXIBLE METAL CONDUIT (FMC):

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.8 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC):

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.9 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT):

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT):

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC):

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.12 ACCESSORIES:

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal conduits unless specifically indicated to be exposed.

4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

5. Arrange conduit to maintain adequate headroom, clearances, and access.

6. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

7. Arrange conduit to provide no more than 150 feet between pull points.

8. Route conduits above water and drain piping where possible.

9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

10. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

11. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

a. Heaters.

b. Hot water piping.

c. Flues.

12. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.

   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.

9. Use of spring steel conduit clips for support of conduits is not permitted.

10. Use of wire for support of conduits is not permitted.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

7. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 18 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

2. Provide underground warning tape in accordance with Section 260553 along entire conduit length.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section Concrete with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding; see Section 260526.

P. Identify conduits; see Section 260553.

3.3 FIELD QUALITY CONTROL:

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING:

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION:

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.2 REFERENCE STANDARDS:

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes and underground boxes/enclosures.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

1.5 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

PART 2 - PRODUCTS

2.1 BOXES:

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

12. Minimum Box Size, Unless Otherwise Indicated:

    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.

    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.

    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.

13. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

b. Back Panels: Painted steel, removable.

c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section Access Panels as requiredwhere approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.

11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

a. Concealed above accessible suspended ceilings.

b. Within joists in areas with no ceiling.

c. Electrical rooms.

d. Mechanical equipment rooms.

H. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 260526.

3.2 CLEANING:

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.3 PROTECTION:

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260533.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - PRODUCTS

1.1 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.2 RELATED REQUIREMENTS:

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS:

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS:

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 - PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS:

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

1) Identify ampere rating and name.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Use identification nameplate to identify main overcurrent protective device.

5) Use identification nameplate to identify load(s) served for each branch device.Identify spares and spaces.

b. Panelboards:

1) Identify ampere rating and name.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device.Identify spares and spaces.

c. Transformers:

1) Identify kVA rating and name.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

a. Service equipment.

b. Industrial control panels.

c. Motor control centers.

d. Elevator control panels.

e. Industrial machinery.

4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

a. Minimum Size: 3.5 by 5 inches.

b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

a. At each source and load connection.

b. Within boxes when more than one circuit is present.

c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

4. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 262726.

2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

F. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS:

A. Identification Nameplates:

1. Materials:

    a. Indoor Clean, Dry Locations: Use plastic nameplates.

    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

    a. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

    a. Equipment Designation: 1/2 inch.

    b. Other Information: 1/4 inch.

5. Color:

    a. Normal Power System: White text on black background.

D. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/2 inch.

5. Color: Black text on yellow background unless otherwise indicated.

E. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Power source and circuit number or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

F. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Load controlled or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS:

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS:

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

E. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE:

A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.6 WARNING SIGNS AND LABELS:

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL:

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260573
POWER SYSTEM STUDIES

PART 1 - GENERAL

1.1 REFERENCE STANDARDS:

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.2 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.3 SUBMITTALS:

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

1.4 POWER SYSTEM STUDIES:

A. Scope of Studies:

1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:

1. Comply with NFPA 70.

2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.

1) Obtain up-to-date information from Utility Company.

b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.

c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.

d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.

e. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Study Reports:

1. General Requirements:

a. Identify date of study and study preparer.

b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.

d. Identify base used for per unit values.

e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

f. Include conclusions and recommendations.

1.5 QUALITY ASSURANCE:

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Electrical connections to equipment.

1.2 REFERENCE STANDARDS:

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

1.4 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS:

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 260802
INSTALLATION & ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS

INTRODUCTION

1.1 TITLE 24 REQUIRES THE COMPLETION OF ALL APPLICABLE CERTIFICATES OF INSTALLATION AND CERTIFICATES OF ACCEPTANCE FOR LIGHTING SYSTEMS. THIS SHALL INCLUDE INDOOR AND OUTDOOR LIGHTING SYSTEMS.

1.2 RELATED DOCUMENTS:

A. Contract drawings and specifications, general provisions of the contract, including general and supplementary conditions, electrical provisions and Division-1 Specification sections apply to work of this section.

1.3 DESCRIPTION OF WORK:

A. Complete all Title 24 required Certificate(s) of Installation (NRCI) and Certificate(s) of Acceptance (NRCA) to be completed per the contract documents.

1.4 RESPONSIBILITIES OF INSTALLING CONTRACTORS:

A. General Contractor (GC)

1. Ensure that all contractors identified as the contractor responsible for acceptance testing and completion of the Title 24 Certificate(s) of Acceptance are certified by the State of California or its designated body to conduct each respective test.

B. Electrical Contractor (EC)

1. Verify proper installation and performance of all electrical services provided.

2. Meet with acceptance tester at beginning of construction to review project requirements.

3. Complete Title 24 Certificate(s) of Installation and manufacturer’s pre-start checklists prior to scheduling startup/programming of lighting control equipment.

a. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site

b. Make Certificate(s) of Installation available for building inspector’s review.

c. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.

d. Correct labeling of all circuits with connected equipment.

4. Complete the Certificate(s) of Acceptance per the contract documents.

a. The company installing the lighting systems must be an authorized Lighting Controls Acceptance Test Employer certified by a Lighting Controls Acceptance Test Technician Certification Provider or include in their bid the cost of retaining and overseeing a

contractor who is an authorized Lighting Controls Acceptance Test Employer to complete the acceptance testing.

b. All required acceptance testing must be completed by a Lighting Controls Acceptance Test Technician employed by the Lighting Controls Acceptance Test Employer. The acceptance tester shall be present for all commissioning efforts.

c. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site

d. Upload all Certificate(s) of Acceptance to the California Title 24 Certificates of Acceptance database, if, at the time of project completion, the database is available to the public.

5. Successful completion of the required Acceptance Tests is the responsibility of the installing contractor. Any costs associated with modifications necessary to obtain compliance and re-testing of systems shall be included in the base bid of this project.

END OF SECTION

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Occupancy sensors.

1.2 RELATED REQUIREMENTS:

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches.

F. Section 265100 - Interior Lighting.

1.3 REFERENCE STANDARDS:

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.

2. Coordinate placement of wall switch occupancy sensors with installed door swings.

3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.

4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.

5. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.

6. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS:

A. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

C. Field quality control reports.

D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE:

A. Comply with NFPA 70.

B. Maintain at project site one copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION:

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS:

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY:

A. Provide five year manufacturer warranty for occupancy sensors.

B. Provide five year manufacturer warranty for all daylighting controls.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS:

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION:

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION:

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switch Occupancy Sensors: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Maintain separation of remote-control, signaling, and power-limited circuits.

1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Identify lighting control devices; see Section 260553.

K. Daylighting Control Photo Sensor Locations:

1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.

N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4 FIELD QUALITY CONTROL:

A. Inspect each lighting control device for damage and defects.

B. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

C. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.5 ADJUSTING:

A. Adjust devices and wall plates to be flush and level.

B. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.6 CLEANING:

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES:

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.

4. Location: At project site.

END OF SECTION

SECTION 262413
SWITCHBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.2 RELATED REQUIREMENTS:

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

1.3 REFERENCE STANDARDS:

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

L. UL 891 - Switchboards; Current Edition, Including All Revisions.

M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:

1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.

2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.

3. Obtain Utility Company approval of switchboard prior to fabrication.

4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.

2. Identify mounting conditions required for equipment seismic qualification.

C. Manufacturer's equipment seismic qualification certification.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Enclosure Keys: Two of each different key.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS:

A. Maintain field conditions within required service conditions during and after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Switchboards - Basis of Design: Eaton.

B. Switchboards:

1. ABB/GE: www.electrification.us.abb.com/#sle.

2. Eaton Corporation: www.eaton.com/#sle.

3. Schneider Electric: www.se.com/#sle.

4. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.2 SWITCHBOARDS:

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Service Entrance Switchboards:

1. Listed and labeled as suitable for use as service equipment according to UL 869A.

2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.

3. Comply with Utility Company requirements for electrical service.

4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.

E. Service Conditions:

1. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:

1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Listed series ratings are not acceptable.

G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

H. Bussing: Sized in accordance with UL 891 temperature rise requirements.

1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.

2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

3. Phase and Neutral Bus Material: Copper.

4. Ground Bus Material: Copper.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

1. Line Conductor Terminations:

a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

b. Main and Neutral Lug Type: Mechanical.

2. Load Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

b. Lug Type:

1) Provide mechanical lugs.

J. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).

b. Outdoor Locations: Type 3R.

2. Finish: Manufacturer's standard unless otherwise indicated.

3. Outdoor Enclosures:

a. Color: Manufacturer's standard.

b. Access Doors: Lockable, with all locks keyed alike.

K. Future Provisions:

1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

3. Where designated spaces for future device provisions are not indicated, include provisions for minimum of 6 device(s) rated at 25 percent of rating of switchboard main or incoming feed.

4. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sectionswhere indicated.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence or residual ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

M. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

N. Instrument Transformers:

1. Comply with IEEE C57.13.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Connect secondaries to shorting terminal blocks.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.3 OVERCURRENT PROTECTIVE DEVICES:

A. Circuit Breakers:

1. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

1) Provide thermal magnetic circuit breakers unless otherwise indicated.

2) Provide electronic trip circuit breakers where indicated.

b. Minimum Interrupting Capacity:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

2) 14,000 rms symmetrical amperes at 480 VAC.

c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

e. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.4 SOURCE QUALITY CONTROL:

A. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:

1. Dielectric tests.

2. Mechanical operation tests.

3. Grounding of instrument transformer cases test.

4. Electrical operation and control wiring tests, including polarity and sequence tests.

5. Ground-fault sensing equipment test.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment in accordance with Section 260529.

F. Install switchboards plumb and level.

G. Provide grounding and bonding in accordance with Section 260526.

H. Install all field-installed devices, components, and accessories.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Set field-adjustable circuit breaker tripping function settingsas directed.

K. Set field-adjustable ground fault protection pickup and time delay settingsas directed.

L. Provide filler plates to cover unused spaces in switchboards.

3.3 FIELD QUALITY CONTROL:

A. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.1.

D. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 200 amperes. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.4 ADJUSTING:

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.5 CLEANING:

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

3.6 PROTECTION:

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS:

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS:

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. ABB/GE: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS:

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Load centers are not acceptable.

2.3 POWER DISTRIBUTION PANELBOARDS:

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type.

2. Provide thermal magnetic circuit breakersfor circuit breaker frame sizes less than 225 amperes.

3. Provide electronic trip circuit breakersfor circuit breaker frame sizes 225 amperes and above.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosuresas indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 LIGHTING AND APPLIANCE PANELBOARDS:

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 OVERCURRENT PROTECTIVE DEVICES:

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

2) 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

8. Do not use tandem circuit breakers.

9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

10. Provide the following features and accessories where indicated or where required to complete installation:

a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Provide filler plates to cover unused spaces in panelboards.

3.3 FIELD QUALITY CONTROL:

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

C. Test GFCI circuit breakers to verify proper operation.

D. Test shunt trips to verify proper operation.

E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING:

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.5 CLEANING:

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

1.2 RELATED REQUIREMENTS:

A. Section 260533.16 - Boxes for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS:

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1. Wall Dimmers: Include derating information for ganged multiple devices.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 - PRODUCTS

2.1 WIRING DEVICES - GENERAL REQUIREMENTS:

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

2.2 MANUFACTURERS:

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

2.3 WIRING DEVICE FINISHES:

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.4 WALL SWITCHES:

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.

2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.5 RECEPTACLES:

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com.

2. Leviton Manufacturing Company, Inc: www.leviton.com.

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION:

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION:

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switches: 48 inches above finished floor.

b. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Identify wiring devices in accordance with Section 260553.

3.4 FIELD QUALITY CONTROL:

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING:

A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING:

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262813
FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Fuses.

1.2 REFERENCE STANDARDS:

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS:

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.5 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Littelfuse, Inc: www.littelfuse.com.

C. Mersen: ep-us.mersen.com.

2.2 APPLICATIONS:

A. Individual Motor Branch Circuits: Class RK1, time-delay.

2.3 FUSES:

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 - PRODUCTS

1.1 ENCLOSED CIRCUIT BREAKERS:

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

H. Provide externally operable handle with means for locking in the OFF position.

1.2 MOLDED CASE CIRCUIT BREAKERS:

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:

1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:

1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

END OF SECTION

SECTION 262816.16
ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS:

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 262813 - Fuses.

1.3 REFERENCE STANDARDS:

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS:

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

C. Project Record Documents: Record actual locations of enclosed switches.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 ENCLOSED SAFETY SWITCHES:

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Minimum Ratings:

a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL:

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING:

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING:

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 264300
SURGE PROTECTIVE DEVICES

PART 1 - PRODUCTS

1.1 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS:

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

E. UL 1449 Voltage Protection Ratings (VPRs):

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

1.2 RELATED REQUIREMENTS:

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS:

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

B. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

E. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS:

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

3. Ballasts: Include wiring diagrams and list of compatible lamp configurations.

4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

C. Samples:

1. Provide one sample(s) of each luminaire proposed for substitution upon request.

D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.

2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.

3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

1.7 DELIVERY, STORAGE, AND PROTECTION:

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS:

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY:

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

B. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

PART 2 - PRODUCTS

2.1 LUMINAIRE TYPES:

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES:

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 EMERGENCY LIGHTING UNITS:

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 EXIT SIGNS:

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

2.5 BALLASTS AND DRIVERS:

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION:

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION:

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure pendant-mounted luminaires to building structure.

5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.

4. Install canopies tight to mounting surface.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL:

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING:

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING:

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES:

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION:

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265120
AUTOMATIC LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Provide and design an automatic lighting control system as described in this specification and as called for on the drawings.

1.2 QUALITY ASSURANCE:

A. Manufacturer shall have a minimum of 10 years experience in manufacturing and installing this type of system.

B. The Contractor shall provide a list of recent jobs completed during the last 5 years with the name and phone number of a contact person.

C. All components and assemblies are to be pre-tested and assembled at the factory prior to installation.

D. Provide a factory-trained technician on site. The technician shall functionally test each component in the system after installation to verify proper operation and confirm that the panel wiring and addressing conform to the wiring documentation.

1.3 SUBMITTALS:

A. The following list includes the required shop drawings and product data information that shall be submitted.

1. Underwriters Laboratories, Inc. (UL) listing and factory test reports.

2. Internal and system wiring diagrams.

3. Single line diagram of the system configuration. Typical riser diagrams are not acceptable.

4. Dimensions of the equipment layout.

5. Control wiring and conduits layout and connections.

6. Floor plans to scale showing the location of each device and equipment.

7. Product data of all the components including but not limited to programmable central controllers, transceivers panels, input relays, switches and other ancillary equipment.

1.4 REFERENCES:

A. UL 916 Energy Management Equipment.

B. FCC Emissions Standards specified in Part 15, subpart J for Class A, Applications.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide and microprocessor controlled relay panels for the Lighting Control System. The system shall include programmable standalone master panel, switch inputs, wiring, power supplies, relays and ancillary relays.

B. Panels shall be capable of standing alone or operating as part of a network.

1. The system shall provide intelligence to operate as follows:

a. Store all user operating data.

b. Initiate all relay output commands based on:

1) Operator inputs

2) Automatic operating schedule

3) Binary type field sensors

4) Universal override switch inputs

5) Internal 56K Baud modem

c. Provide automatic system diagnostics and alarming based on detected faults in the controller, transceiver panels, relays, and data line.

2. System shall include a memory back up to be able to survive an indefinite length of power failure.

C. Lighting Control Panel (LCP): Microprocessor based, complete prewired assemblies consisting of the following:

1. Stand alone panel controller capable of receiving and acting upon programs downloaded from the central computer. Programs downloaded from the network shall be capable of continuing to operate even if the network should fail. Battery Back up provides 8 days of memory retention. Panel shall be part of a system that can control up to 750 relays and receive up to 500 switch inputs. Panel shall have an USB input for local programming and trouble shooting from a laptop computer.

2. Internal digital clock with self control power.

3. Output modules: Plug in type to receive coded digital commands from the panel controller and pulse output relays to the appropriate state. Actual status feedback of the relays are to be fed back to the panel controller and from there to the central computer. Actual status of each relay is to be indicated by a pilot LED on the control board. Each Module controls 8 or 16 relays.

4. Switch input modules: Plug-in type, actuated by remote external contact closures. These contact closures may be either momentary or maintained. The action of the contact is noted by the panel controller and acted upon as programmed by software. The action of the

contact can command any group of output relays to the desired state. Either 8 or 24-input channels as shown on the plans.

5. Output Relays

   a. Type: Momentary pulsed, mechanically latched with pilot light contact.

   b. Rating: 20 Ampere, 277VAC

   c. Number per panel: 16,32 or 48 as required to satisfy this project scope.

6. The low voltage and high voltage sections of the lighting control cabinet shall be separated by a 14 gage steel barrier in which the relays are mounted. In areas where both 120 volt and 277 volt loads are present the high voltage compartment shall have a 14 gage steel barrier between the relays that carry 120 VAC and the relays that carry 277VAC. Each section shall be clearly labeled as to the voltage in that compartment.

7. Panel power supply shall be dual primary 115/277 volts AC, 60 Hz. ± 10%. Low voltage side shall be protected from power line surges and spikes on the input power. The low voltage section shall be protected against short circuit faults and relay failures.

8. Panels shall be UL approved and shall have a short circuit withstand current rating at 14,000 AIC.

9. Manufacturer: Lighting Control and Design, or G.E. or equal.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. The Lighting Control System shall be installed and wired completely as required by the equipment manufacturer by the contractor, who shall make all necessary wiring connections to the lighting fixtures, override switches, photo cells and equipment.

B. The Contractor shall provide on-site programming time with factory-trained personnel for the system set-up. The Contractor shall set up the software program and program the entire system in accordance with the Owner's instructions.

C. Documentation

1. Accurate "as-built" drawings shall be provided by the Contractor. These shall indicate the load controlled by each relay and the identification number for that switch connected to an input and the identification number of that input. Three sets of space plans or reflected ceiling plans shall be provided by the contractor indicating which fixtures are controlled by each relay.

2. A separate data grade private line with RJ45 jack shall be furnished for each modem.

3.2 SERVICE AND SUPPORT:

A. Startup: After the system has been installed, the Contractor shall provide the services of a factory trained representative of the manufacturer to verify correct operation of all system

components. The contractor shall guarantee all material and workmanship involving the system for three years after startup.

B. Training: After system startup and after all the programming is completed, the Contractor shall arrange for a factory trained representative to train the Owner's personnel. The trainer shall instruct the Owner's personnel in how to program the system and demonstrate a typical operating program for an area. The Contractor shall allow for 24 hours' instruction time for the Owner's training.

C. Factory Support: Factory support shall be available free of charge during the three-year warranty period to answer programming and application questions. The manufacturer, or his representative, shall have a remote terminal capable of programming the system to support the Owner's personnel during this period. The Contractor shall include a modem, necessary cabling and telephone extension to support this telecommunications operation. The Contractor shall provide a three-year maintenance service contract as part of the cost.

D. The Contractor shall also provide a software site licensing so that the Owner will be able to transfer the software program from the main computer to the other computers. This transfer shall not be an extra cost to the Owner.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Exterior luminaires.

1.2 RELATED REQUIREMENTS:

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS:

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS:

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

C. Samples:

1. Provide one sample(s) of each luminaire proposed for substitution upon request.

1.6 QUALITY ASSURANCE:

A. Comply with requirements of NFPA 70.

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

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY:

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES:

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES:

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION:

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION:

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL:

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING:

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.6 CLEANING:

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES:

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION:

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 270000
STRUCTURED CABLING FOR COMMUNICATIONS

Part 1 GENERAL

1.1 WORK INCLUDED

A. Provide complete structured cabling system including horizontal copper cabling, backbone fiber optic cabling, telecommunications rooms, equipment racks, cable management systems, and all associated components.

B. Work includes but is not limited to:

1. Category 6A horizontal copper cabling system
2. Telecommunications rooms equipment
3. Cable pathways and infrastructure
4. Terminations and connections
5. Testing and certification
6. Coordination with building owner regarding patch cord procurement and scope responsibilities

1.2 APPLICABLE STANDARDS

A. BICSI Telecommunications Distribution Methods Manual (TDMM)

B. TIA/EIA-568 Commercial Building Telecommunications Cabling Standard

C. TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces

D. TIA/EIA-606 Administration Standard for Telecommunications Infrastructure

E. California Electrical Code (CEC)

F. California Building Code (CBC)

G. California Fire Code (CFC)

1.3 PERFORMANCE REQUIREMENTS

A. Installation Requirements:

1. Install in accordance with BICSI TDMM and manufacturer instructions
2. Contractor shall provide turn key system with all parts and miscellaneous accessories
3. Maintain minimum bend radius requirements
4. Avoid electrical interference sources
5. Provide proper cable support and strain relief
6. Fire-Rated Penetrations: All penetrations through fire-rated walls, floors, and ceiling assemblies shall be properly sealed and fire-stopped to maintain the original fire rating of the assembly. Use only UL-listed firestop systems appropriate for the specific assembly type and cable configuration. Provide firestop documentation and certificates for all penetrations.

B. Testing and Certification:

1. Copper Cabling Tests:
2. Wire map testing for all pairs
3. Length testing
4. Insertion loss testing
5. NEXT (Near End Crosstalk) testing
6. PSNEXT (Power Sum Near End Crosstalk) testing
7. ELFEXT (Equal Level Far End Crosstalk) testing
8. PSELFEXT (Power Sum Equal Level Far End Crosstalk) testing
9. Return loss testing
10. Alien crosstalk testing per Category 6A requirements
11. Propagation delay and delay skew testing
12. Provide test results for each link
13. Testing shall be done with Fluke products

C. Labeling and Documentation:

1. Label all cables, outlets, and equipment per TIA/EIA-606
2. Provide as-built drawings and cable schedules
3. Electronic documentation in AutoCAD and PDF format
4. Cable management database with testing results
5. Coordinate with building owner for MAC address collection and device white listing requirements for network security

D. Warranty Requirements:

1. Minimum 25-year manufacturer warranty on cabling system
2. Include all components from outlet to patch panel
3. Cover materials and workmanship
4. Provide local warranty support
5. 1-year workmanship warranty by installer covering all installation labor and practices

1.4 SUBMITTALS

A. Product data sheets for all components

1. Product information shall be provided in one complete package. Incomplete submittals will be rejected.
2. Partial submittals will be allowed only for lead-time considerations.

B. Shop drawings showing cable routes and equipment layouts, including:

1. Title sheet
2. Floor plans
3. Equipment room layouts
4. Elevations
5. Unique Device IDs
6. J-hook routes
7. Single line diagrams (fiber, grounding/bonding, network topology)
8. Rough-in details
9. Wiring diagrams
10. Specialized device mounting or pathways

C. Closeout documentation in both physical and digital formats

1. As-built drawings in 3-ring binder

a) Red-lined drawings and hand drawings will be rejected

2. Cable schedules and labeling schemes

a) Port index with patch panel ports, work area outlets, and room number

3. Test reports and certifications
4. Operations and maintenance manuals
5. Manufacturer warranties
6. Contact information

Part 2 products

2.1 GENERAL

A. This Section includes General Requirements for each section in Division 27 and shall be used in conjunction with specifications, other related Divisions and related Contract Documents to establish the total requirements for the project:

1. Refer to specific sections for Product Part Numbers.

B. All materials and products shall be:

1. Appropriate for the intended use
2. Permitted by the Authority Having Jurisdiction (AHJ)

C. All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.

D. Any modifications to equipment to suit the intent of the Specifications shall be performed in accordance with these requirements.

E. Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.

F. All components will be approved by the System Designer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:

1. Be in compliance with the Construction Documents.
2. Have fit and finish compatible with the existing surrounding structure.
3. Be unobtrusive.
4. Provide the required functionality.

G. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.

H. Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.

I. All fittings, supports, splices, etc. for the system shall be installed to provide a complete assembly-including fasteners, hardware, and other items required to complete the installation as indicated in the Drawings and Specifications.

2.2 SUBSTITUTION POLICY

A. Substitution requests: Substitution requests will be considered only if submitted to Owner's Representative not less than 7 days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representative's sole discretion. Requests for substitutions shall be considered "not approved" unless approval is issued in writing by Owner's Representative.

B. Rejection: For equipment, cabling, wiring, materials, and all other products indicated or specified as "no substitutions" or "no alternates", Owner does not expect not desire requests for substitutions or alternate products other than those specified. Owner reserves the right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

C. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees, or costs incurred for late completion.

2.3 MANUFACTURERS

A. Acceptable Manufacturers:

1. Berk-Tek
2. CommScope
3. Panduit
4. CPI
5. Or approved equal

B. Products from different manufacturers shall not be mixed within the same system component category

2.4 HORIZONTAL COPPER CABLING

A. Cable Type: Category 6A, 4-pair, 23 AWG, unshielded twisted pair (UTP)

1. Minimum 650 MHz bandwidth
2. Plenum-rated (CMP) for air handling spaces
3. Riser-rated (CMR) for vertical applications
4. General purpose (CMG) for other applications

B. Performance Requirements:

1. Support 10GBASE-T applications
2. Max cable diameter:

    a) Plenum 0.23in
    b) Riser 0.275in
    c) OSP 0.355in

3. IDC termination method
4. T568B wiring scheme
5. Colors to be selected by the Owner per system:

    a) Yellow
    b) White
    c) Blue

6. Jacks shall be black

2.5 FACEPLATES AND MOUNTING BOXES

A. Faceplates:

1. Single-gang and double-gang configurations
2. White thermoplastic material
3. Snap-in modular jack compatibility
4. Blank on unused ports
5. Location for printed labels

B. Mounting Boxes:

1. Metal construction for fire-rated assemblies
2. Knockouts for conduit entry
3. Mounting tabs for secure attachment

C. Surface-mount boxes:

1. Minimum 2-port configuration
2. Plenum-rated

2.6 CABLE PATHWAYS

A. Conduit:

1. EMT for dry locations, rigid steel for wet locations
2. 40% fill ratio maximum
3. Pull Points: Maximum 100 feet between pull points
4. Bends: Maximum two 90-degree bends between pull points

B. Innerduct:

1. 1in Ribbed HDPE orange or black

C. J-Hooks

1. Metal
2. Sized for minimum of 25 cables

2.7 TELECOMMUNICATIONS ROOM EQUIPMENT

A. Equipment Racks:

1. 2-Post Racks: 19" EIA-310 compliant
2. 7-foot height standard
3. Clear grained aluminum or Epoxy-polyester hybrid powder coat paint. In black

B. Cable Management:

1. Overhead Cable Runway: 12" width minimum, galvanized steel
2. Vertical Cable Runway: 8" width minimum, wall-mounted
3. Vertical Cable Managers: 8" width
4. Horizontal Cable Managers: 2U height,

C. Patch Panels:

1. Category 6A, 48-port, 2U height
2. Angled ports for improved cable management
3. Rear cable management integrated
4. Snap-in jack compatibility

D. Fire-Treated Plywood:

1. 3/4" thick, fire-retardant treated
2. Painted with fire-retardant paint
3. Wall-mounted at 8' height
4. Minimum 4' x 8' sheets
5. Fire-rated stamp must remain visible after painting or provide permanent engraved nameplate identifying fire-retardant treatment and rating

E. Grounding and Bonding:

1. Telecommunications main grounding busbar (TMGB)
2. Provide pathway to grounding rod electrode and exothermic weld to the electrode.
3. Telecommunications grounding busbar (TGB) in each IDF
4. #6 AWG grounding conductors
5. Bonding jumpers for all metallic components within room including racks, runway, panels, conduits

Part 3 EXECUTION

3.1 EXAMINATION

A. Verify all site conditions, pathways, cable supports, and rough-in locations before starting installation.

B. B. Confirm that required spaces are dry, secure, and ready for cabling and equipment installation.

3.2 INSTALLATION

A. Install all cabling, hardware, racks, cable trays, and supports in accordance with manufacturer instructions, BICSI TDMM, and applicable codes.

B. Maintain minimum bend radius and pulling tension requirements. C. Route cabling through designated pathways; do not place cabling directly on ceiling tiles or grids.

C. Maintain required separation between telecommunications and power cabling per NEC and TIA standards.

D. Use only specified or approved equal components for terminations and connections.

E. Seal all penetrations through fire-rated assemblies using approved firestopping methods.

F. Maintain service continuity for existing systems and coordinate cutovers to prevent service interruptions.

G. Use only Velcro or reusable cable ties for cable management.

H. Plastic zip ties are not permitted.

3.3 FIELD QUALITY CONTROL

A. Perform all required testing as specified in Section 1.3.D for copper and fiber optic cabling.

B. Submit detailed test results for each link and strand.

C. Replace any cabling that fails testing at no additional cost to the Owner.

D. Maintain a complete set of red-line drawings on site, updated weekly to reflect as-built conditions. Red-line drawings shall be available for Owner review at any time during construction and shall be submitted to the Owner within 30 days of project completion.

3.4 TESTING AND INSPECTION OF OWNER-PROVIDED EQUIPMENT

A. Provide tests specified below, when applicable or required by the Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.

1. Furnish all test equipment and instruments required for the tests.
2. Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.
3. All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.

3.5 IDENTIFICATION AND LABELING

A. Label all outlets, patch panels, cables, and equipment in accordance with TIA/EIA-606 standards and coordinated with Owner.

B. Update as-built drawings to reflect final installation and labeling.

3.6 CLEANING AND PROTECTION

A. Protect installed cabling and equipment from damage during construction until final acceptance.

B. Remove all installation debris, scrap cabling, and packaging material from the site daily.

C. Provide touch-up paint for any damaged fire-rated plywood or equipment supports.

3.7 FINAL ACCEPTANCE

A. Notify the System Designer and Owner of the proposed Final Inspection appointment at least 72 hours in advance.

B. The Owner may visit the site during construction to verify compliance. Punch list items identified by the Owner shall be corrected within 10 days of notification.

C. System acceptance shall occur only when:

1. All submittals and documentation have been submitted, reviewed, and approved.
2. The complete system has passed all testing requirements.
3. All punch list items have been resolved and accepted.

END OF SECTION

SECTION 283100
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.

F. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUMMARY

A. This Section includes Fire alarm system design and installation, including all components, wiring, and conduit.

1.4 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72, 2022 Edition, apply to fire alarm terms used in this Section.

1.5 SYSTEM DESCRIPTION

A. Existing Fire alarm control panel is a Silent Knight IFP-100 addressable system. The fire alarm system is being expanded in occupancies listed on construction documents. Provide all necessary components to the existing fire alarm system including all modules, SLC loops, etc. for a complete and operable system.

1. New notification and initiating devices shall interface with existing fire alarm system.

1.6 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72, 2022 Edition, CBC, CFC & Titles 19 and 24 CCR.

B. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Verified automatic alarm operation of smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire extinguishing system operation.
7. Fire standpipe system.

C. Fire alarm signal shall initiate the following actions:

1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciators.
3. De-energize electromagnetic door holders.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
8. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
9. Record events in the system memory.
10. Record events by the system printer.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:

1. Operation of a fire-protection system valve tamper.

E. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at the FACP.
4. Ground or a single break in FACP internal circuits.
5. Abnormal ac voltage at the FACP.
6. A break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at the FACP or annunciator.

F. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators. Record the event on system printer.

1.7 SUBMITTALS

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

B. Shop Drawings:

1. Shop Drawings shall be prepared by persons with the following qualifications: Trained and certified by manufacturer in fire alarm system design. Fire alarm certified by NICET, minimum Level III.
2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually

and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

3. Device Address List: Coordinate with final system programming.
4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
6. Batteries: Size calculations.
7. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
8. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
9. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

F. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 01 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

G. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.

    a. Hard copies on paper to Owner, Architect, and authorities having jurisdiction.
    b. Electronic media may be provided to Architect and authorities having jurisdiction.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 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.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke, Fire, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.

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. FACP and Equipment:

a. Existing: Silent Knight IFP-100

2. Wire and Cable:

a. West Penn Wire/CDT; a division of Cable Design Technologies or equal.

3. Audible and Visual Signals:

a. System Sensor

2.02 EXISTING FACP / FIRE ALARM SYSTEM

A. Compatibility with the existing equipment: Fire alarm system and components shall operate as an extension of an existing system.

B. Circuits:

1. Signaling Line Circuits: NFPA 72, Class B, Style 0.5.

a. System Layout: Install no more than 100 addressable devices on each signaling line circuit.

2. Notification-Appliance Circuits: NFPA 72, Class B, Style Y.
3. Actuation of alarm notification appliances, annunciation, smoke control, elevator recall, and actuation of suppression systems shall occur within 20 seconds after the activation of an initiating device.
4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

C. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel FACP indication and system reset if the alarm is not verified.

D. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

E. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

F. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

G. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.

J. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.

1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

K. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

L. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory and digital alarm

communicator transmitter and digital alarm radio transmitter shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM SYSTEM POWER."

M. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.

1. Batteries: Sealed lead calcium or Sealed, valve-regulated, recombinant lead acid.
2. Battery and Charger Capacity: Comply with NFPA 72.

N. Surge Protection:

1. Install surge protection on normal ac power for the FACP and its accessories.
2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

O. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.03 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, breaking-glass or plastic-rod or pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod or pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.

2.04 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Multipurpose type, containing the following:

a. Integral Addressable Module: Arranged to communicate detector status (normal,

alarm, or trouble) to the FACP.
b. Piezoelectric sounder rated at 88 dBA at 10 feet (3 m) according to UL 464.
c. Heat sensor, combination rate-of-rise and fixed temperature.

4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

    a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg F (8 or 11 deg C) per minute.
    b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F (57 or 68 deg C).
    c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:

    a. Sensor: LED or infrared light source with matching silicon-cell receiver.
    b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.

    a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.

5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where indicated.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
8. Each sensor shall have multiple levels of detection sensitivity.

9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
10. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.05 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate-of-rise of temperature that exceeds 15 deg F (8 deg C) per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

1. Mounting: Adapter plate for outlet box mounting or Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.06 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
2. Revise sound-level values in first four paragraphs below to comply with local interpretations of ADA requirements. See Editing Instruction No. 10 in the Evaluations.

B. Bells: Electric-vibrating, 24-V dc, under-dome type; with provision for housing the operating mechanism behind the bell. Bells shall produce a sound-pressure level of 94 dBA, measured 10 feet (3 m) from the bell. 10-inch (254-mm) size, unless otherwise indicated. Bells are weatherproof where indicated.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn.

D. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: candela as indicated on drawings.
2. Strobe Leads: Factory connected to screw terminals.

2.07 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

A. Dedicated, two-way, supervised, telephone voice communication links between the FACP, the Fire Command Center, and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:

1. Common-talk type for firefighter use only.
2. Selective-talk type for use by firefighters and fire wardens.
3. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
4. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
5. Selector panel controls simultaneous operation of telephones in selected zones and permits up to six phones to be operated simultaneously. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
6. Provide liquid-crystal digital display to indicate location of caller.
7. Remote Telephone Cabinet: Flush or surface-mounted cabinet, as indicated, factory-standard red finish, with handset.

    a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating "Fire Warden Phone" or "Fire Emergency Phone."
    b. With "break-glass" type door access lock.

8. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Warden Phone" or "Fire Emergency Phone."
9. Handsets: Provide push-to-talk type sets with noise-canceling microphone. Provide 10 handsets stored in a cabinet adjacent to the FACP.

2.08 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.09 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

2.10 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with CEC, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, No. 14 AWG or as indicated on drawings.

1. Circuit Integrity Cable: Twisted shielded pair, CEC Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.

2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Smoke or Heat Detector Spacing:

1. Smooth ceiling spacing shall not exceed 30 feet (9 m) and the rating of the detector.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

B. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.

C. Duct Smoke Detectors: Comply with NFPA 72, NFPA 90A and CMC. Install sampling tubes so they extend the full width of the duct.

D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

E. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

H. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

I. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.02 WIRING INSTALLATION

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.
3. CEC

B. Wiring Method: Install wiring in metal raceway according to Section 260533.13 - Conduit for Electrical Systems

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no

excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.03 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Section 260553 - Identification for Electrical Systems.

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.04 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.05 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, and to assist in field testing. Report results in writing.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

C. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

D. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct

supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.

3. Include the existing system in tests and inspections.
4. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
5. Testing: Follow procedure and record results complying with requirements in NFPA 72.

    a. Detectors that are outside their marked sensitivity range shall be replaced.

6. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in CEC.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.

C. Work in two paragraphs below is normally the responsibility of Owner. Retain one or both paragraphs if Owner needs additional time for inspections required by NFPA 72.

D. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

E. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 01 Section "Demonstration and Training."

3.08 DOCUMENTATION

A. Provide an NFPA Certificate of compliance to Local Fire Marshal, and Architect.

END OF SECTION

SECTION 321726
TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Detectable warning mats and accessories indicated, specified, or required to complete installation.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s technical product literature for each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements: Comply with codes, regulations and standards indicated on the Drawings.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering and wear.
b. Separation or delamination of materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DETECTABLE WARNING MATS

A. Surface-Applied Detectable Warning Mats: Accessible truncated-dome detectable warning resilient mats, UV resistant, manufactured for adhering to existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of mat, and beveled outside edges.

1. Material: Modified rubber compound, UV resistant.
2. Color: As selected by Architect from manufacturer's full range.
3. Dome Spacing and Configuration: Manufacturer's standard compliant spacing, in manufacturer's standard pattern.
4. Mounting: Adhered to pavement surface with adhesive.

2.2 INSTALLATION MATERIALS

A. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

B. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

a. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION OF DETECTABLE WARNING MATS

A. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.

B. Apply adhesive to back of mat in amounts and pattern recommended by manufacturer, and set mat in place. Firmly seat mat in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to mat to ensure full contact with adhesive.

C. Mask mat perimeter and adjacent concrete, and apply sealant in continuous bead around perimeter of mat.

D. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning mat and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.

E. Protect installed mat from traffic until adhesive has set.

3.3 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. Provide all labor, materials, tools, transportation, equipment and incidentals necessary to perform the work as indicated on the Irrigation Plans and as herein specified.

1.02 SCOPE OF WORK

A. Irrigation materials and equipment.

B. Installation standards.

C. System location and layout.

D. Excavation and backfill.

E. Installation of pipe, equipment, and appurtenances.

F. Water flow meters.

G. Field quality control – Coverage Tests.

H. Plant establishment period.

I. Clean up.

1.03 RELATED SECTIONS

A. Related work specified elsewhere:

1. 01 33 23 - Shop Drawings, Product Data, and Samples
2. 32 90 00 – Planting

1.04 REFERENCES

A. The Standard Specifications for Public Works Construction, “Greenbook”, latest edition at the time of Bid, is reference as if herein contained and the contractor shall keep a copy at the project site. These Specifications shall supersede conflicts with information given in the “Greenbook”, unless otherwise determined by the Owner or their designated representative.

B. American Society for Testing and Materials (ASTM):

1. ASTM A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
2. ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2700 kN-m/m3))
3. ASTM D1784	Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
4. ASTM D1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

5. ASTM D2241	Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
6. ASTM D2464	Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
7. ASTM D2466	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
8. ASTM D2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

C. California Code of Regulations, Title 24:

1. Part 3 California Electrical Code

D. Underwriters Laboratories Inc. (UL):

1. UL 651 Schedule 40 and 80 Rigid PVC Conduit.

1.05 VERIFICATION OF DIMENSIONS

A. Dimensions are approximate, before proceeding with any work, Contractor shall verify all dimension and shall immediately inform the L.A. and owner of any discrepancies between the drawings and/or specifications and actual field conditions. No work shall be done in any area where there is such a discrepancy until approval has been given by L.A. and owner. Any work done without notification and prior approval will be the sole responsibility of the Contractor to remedy as required by L.A. and Owner.

1.06 SUBMITTALS

A. Existing Static water pressure/ Water service size verification:

Static water pressure on site shall be recorded with an accurate liquid filled gauge capable of measuring 0-200 PSI (Winters PFQ806LF or equal). Measurements shall be taken as early as possible per available source and at a time no other distribution devices are actively running. Contractor to document readings in writing on Contractors form that list time & date, reading in PSI, location, and type of gauge used in addition to date stamped photographs of readings. Contractor to document all points of service including both potable and recycled. Final results shall be submitted to the Owners representative prior to purchase of equipment.

B. Materials List:

1. Complete material list shall be submitted prior to performing any work. Catalog data and full descriptive literature must be submitted whenever the use of the item is different than those specified is requested. Notarized certificate must be submitted by plastic pipe and fitting manufacturer indicating that material complies with specifications, unless material has been previously approved.

2. Material list shall be submitted using the following format (double spaced between each item):

Item	Description	Manufacturer	Model
1.	Pressure Pipe	Lasco	Sch. 40
2.	Lawn Head	Rainbird	1804-SAM-PRS
Etc.	Etc.	Etc.	Etc.

C. Record Drawings:

1. Record accurately on one set of contract drawings all changes in the work constituting departures from the original contract drawings daily including noting when work was done.
2. The changes and dimensions shall be recorded in a legible and workmanlike manner to the satisfaction of the Owners Representative. Prior to final inspection of work, submit record drawings to Owners Representative for approval.
3. Dimensions shall be from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Data to be shown on record drawing shall be recorded day to day as the project is being installed. All lettering on drawings shall be minimum 1/8 inch in size.
4. Show locations and depths of the following items:
   a. Point of connection.
   b. Routing of sprinkler pressure lines (dimension maximum 100 feet along routing)
   c. Gate valves/ Isolation valves.
   d. Sprinkler control valves.
   e. Quick coupling valves.
   f. Routing of control wires.
   g. Related equipment (as may be directed).
5. Maintain record drawings on-site at all times. Upon completion of work, transfer all as-built information and dimensions to clean blackline prints for reproduction.

D. Operation and Maintenance Manual: Operation and Maintenance Data, for submittal requirements. As a minimum, provide operation and maintenance instructions for the following items:

1. Electric Remote-Control Valves (including master control valves);
2. Satellite Irrigation Controllers;
3. Water Flow Meters; and
4. Irrigation Controller Software.

1.07 QUALITY ASSURANCE

A. The landscape irrigation system shall consist of a completely automatic, electrically-controlled bubbler, drip, and spray-irrigation system. The system shall be installed to provide complete coverage with minimum maintenance. The irrigation system shall be installed to prevent overspray onto walks and structures.

B. The irrigation system shall avoid conflicts with plant materials, lighting standards, sign posts, architectural features, above and below ground utilities, and drainage system. Contractor responsible for coordination with other trades to verify acceptable locations to avoid conflicts.

C. Irrigation piping layout is schematic, showing location of pipes and fittings close to landscape areas is not always possible graphically. All equipment shall be located inside the landscape areas.

D. Plant establishment period is specified in Section 32 93 00 – Plants.

1.08 SEQUENCING AND SCHEDULING

A. Contractor to coordinate layout and installation of irrigation sleeves, conduits, and piping under paved areas and other features prior to their construction.

B. Coordinate installation of irrigation system with excavation of planting beds and backfilling of planting beds with topsoil. Refer to Section 32 90 00, Planting, for requirements. Typically, the irrigation system shall be installed after planting beds have been excavated and backfilled with topsoil.

C. The irrigation system shall be installed and tested prior to installation of plant material. Coordinate layout and installation of irrigation system with location and installation of plant material to assure that there will be complete and uniform irrigation coverage of planting as indicated.

D. Tree locations shall be staked in the field prior to installation of irrigation pipe and heads. Refer to the plant list on the Contract Drawings for plant setbacks and spacing requirements.

1.09 EXISTING UTILITIES

A. Existing utilities and conditions: Prior to cutting into the soil, locate all cables, conduits, sewer lines, septic systems, and other utilities commonly encountered underground and take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, promptly notify the L.A. and Owner who will give direction. Proceed in the same manner if a rock layer or any other conditions encountered underground make changes advisable.

1. Where investigation of subsurface conditions has been made by a qualified body in areas in which local materials may be obtained, the Contractor may request the use of such information but will be solely responsible for its verification and accuracy

2. It is the Contractors sole responsibility to verify any located or demarked utilities via pot holing or other method prior to start of excavation. Failure to do so will result in all damages being the sole responsibility of the Contractor.

1.10 INSPECTIONS

A. Inspections will be required for:

1. Pressure test of irrigation main line.

2. Coverage test.

3. Manufacture certification, for warranty, verification of installation per manufacture requirements.

4. Final inspection/start of maintenance. Final inspection shall be performed by the Owners Representative and Landscape Architect

   a. Final inspection shall include verification of complete installation per plans

   b. All Sensors, gauges, grounding, and accessories must be installed and functioning/ programed per manufacture requirements

   c. Third party water audit of system per MWELO requirements, Contractor shall be responsible for supplying water audit and results/ report to Owner's representative as completed by a Certified Landscape Irrigation Auditor(CLIA).

5. Completion of maintenance and owners' Final acceptance.

B. Inspection Requests:

1. Contractor shall notify the Owners Representative and Landscape Architect in advance for requesting all inspections as follows:

   Pressure supply line installation and testing - 36 hours (1- 2 working days)

   System layout - 36 hours (1- 2 working days)

   Coverage Tests - 36 hours (1- 2 working days)

   Final Inspection - 48 hours (2 working days)

2. When inspections have been conducted by other approved personnel, the Contractor shall show evidence in writing of when and by whom these inspections were made including a signature of the referenced Inspector.

3. No inspection will commence without "record" prints. In the event the Contractor calls for an inspection without up to date "record" prints, without completing previously noted corrections, or without preparing the system for inspection, the inspection will be canceled and the Contractor back charged for the direct costs of all Owners Representative time and consultant time lost.

C. Closing in Uninspected Work:

1. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been inspected, tested, and approved by the Owners Representative.

2. Any additional inspections required due to the Contractors actions, such as failing to have work inspected or covering it prior will- result in additional inspections charged by the current hourly rate of the Landscape Architect or Certified Irrigation designer/Auditor including travel time and expenses.

D. Coverage Test/ Adjustments:

1. When the sprinkler system is completed, Contractor shall perform a coverage test in the presence of the Owners Representative and the Landscape Architect to determine if the water coverage for planting areas is complete and adequate. This test shall be accomplished before any planting.

2. Any adjustment required for proper coverage shall be the Contractors Responsibility, and shall include field adjustments and additions as needed to head layout as directed by the Landscape Architect. All additional cost associated with final system tunning and adjustments shall be the Contractors Responsibility.

E. Hydrostatic Tests:

1. All pressure lines shall be tested under a hydrostatic pressure of 150 psi for a period of not less than two hours or per local governing regulation- whichever is greater.

2. All hydrostatic tests shall be made in the presence of the Owners Representative. No pressure line shall be backfilled until it has been inspected, tested, and approved in writing.

F. Contractor shall furnish necessary force pump and all other test equipment.

1.11 TURNOVER ITEMS

A. Controller Charts:

1. Record drawings must be approved by Owners representative before charts are prepared.

2. Provide one controller chart for each automatic controller. Chart shall show the area covered by controller.
3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.
4. Chart shall be a blackline print with a different color used to show the area of coverage for each station.
5. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

B. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Owners Representative 10 calendar days prior to final inspection. The manuals shall describe the material installed.
2. Each complete, bound manual shall include the following information:
   a. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
   b. Complete operating and maintenance instructions for all equipment.
   c. Spare parts lists and related manufacturer information for all equipment.

C. Equipment:

1. Supply as part of this contract the following items:
   a. 4 additional sprinkler heads of each type and spray pattern shown.
   b. Two (2) wrenches for disassembly and adjustment of each type of sprinkler head involved.
   c. 10 additional drip emitters of each type and flow rate shown.
   d. 25’ of each type of drip tubing used per plan, and 6 of each fittings used.
   e. Two keys for each automatic controller.

D. Contractor to verify with the Owners Representative what type of padlocks and keys are required for enclosures that can be padlocked. Each locking mechanism must have 4 copies of the correct key for turnover to the Owners Representative. Depending on actual enclosures per plan this includes locks for gates, any needed chains/cables, and other security instruments for the protection of Irrigation equipment.

1.12 GUARANTEE

A. General:

The entire sprinkler system, including all work done under this contract, shall be guaranteed against all defects and fault of material and workmanship for a period of one (1) year following the filing of the Notice of Completion. All materials used shall carry a manufacturer's guarantee of one (1) year.

Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Owners Representative. When the nature

of the repairs as determined by the Owners Representative constitute an emergency (e.g. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owners Representative by the Contractor, all at no additional cost to the Owner.

B. Form of Guarantee: Guarantee shall be submitted on Contractors own letterhead as follows:

FORM OF:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the complete irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications. We agree to repair or replace any defects in materials or workmanship which may develop during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. This shall include all defects and failures in workmanship and the results of such issues such as trench settling, erosion as caused by failures or defects, and including plant replacement. We shall make such repairs or replacements within 10 calendar days following written notification by the Owners Representative. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from the Owners Representative, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

ADDRESS: _____

_____

PHONE: _____

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials and or equipment installed or furnished shall be new and in pristine condition. Materials that have faded, are dirty, or have been improperly stored will be rejected and shall be removed from the site and replaced at no expense to the Owner.

B. All materials shall be stored per manufactures recommendation and protected from, weather, construction activities, and vandalism/theft.

2.02 PIPE

A. Pressure supply line from point of connection through backflow prevention unit shall be Type ‘K’ brass or copper pipe.

B. Pressure supply lines 2-1/2 inches in diameter and up to 6 inches in diameter downstream of backflow prevention unit shall be Class 315 solvent weld PVC.

C. Pressure supply lines 2 inches in diameter and smaller downstream of the backflow prevention unit shall be Schedule 40 solvent weld PVC.

D. Non-pressure lines shall be Schedule 40 solvent weld PVC.

2.03 COPPER PIPE AND FITTINGS

A. Copper pipe shall be Type 'K', hard tempered ASTM B 88 and fittings shall be wrought solder joint type in accordance with ANSI B16.22.

B. Joints shall be soldered with silver solder, conforming to ASTM B206.

2.04 BRASS PIPE AND FITTINGS

A. Brass pipe shall be 85 percent red brass, ANSI, Schedule 40 screwed pipe.

B. Fittings shall be medium brass, screwed 125-pound class.

2.05 GALVANIZED STEEL PIPE AND FITTINGS

A. All galvanized steel pipe shall be Schedule 40, threaded, coupled, and hot-dipped galvanized, and shall comply with the requirements of ASTM A 120-66 or ASTM A 53-67.

B. All fittings for galvanized steel pipe shall be 150-pound rated galvanized malleable iron, banded pattern.

C. Pipe sizes indicated on the drawings are nominal inside diameter, unless otherwise noted.

2.06 CONDUIT

A. Conduit: Provide rigid non-metallic conduit conforming to UL Standard No. 651 for rigid non-metallic conduit, such as Schedule 40 PVC conduit, unless otherwise indicated.

2.07 PLASTIC PIPE AND FITTINGS

A. All plastic pipe shall bear the following markings: manufacturer's name, nominal pipe size, schedule or class, type of material, pressure rating in psi, NSF seal of approval, and the date of extrusion.

B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound.

C. Rubber gasket PVC pipe, couplings, and fittings shall conform to ASTM D 1784 Type I, Grade I, 2,000-psi design stress. Couplings, rubber gaskets, and fittings shall be as approved by the pipe manufacturer.

D. Ring-type rubber gasket couplings shall permit a 5 degree deflection of the pipe at each coupling (2-1/2 degree each side) without exfiltration or infiltration, cracking or breaking.

E. All Mainline fittings shall be standard weight Schedule 80 and shall be injection molded of an improved PVC fitting compound. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated.

F. All Lateral line fittings shall be standard weight Schedule 40 and shall be injection molded of an improved PVC fitting compound. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated.

G. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be nonhardening sealing compound compatible with plastics. Compound must not lubricate the joint.

H. All threaded nipples shall be standard weight Schedule 80 with molded threads.

I. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy.

J. Solvent cementing shall be neat and demonstrate quality workmanship- Primer and Glue shall not be used in excess or applied in a way to affect the portions of the pipe that are not part of the actual connected joint. Any joints with excessive runs/drips, trails, or globing of Glue and or Primer shall be cut out in whole and replaced at cost by the Contractor until an acceptable professional product is completed and accepted by the Owners Representative.

2.08 BACKFLOW PREVENTION UNITS

A. The backflow prevention unit shall be as indicated on the drawings.

2.09 BACKFLOW PREVENTION ENCLOSURE

A. The backflow prevention device enclosure shall be as indicated on the drawings or approved equal. Install one for each backflow device.

2.10 BOOSTER PUMP

A. The Pump unit shall be as indicated on the drawings if required.

2.11 VALVES

A. Gate and Ball Valves:

1. Ball valves 2 inches or smaller shall have screwed joints and brass bodies.

2. All gate valves larger than 3 inches in diameter shall have 2-inch-square operating units and have an arrow cast in the metal indicating the direction of opening. Valves shall have iron body and be bronze mounted.

3. All gate valves larger than 2 inches and up to 3 inches in diameter shall conform to (1) or (2) above.

4. All gate valves shall have a minimum working pressure of not less than 150 psi and shall conform to AWWA standards.

B. Quick Coupling Valves:

1. Body of valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have 3/4-inch female threads opening at base, with two-piece body. Construct valves to be operated only with a coupler, designed for that purpose. Coupler is inserted into valve and a positive, watertight connection shall be made between coupler and valve. Hinge cover shall be brass with a yellow rubber-like vinyl cover bonded to it.

C. Remote Control Valves:

1. Valves shall be spring-loaded, self-cleaning, packless diaphragm activated, of a normally closed type.

2.12 VALVE BOXES

A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

B. The valve box cover shall be secured with a hidden latch mechanism or bolts.

C. The cover and box shall be capable of sustaining a load of 1,500 pounds.

D. Valve box extensions shall be by the same manufacturer as the valve box.

E. Gate valve boxes shall be round plastic boxes with bolt-down covers marked "GV," heat branded in 2" high characters; AMETEK or approved equal.

F. Remote control valve boxes shall be rectangular plastic boxes with bolt-down covers marked "RCV"; and with the valve identification number heat branded in 2" high characters; AMETEK or approved equal.

G. Colors of boxes shall be green unless otherwise called out by the plans.

H. Valve boxes shall be sized to fit all equipment with ample room for operation and any required maintenance tasks, Contractor to adjust as needed per field conditions and final assembly of components at no additional cost.

2.13 AUTOMATIC CONTROLLER

A. Automatic controller shall be as called for on the plans.

2.14 ELECTRICAL

A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installation.

B. All electrical work shall conform to local codes and ordinances.

2.15 WIRING

A. Remote control wire shall be direct-burial AWG-UF type, sized according to manufacturer's specifications per the drawings, and in no case smaller than 14 gauge.

B. Connections shall be either Spears Dri Splice or 3M DBR/Y Direct burial type connectors per the details.

C. Common wires shall be white in color. (Where two or more controllers are used, the common wires shall be white with a different color stripe for each controller.) Control wires shall be black (where two or more controllers are used, the control wires shall be a different color for each controller.) These colors shall be noted on as-built plans located on controller door.

2.16 SPRINKLERS

A. Sprinklers shall be as called for on the plans.

2.17 FERTIGATION

A. If called for on the plans shall be provided by Eco-Fert fertigation. Contractor shall coordinate installation and programming with Eco-Fert. Eco-Fert System Number EFSS-FP1. Coordinate Installation with Eco-Fert (949) 766-5800 and include all conduits and electrical service for installation. Fertigation system shall include, but not be limited to the following components as a minimum:

- Walchem Pump
- Signet 9900
- Schedule 80 4" fittings
- Extension Boxes
- GF 2536
- Saddle
- Stainless Steel Cabinet/Pedestal
- Tank
- 4 pin connectors
- 5 pin connectors
- Madison Horz float
- Valve Boxes
- Fan.

PART 3 - EXECUTION

3.01 GENERAL

A. Water Supply:

1. Connections to or for the installation of the water supply shall be at the locations shown on the drawings. Any changes caused by actual site conditions shall be made at no additional cost to the Owner.

B. Electrical Service:

1. Contractor shall make and supply all electrical connections including conduit, wiring, and support breakers/switches to supply the irrigation controller, booster pump, and fertigation system in addition to any required ancillary equipment.

C. Layout:

1. Layout irrigation system prior to excavation and make minor adjustments required due to differences between site and diagrammatic drawings/plans. All equipment to be located within planter areas. It is the Contractors responsibility to notify the Landscape Architect of any items of concern prior to start of installation. Any changes in layout or design by the Contractor not disclosed and approved prior by the Landscape Architect are made at the Contractors sole liability.

D. Diagrammatic Intent:

1. The drawings are purposely diagrammatic, due to scale it is impossible to show all items in their actual location on the plan. The size and location of equipment and fixtures are drawn to scale where possible to show overall system makeup and design. Provide offsets in piping and changes in equipment locations as necessary to conform with structures, hardscape, and to avoid obstructions or conflicts with other work. Contractor shall not willfully install any equipment that would be out of place, cause issue/ interference with other work, or appear to be out of location per industry standards. All equipment shall be located in landscape areas unless specifically approved by the Owners Representative prior to installation for any non-conforming circumstances.

E. Modifications:

1. Provide modifications to the irrigation system to avoid blockage of sprinkler irrigation patterns, to prevent overspray and excessive runoff onto walkway and parking areas, and to provide full irrigation coverage to the planted areas. Such modifications also include adjusting locations and adding heads as required to spray around trees, light poles, sign posts, other objects that obstruct spray pattern, and any other adjustments required due to field conditions unknow at the time of design. All cost’s associated with Modifications are the Contractors sole responsibility as they shall be considered part of the bid.

F. Grades:

1. Before starting work, carefully check all grades to determine that the site is properly graded and work may safely proceed, keeping within the specified material depths with respect to finish grade.

G. Inspections:

1. Prior to all work of this section, carefully inspect the current work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Any installation prior to the completion of other trades that requires work to be adjusted or redone is the sole responsibility of the contractor.

2. Verify existing grades are correct and that proper coverage per the details and final equipment locations and heights are correct. Any work installed that is found to be incorrectly installed per the details that requires adjustment to equipment or pipe relocation is the sole responsibility of the Contractor.

3. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

H. Discrepancies:

1. In the event of discrepancy, notify the Owners Representative and the Landscape Architect prior to starting work.

2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved and approval of solution has been granted in writing.
3. Failure of the Contractor to accurately lay out or knowingly install the system in a way that creates design inadequacies without prior acknowledgement to the Owners Representative will be the direct responsibility of the Contractor to remedy without any additional costs or impact to the Owner.

I. Field Measurements:

1. Contractor shall be responsible to make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other trades, including the proper location of required sleeves, and support items that may involve other trades.

3.02 INSTALLATION STANDARDS

A. The landscape irrigation system shall be installed in accordance with applicable requirements of the California Plumbing Code and California Electrical Code, and the requirements of the jurisdictional water company or utility district.

B. Manufactured materials and equipment shall be installed in accordance with the respective manufacturer's instructions for the location and conditions.

3.03 TRENCHING

A. Dig trenches and support pipe continuously on bottom of ditch. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

B. Contractor responsible for all trenching activities which shall be in accordance with current safety and OSHA requirements.

C. Provide minimum cover of 24 inches, maximum 30 inches on pressure supply lines 3 inches and larger.

D. Provide minimum cover of 18 inches, maximum 24 inches on pressure supply lines 2-1/2 inches and smaller.

E. Provide minimum cover of 4” for subsurface drip lines, or as recommended by the subsurface drip line manufacture.

F. Provide minimum cover of 18 inches, maximum 24 inches for control wires.

G. Provide minimum cover of 12 inches, maximum 16 inches for non-pressure lines.

H. Provide minimum cover of 24 inches, maximum 30 inches for all pipe sleeved under paving.

I. Provide minimum cover of 36 inches in infiltration areas (6” minimum backfill cover over pipe beneath gravel layer).

J. When two pipes are to be placed in the same trench, maintain a six-inch space between pipes as a minimum. No pipe shall be installed directly over or next to another.

K. For pressurized lines, snake as needed in the trench to allow for minor expansion and contraction depending on the type of pipe used. Follow manufactures recommendations.

L. Where it is necessary to excavate adjacent to existing trees, the Contractor shall avoid injury to trees and tree roots. Excavation in areas where 2-inch and larger roots occur shall be done by hand. All roots 2 inches and larger in diameter shall be tunneled under and shall be heavily wrapped with wet burlap to prevent scarring or drying. Where trenching machine is run close to trees having roots smaller than 2 inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making a clean cut through the roots. Roots 1 inch and larger in diameter shall be painted with two coats of Tree Seal or approved equal. Trenches adjacent to trees shall be closed within 24 hours. Any damage to tree root structure and resulting decline will be the sole responsibility of the Contractor.

M. After trenches have been excavated, pipe shall be installed, tested, and inspected, and the trench shall be backfilled without undue delay.

3.04 PIPING

A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphaltic concrete pavement.

B. Cutting or breaking of existing pavement is not permitted.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, and burrs and reaming; install pipe with all markings up for visual inspection and verification.

D. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings; store plastic pipe and fittings under cover until ready to install; transport plastic pipe on a vehicle with a bed long enough to allow the pipe to lay flat, avoid undue bending and any concentrated external load.

E. Remove all dented, crushed, scratched, and damaged pipe sections.

F. Contractor shall install concrete thrust blocking at all changes of direction and terminal points of pressure pipe per plans.

G. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.

H. Parallel lines shall not be installed directly over one another.

I. In solvent welding/ cementing, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods; allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

J. Solvent welding/cementing shall be neat and demonstrate quality workmanship- Primer and Glue shall not be used in excess or applied in a way to affect the portions of the pipe that are not part of the actual connected joint. Any joints with excessive runs/drips, trails, or globing of Glue and or Primer shall be cut out in whole and replaced at cost by the Contractor until an acceptable professional product is completed and accepted by the Owners Representative

K. 360-degree applicators shall be used to apply primer and solvent on sizes - 2 inches and larger.

L. Center load all plastic pipe prior to pressure testing.

M. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.

N. For plastic-to-metal connections, work the metal connections first. Use a nonhardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise.

O. Snake all piping to allow for expansion and contraction due to environmental conditions.

P. All piping shall be in sleeves where it travels under hardscape or other surfacing or above ground obstacles that prevent future excavation.

Q. All wiring shall be sleeved where it travels under hardscape or other surfacing or above ground obstacles that prevent future excavation.

3.05 ASSEMBLIES

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practice.

B. Install backflow assemblies at locations approved in the field and at height required by local codes.

C. Valves shall be installed in Landscape areas whenever possible per Owners Representative standards.

D. Each valve box shall be installed on a foundation of gravel backfill; 3 cubic feet minimum. Place boxes on common bricks bedded in backfill per details. Valve boxes shall be installed with their tops ½" inch above the surface of surrounding finish grade in lawn areas and 2" inch above the surface of surrounding finish grade in shrub areas or per details.

E. Valve box risers or extensions shall be installed as needed per field conditions at no additional cost, they shall be by the same manufacture as the installed box.

F. Areas with burying rodents will require metal fabric or wire mesh installed under boxes prior to gravel and shall be placed at all other possible entry points to protect the equipment from damage. All cost associated with wire fabric installation shall be the responsibility of the contractor.

3.06 BACKFILLING

A. Before pipeline trenches are backfilled, the irrigation system shall be pressure tested and the location of irrigation heads modified as required to obtain complete and uniform coverage of each plant's root ball. Refer to field quality control requirements specified herein.

B. Initial backfill on all lines shall be of fine granular material with no foreign matter larger than ½" inch in size. Reference section 217-1.2 of the "Greenbook" for further requirements of bedding material. All protruding rocks or other material capable of damaging pipe will shall be removed from trench walls or bottom prior to placement of pipes or conduits.

C. If native soil is composed of gravels, rocks, or other material that can damage PVC piping washed sand bedding of 6" minimum under and over the pipe shall be required.

D. Compaction of backfill in landscaped areas shall be not less than that of surrounding ground as determined by ASTM D1557.

E. Backfill shall be tamped in 4-inch lifts under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

F. Flooding in lieu of tamping is not allowed without specific prior approval.

G. Under no circumstances shall truck wheels be used to compact soil.

H. Provide washed sand backfill a minimum of 6 inches over and under all piping under paved areas.

3.07 CONTROLLER

A. The exact location of the controller shall be approved by the Owners Representative before installation. The electrical service shall be coordinated to this location by the Contractor.

B. Fertigation controller will be located next to fertigation unit per plan if included. Maintenance access shall be provided.

C. Pump starter shall be connected to controller pump starter relay switch.

D. The irrigation system shall be programmed to operate during the periods of minimal use of the design area, and for maximum efficiency.

E. Testing/Certifications Requirements:

1. All manufacturer requirements for certification and or warranty release of the system in addition to electrical code requirements are the Contractors responsibility to meet and supply proof in the form of documentation of inspection and compliance.

3.08 WIRING

A. Wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines and shall be located below the supply lines wherever possible.

B. Where more than one wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.

C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional turn, and one of 24 inches shall be provided at each remote-control valve.

E. A continuous run of wire shall be used between a controller and each remote-control valve. Under no circumstances shall splices be used without prior approval.

F. Two additional pilot wires shall be run to the ends of each common wire run for future maintenance, in a looped system one extra pilot wire shall be run for every ten stations used.

G. For systems with over forty conventual stations and extra common wire shall be provided and shall be a different color for future use and or maintenance needs.

3.09 FLUSHING THE SYSTEM

A. Prior to installation of sprinkler heads, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Sprinkler heads shall be installed after flushing the system has been completed.

3.10 SPRINKLER HEADS

A. Sprinkler heads shall be installed as designated on the drawings and per Owners Representative standards.

B. Spacing of heads shall not exceed maximum indicated on the drawings.

3.11 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and verify coverage of each system prior to coverage test.

B. If it is determined by the Owners Representative that additional adjustments, heads or nozzle changes/ additions will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to acceptance and any planting. (See 3.01 section E)

C. The entire system shall be operating properly before any planting operations commence.

3.12 PLANT ESTABLISHMENT

A. Contractor to continually check and adjust the system for proper run times, coverage, and function throughout the Plant Establishment Period listed in Section 32 93 00 – Plants.

3.13 COMPLETION CLEANING

A. Upon completion of the work, Contractor shall smooth all ground surfaces; remove excess materials, rubbish, debris, etc.; sweep adjacent streets, curbs, gutters, walkways, and trails; and remove construction equipment from the premises. Contractor is responsible for removing and cleaning any tracking, tire marking, or other visible signs of damage to existing facilities.

PART 4 - PAYMENT

4.01

PRODUCT DATA SHEET 1 - Full compensation for finishing all labor, materials, tools, equipment, and incidents for doing all work involved in section 32 84 00 Planting Irrigation complete in place shall be included per the bid documents, and no additional payment will be made.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 – GENERAL

1.01 SCOPE

A. The work required is indicated on the drawings and includes, but is not necessarily limited to: soil preparation; fine grading, finish grading; planting trees; guying and staking trees; planting shrubs and ground cover; soil erosion control; maintenance; plant establishment period; guarantees; and replacement.

1.02 RELATED SECTIONS

A. Related work specified elsewhere:

1. 32 84 00 Planting Irrigation
2. 32 90 05 Planting Maintenance

1.03 GUARANTEE

A. All trees installed under the contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship for a period of one (1) year.

B. All plant material 15 gallon or larger shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship for a period of one (1) year.

C. During the guarantee period, any material found to be dead, missing, or in poor condition shall be replaced by the Contractor within seven (7) days of written notification. The Owners Representative/ Landscape Architect shall be the sole judge as to the condition of the material.

D. Replacement shall be made in accordance with these specifications and the plans.

E. Material and labor involved in replacing plant material shall be provided by the Contractor at noadditional cost to the Owner.

1.04 REFERENCES

A. The Standard Specifications for Public Works Construction, “Greenbook”, latest edition, is reference as if herein contained and the contractor shall keep a copy at the project site. These Specifications shall supersede conflicts with information given in the “Greenbook”, unless otherwise determined by the Owner or their designated representative.

1.05 QUANTITIES AND TYPES

A. Plant materials shall be furnished in the quantities and/or spacing as shown and noted for eachlocation, and shall be the species, kinds, sizes, etc. as symbolized and/or described in the “PlantMaterials Legend”, as indicated by the drawings. The L.A has provided this list and/or counts only as a convenience to the Owner and Contractor and assumes now responsibility for its accuracy. As part of his/her bid the Contractor

shall be solely responsible for accuratelyidentifying the counts and species as shown on the plans by symbols.

1.06 VERIFICATION OF DIMENSIONS

A. Dimensions are approximate, before proceeding with any work, Contractor shall verify all dimension and shall immediately inform the L.A. and owner of any discrepancies between the drawings and/or specifications and actual field conditions. Minor adjustments to planting locations for interference with infrastructure or other site features shall be included in the bid by the contractor. No work shall be done in any area where there is such a discrepancy until approval has been given by L.A. and owner. Any work done without notification and prior approval will be the sole responsibility of the Contractor to remedy as required by L.A. and Owner.

1.07 INSPECTIONS

A. Inspections will be required to observe and verify the work. The Contractor shall contact the Owners Representative at least 48 hours (2 working days) in advance of an anticipated inspection. An inspection will be required at each of the steps listed below:

1. Upon completion of fine grading, and prior to commencement of soil preparation, foracceptance of fine grading work and taking of soils samples.
2. Inspection of completed finish grading work per this section following soil amendment work.
3. Percolation test of selected planting locations.
4. On site delivery of plant material.
5. When trees and shrubs are spotted for planting, but before planting holes are excavated.
6. When planting and all other indicated or specified work has been completed.
7. During application of pre-emergent chemical.
8. At start of plant establishment and maintenance period.
9. At the end of the plant establishment period, concurrent with final acceptance of the project for maintenance by the Owner. <u>This acceptance for maintenance will be confirmed in writing by the Landscape Architect or Owners Representative.</u>

1.08 SOILS TEST

A. Agronomic soil analysis shall be required with interpretation and recommendations (include texture, organic matter, estimated nitrogen release, Phosphorus (P 1, P 2), potassium, magnesium, calcium, soil pH, hydrogen, cation exchange capacity, percent base saturation, soluble salts, excess lime rate, sodium and boron at the acceptance

of fine grading. Total amount of tests required shall be as stated per the per plans or at a minimum of 1 test per 25,000 sq. ft. whichever is greater. The tests shall be individual to identify any irregularities in soil types on site and amend them as necessary per plant or area needs. Creating a single composite mix of all samples is not allowed. The final approved recommendation shall take precedence over the minimums listed herein or elsewhere in the plans. Recommendations shall be based on the plants listed per the planting plans specifically. The recommendations shall call for any needed special requirements for the listed trees, shrubs, ground covers, turf, and or any other special specie requirements. Any additional costs due to recommendations of the soil test shall be the responsibility of the Contractor who has reviewed the site during bidding and made their own observations and tests as needed to make an accurate bid based on the site conditions and their experience as a professional contractor. See plans for amount and locations of tests required based on project size. All costs for testing shall be the responsibility of the Contractor and included in their bid as well as the proper scheduling allowing for analysis and reporting lead times.

1.09 SUBMITTALS

A. Contractor to submit date stamped photos documenting current appearance of each plant listedin the plant legend. Photos shall clearly document size and condition from the nursery, including height, spread, and size of caliper noted for trees for approval by Landscape Architect.

B. In addition to photos the Contractor shall supply documentation of the required quantities available from the supplier at the time of submittal, it is the Contractors responsibility to procure all plant material ahead of delivery once the submittal is approved. Any additional

cost as a result of scheduling or order of operations for holding, growing, and caring for plant material shall be included In the Contractors bid.

C. Contractor to submit written recommendations from a Certified Pest Control Advisor for allherbicides and pesticides to be used on site for approval by Landscape Architect.

D. Contractor to submit samples of Mulch or other listed ground cover material per plan in a1-gallon zip-lock type plastic bag for approval by Landscape Architect.

E. The following written certifications and or delivery tickets are required to be submitted to theLandscape Architect within 10 working days upon delivery of the respective materials to the job site:

1. Total Quantity of commercial fertilizers by type
2. Total Quantity of soil amendments and conditioners by type
3. Total Quantity of mulch
4. Total Quantity of iron sulphate
5. Also, all items per section 32 92 00 (turf seeding or sod)

Failure to supply proof of delivery to the site of the required products shall cause a

delay in scheduled billings being approved until the documentation is approved in full.

F. All bagged products (fertilizers, etc.) shall stay on the site in a neat and orderly manner until thefinal approval by the Landscape Architect.

1.10 SUBSTITUTIONS

A. Substitutions for any indicated plant material shall be permitted only if the provided substituted materials are approved in advance at the start of work, and if found to be acceptable by the L.A. with no additional costs to the owner. The L.A. has final authority on the approval of substitutions based on their opinion of overall impact to plant palette and the substitutions previous performance. No substitutions shall be allowed based on failures of the Contractor tolocate and reserve plant quantities at the time of award. For any additional required inspections, nursery visits, or staff time spent verifying additional plant material after the original approval will be the responsibility of the Contractor and charged at the Landscape Architects current rates at time of Design Award.

1.11 WARRANTY

A. General:

The Contractor shall guarantee all plant material against all defects and fault of material and workmanship/installation for the entire combined period of the plant establishment/maintenance periods. The Contractor shall guarantee all trees and plant material 15 gallon and larger for a period of one year from completion of plant establishment. Any trees that fail or are found to be in decline will be replaced by the Contractorat no cost to the owner. The final decision on the health and status of the material will be the sole discretion of the Landscape Architect and or the City's Representative.

Should any problem with the planting installation be discovered within the guarantee period, itshall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Owners Representative. When the nature of the repairs as determined by the Owners Representative constitute an emergency (I.E. Tree failures, Etc.) the Owner may proceed to make repairs at the Contractor's expense. Any and alldamages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owners Representative by the Contractor, all at no additional cost to the Owner.

PART 2 - MATERIALS

2.01 SOIL AMENDMENTS, FERTILIZER, AND CONDITIONERS

Samples of soils amendments and plants shall be submitted for inspection and stored on the site until furnishing of materials is completed. Photographs may be used for Plant Material if they include the following: date of image, person or object for scale, nursery name and contact info, multiple views of any items 24" or larger. Delivery may begin upon approval of samples and completed grow and kill period, or as directed by the Owner's

Representative. Substitutions in any material will not be permitted unless presented during bidding and specifically approved in writing by the Owner's Representative in the form of an official bid addendum.

A. Soil and Soil Amendments:

1. Fertilizer and amendments for soil conditioning and maintenance shall bear the manufacturer's guaranteed analysis and shall be as recommended in the required soils laboratory report.
2. Fertilizer tablets if called for shall be Agriform 21 gram 20-10-5, to be applied per Manufacturer's Specifications.
3. Myco tabs if called for shall be TRI-C 1.68 gram Myco Tabs(Mycorrhizal + NPK) to be applied per Manufacturer's Specifications.
4. Myco Paks if called for shall be TRI-C 4 gram Myco Paks to be applied per Manufacturer's Specifications.
5. Premium Humate if called for shall be TRI-C premium humate applied per manufacturer's specification for soil preparation via Rototilling.
6. Revival Plus if called for shall be TRI-C Myco Revival plus and installed in conjunction with TRI-C humate per manufacturer's specifications.
7. Organic amendments if called for shall be nitrolized redwood sawdust (.5% actual nitrogen), or Fir Bark 1% nitrogen). It shall be fine textured, having minimum 80% passing #8 screen and minimum 95% passing #4 mesh screen. Salinity shall be no higher than 3.5 milliohms per centimeter at 25 Centigrade as measured by saturation Pine shall not be used as an organic amendment.

B. Application Rates

Application rates when called for shall be at a minimum as listed below - Note: Soil analysis may adjust listed rates and shall take precedence.

1. Fertilizer tablets- Apply 21 gram Agriform tablets at the following rates per plant by size:

Shrubs:
- 1 gal. shrub – 1 tablet
- 5 gal. shrub – 2-3 tablets
- 15 gal. & 24" box shrubs – 7-10 tablets

Trees:
- 24" box tree – 15-24 tablets
- Larger sizes: Add 1 tablet for each additional 18" over 9' in height

2. Myco tabs shall be used at the following rates per plant by size:
- 1 gal - 2 tabs
- 5 gal - 8 tabs
- 15 gal – 16 tabs
- 24" box – 22 tabs
- 36" box – 28 tabs
- 48" box – 34 tabs
- 60" box – 40 tabs
- 72" box – 46 tabs
- 84" box – 52 tabs
- 96" box – 60 tabs

3. Myco Pak shall be used at the following rates per plant by size:
- 1 gal – 1 pak
- 5 gal – 3 paks
- 15 gal – 8 paks
- 24" box – 12 paks
- 36" box – 18 paks
- 48" box – 22 paks

4. Premium humate shall be incorporated at 50lbs. per 100 square feet

5. Myco Revival Plus shall be topically applied per manufacture and watered in accordance with the manufacturer's instructions

C. Inorganic Conditioners:

Inorganic conditioners shall be agricultural grade gypsum, soil sulfur and iron sulphate. Iron sulphate shall be ferric sulphate or ferrous sulphate in pelleted or granular form containing not less than 18.5% iron, expressed as metallic iron, and shall be registered as an agricultural mineral with the State Department of Agriculture in compliance with Article 2 "Fertilizing Materials", Section 1030 of the Agriculture Code.

2.02 PLANTS

All plants shall be true to name, and one of each bundle or lot shall be tagged with the name and size of plants in accordance with the standards of practice recommended by American Standard for Nursery Stock ANSI Z60.1-2014. The root condition of plants furnished in containers shall be determined by removal of earth from the roots of not less than two plants nor more than 2% of the total number of plants of each species or variety except when container-grown plants are from several different sources: in which case, the roots of not less than two plants of each species or variety from each source shall be checked by the Owners Representative / Landscape Architect at his option. The selection of plants to be checked will be made by the Owners Representative / Landscape Architect. All plants rendered unsuitable for planting shall be considered as samples, and replacements shall be provided at no additional cost. In case the sample plants are found to be defective, the entire lot or lots of plants represented by the defective samples will be rejected.

A. All trees and shrubs supplied by Contractor shall be of the specified standard height and diameter set by the American Standard for Nursery Stock. The height of the trees shall be measured from the root crown to the last division of the terminal leader and the diameter shallbe measured six (6) inches above the crown roots. The trees shall stand erect without support.

B. No plants or trees shall be accepted with compromised root systems, including girdling, root bound, and or recently up planted from smaller container stock.

C. Container stock shall have grown in the container for at least 6 months, but not over two years.

D. Do not prune any plants prior to delivery without specific prior approval.

E. Material that has been trimmed, damaged, or does not meet the standard approved via photographs will be rejected.

F. All cost associated with returning and replacing rejected material shall be the Contractors sole responsibility.

G. Substitutions shall not be permitted unless the contractor can prove in writing that no specimens can be located within 100 miles of the project. A minimum of 5 notices from suppliers stating the plant is not available are a required.

H. At all times plants shall come from Nursery stock grown in similar conditions and climate zones as associated with the project.

2.03 BACKFILL MATERIAL

A. Topsoil shall be free from noxious weed seed and shall be of a loam characteristic, fertile and friable.

B. Wood shavings shall be leached nitrogen fortified and shall be free of foreign matter.

C. Native plantings shall use native soil only for backfill.

D. Soil used for backfill of planting pits for bidding purposes shall be enriched using the following blend per cubic yard (agronomic soil test recommendations shall take precedence where theseminimum amounts are exceeded):

60% site soil or approved import40%

wood shavings

17 lbs. soil condition/fertilizer (Gro-Power Plus)1 lb. iron

sulphate

E. All soil backfill shall be bulk mixed, not individually mixed at each plant pit.

2.04 STAKES AND TIES

A. Tree stakes shall be 3" dia. x 10-foot-long straight-grained copper naphthenate treated lodgepole pine unless called for differently per the plans. Stakes shall be free from knots, checks, splits, or disfigurement.

B. Tree ties shall be "Cinch-Tie Tree Support" supplied by V.I.T. Co., Escondido, California, (760) 480-6702. For 5- 15-gallon trees, Model CT24; for 24"- 36" box trees, Model CT32. Total amount of ties per tree shall be as called for by the Details.

C. Multi-stem trees and 48" box trees and larger shall require underground tree guying/earth anchors system that include strapping of the root ball and soil anchors. Duckbill Root Ball anchor sized per manufactures recommendations or approved substitution shall be required.

D. Tall vertical growing specimens, similar to Italian Cypress or Brisbane Box trees shall require special staking requirements designed to align and support their long single leader growth habits. This shall include using 20' length sch. 40 steel pipe or similar staking devise that may require special installation and tie methods. Contractor to include alternative staking methods based on tree types as required by plans in the total cost of their bid.

PART 3 - EXECUTION

3.01 LANDSCAPE GRADING

A. The Contractor shall complete Fine grading as required by adding/working soil, removing surplus soil, removing rocks and debris over 1 inch in diameter within the top 2" of soil in flat and slopeareas, and removing rocks over 2" in diameter within the top 6" of soil in areas with slopes lessthan 3:1. Bring all areas to be landscaped to fine grade. All areas shall slope to drain. Flow lines shall be established to drain inlets, existing road curbs, sidewalks, and or other drainage conveyance structures as shown on the grading plans. Fine grading shall be raked clean and present a consistent surface. Contractor shall notify Owners Representative/ Landscape Architect of any areas that appear to have drainage issues prior to soil preparation for complete mitigation and or correction as required.

B. The Contractor shall key/cut and remove all soil for mulch, ground cover, turf interfaces with hardscape per the details to retain minimum depth and final finish alignment.

3.02 WEED AND PEST CONTROL MEASURES

A. Upon completion and acceptance of all fine grading work and prior to soil preparation, the Contractor shall perform weed and pest control (Grow/Kill) (Pest Termination) measures as follows:

1. Irrigate all areas designated to be planted for a minimum of 10 minutes per setting, two settings per day for 14 days continuously to germinate existing seed bank.
    a) In instances of point source or drip irrigation it is the Contractors responsibility to completely irrigate all planting areas which may require additional or supplemental irrigation above the designed system per plans. This may include adding above ground temporary irrigation, watering from water trucks/tanks, and or hand watering and shall be included in the Contractors bid.
2. Apply a contact non selective herbicide per the written recommendations of a Certified Pest Control Advisor specific to the site- allow 7 days or sufficient time to pass to allow a complete kill of all weeds germinated.
3. Remove all weeds present including any viable root systems and above ground vegetation, this includes all weeds within the limit of work- not only planting areas.
4. Repeat step one for only 7 days and then follow steps 2-3 as above until weed cover is lessthan 1%.
5. Contractor shall call for inspection and verification of the completion of the Grow Kill Period prior to planting.
6. Contractor to indicate on master schedule total grow kill period as part of submittals.
7. If the Contractor wants to phase the grow kill operation, the Contractor will be responsiblefor providing plans documenting treatments including start and stop dates, in addition to reporting and requesting additional inspections for verification.
8. Any failure by the Contractor to continually irrigate or miss herbicide or clean up

windows as listed above would require the process starting over from step one.

9. Contractor is responsible for the purchase and erection of all signs and barriers required to prevent intrusion into treated areas in addition to all required forms of public notice as required by the PCA responsible for the recommendation, local governing organizations, and or manufacture requirements for the safe and responsible use of products.
10. No material or method applied shall affect the success or ability of hydroseeded or planted material to germinate/thrive.
11. During grow and kill operations the Contractor shall also re-access any possible rodent or herbivore activity and continue removal and or treatment programs to maintain a pest free site and a boundary or buffer zone. This shall include areas outside of planting limits if within the project property to create buffer zones.

3.03 SOIL PREPARATION

A. All fine grading and mounding and all weed control measures shall be documented, completed, and approved prior to any soil preparation.

B. This work shall not commence until the agronomic soils tests have been completed. Should 30 calendar days elapse between completion of soil preparation and commencement of planting, all areas shall be prepared again.

C. In planting areas with gradients less than 3:1, a layer of soil amendments shall be spread and rototilled into the soil to a minimum depth of 6 inches, or as required by the soils report, so that the soils shall be loose, friable, and free from all rocks, sticks, and other objects undesirable to planting.

D. The following soil amendments shall be used for estimating purposes if soil tests are not provided a time of bid and be added per 1,000 square feet to all planting areas with gradients less than 3:1 (agronomic soil test recommendations shall take precedence where these minimum amounts are exceeded). Contractor shall be responsible for any additional cost due to Soil report recommendations and shall have inspected and understood the current soil conditions at time of Bid. (Note: the following is for typical ornamental planting installation- they shal not apply to Native plantings, see Soil Management report for further information if included in plans)

1. 3 cubic yards organic amendment
2. 200 pounds soil conditioner/fertilizer (Gro-Power Plus)
3. 25 pounds gypsum

All landscape areas shall be re-fine graded to "dress out", maintain, and/or reestablish grades and flow lines as approved prior to amending the soil. Fine grades will be inspected upon completion. Contractor shall not proceed with planting work until fine grades have been inspected and accepted by the Landscape Architect.

E. Moisture Content - The soils shall not be worked when the moisture content is so great that excessive compaction will occur; and not when it is so dry that dust will form in the air or that clods will not break easy. Water shall be applied, as necessary, to

provide ideal moisture content for tilling, planting, and required dust control.

F. Note: Special soil preparation areas such as drainage basins or areas with different agronomic requirements shall be per plan and or notes/details.

3.04 FINISH GRADING

A. After completion of all soil preparation work the Contractor shall finish grade all planting areas filling as needed or removing surplus dirt, removing rocks and debris over 1 inch in diameter, and floating to a smooth uniform grade. All areas shall slope to drain. Flow lines shall be established to inlets, road curbs and/or other drainage means as shown on the plans and as directed.

3.05 PLANTING

A. Prior to planting the Contractor shall dig test planting holes for percolation tests. Per direction of the Landscape Architect, locations shall be selected to address all soil types and situations on site, such as examples for slope, exposure, soil type, etc. Holes will be dug to the depth per planting details and filled to 25% capacity with water. Test start time will be documented and checked every half hour until fully infiltrated to ensure proper drainage. Any areas found to not infiltrate per the recommended time frame for the selected material will require additional drains and specialized planting techniques per the details for Trees and Shrubs in Wet Soils, which require deeper pits, additional gravel sumps, and drain pipes. The Contractor shall include the cost of these additional items per the site conditions at the time of bidding and if not installed shall refund a credit.

B. Trees and Shrubs: Plant holes shall be dug to size as indicated in the drawings. Before trees and shrubs are set in the holes, all holes shall be pre-watered as follows:

All planting holes shall be filled to the brim with water and allowed to drain before any planting is done. If any holes fail to drain then they will be added to the holes for wet soils treatment as stated in item “A” above.

C. Soil surrounding planting pit shall be in a friable condition and moist to a depth of 8".

D. Backfill using specified soil mix per the details to within 8" of finish grade. At this depth, place the fertilizer tablets or Mycro packs/ tabs per details. Complete backfillingto finish grade.

E. Plants and Trees shall be planted at such a depth that the crown roots bear the same relative position to finish grade as they did to the soils where they were grown. At no time shall the soil level be raised around the crown. If the soil level per grower’s container is higher than base of the trunk flare the Contractor shall remove excess soil per ISA standards and BMP’s. Backfill after planting shall be compacted carefully into place without injuring the roots of the tree or breaking up the ball of earth surrounding the roots.

F. Contractor shall create and mound soil as required for water basins per the details including adding slope guards, stones for root cover/ soil moisture protection on southwestern exposures, trunk protection, and additional straw wattles when required.

G. All excess soil spoils and excavated debris shall be removed from the site by the

Contractor.

3.06 GROUND COVER AND VINE PLANTING

A. Soil preparation and fine grading shall be completed prior to ground cover planting.

B. Add Soil Amendments and conditioners to ground cover areas per Section 3.03, part D of the above planting specifications.

C. All rooted ground cover and bare dirt areas are to be treated with a pre-emergent chemical (subject to approval by the Landscape Architect prior to application as recommended by a CPA). Chemicals are to be applied by a DPR Qualified or Certified applicator. This treatment shall be applied at the following times during the contract: a) before planting, b) at beginning of plant establishment period, and c) at the end of plant establishment period. The Owners Representative / LandscapeArchitect shall be given a minimum of 48 hours (2 working days) notice prior to each application.No chemicals shall be applied other than in the presence of the inspector.

D. Ground cover shall be planted below all shrubs and trees to within 12" of the shrub main stem unless otherwise noted on the plans.

E. Ground cover and vines shall be planted in moist soil and spaced as indicated on the plans.

F. Each plant shall be planted with its proportionate amount of flat soil to minimize root disturbance. Soil moisture shall be such that the soil does not crumble when removing plants.

G. Following planting, ground cover and vine areas shall be re-finished graded to restore smooth finish gradeand to ensure proper surface drainage. All excess soil spoils and excavated debris shall be removed from the site by the Contractor.

H. A 3-inch layer of mulch per plans shall be spread over the planted areas. Watering shall begin immediately following mulching.

I. When necessary to prevent plant damage from pedestrian traffic during the initial growing stage, the Contractor shall erect temporary protective fencing to be removed at the end of theplant establishment period.

J. Vines shall be tied to walls, fences, etc., in the manner prescribed on the plans and details. At a minimum the contractor shall provide attached fasteners and guying for vines requiring support. Temporary staking shall be removed at the beginning of the plant establishment period.

3.07 TREE STAKING

A. Stake trees as per planting details. No bare metal wire shall circle any part of any tree.

B. All nursery stakes shall be removed at the time of planting.

C. Contractor to adjust staking as needed for locations in high wind areas, including adding morerestraints and stakes per the plans and current ISA guidelines at no additional cost.

3.08 WATERING

A. It shall be the Contractor's responsibility to maintain a balanced watering program to

ensure proper growth until final acceptance of the work.

B. Immediately after planting, apply water to each tree, shrub or vine. Apply water using a gentle spray pattern via a water wand in the planting hole until the material about the roots is completely saturated from the bottom of the hole to the top of the ground.

C. Apply water in sufficient quantities and as often as seasonal conditions require to keep the planted areas moist at all times per the plants requirements, well below the root system of plants.

D. Contractor shall be responsible for monitoring all planting areas and adjusting irrigation as needed for severe weather conditions such as high wind or high heat waves including working weekends and holidays as part of their Bid based on project timelines and schedules per seasonal requirements .

E. For turf or hydroseed installation using Eco Mat or other subsurface irrigation the contractor will be responsible for any head adjustments or hand watering required to germinate the seeds against any hardscape buffer areas (typically 24”) at no additional cost.

F. Irrigation:

1. Contractor shall properly and completely maintain the irrigation system. Contractor to program controller per watering schedule on irrigation plans and adjust in the field as necessary. Overhead irrigation areas to have a maximum run time of 15 minutes per cycle.with additional cycles as needed. At no time will run off or erosion be allowed.

3.09 MULCHING

A. Contractor to apply a 3" minimum mulch layer to all planting areas unless specified as other ground cover treatment by the plans.

B. Contractor to keep mulch from plant trunks as follows:

1. Shrubs shall have 3" of clearance from trunks/main stems to mulch
2. Trees shall have 6" of clearance from crown/ base of the flare to mulch

C. Contractor to overhead water entire mulched area to help settle and lock material together and start the process of nutrients moving into the below soil.

3.10 PLANT PROTECTION

A. The Contractor is responsible for all aspects of protection of the installed landscape from loss or damage through the Plant Establishment and Maintenance periods until the final acceptance via written notice. This shall include any additional materials or protection methodologies such as but not limited to ground wire cages, shields, trunk covers, shading, herbivore protection above/below via product use or trapping and or removal, application of deterrents, and Pest and insect control.

3.11 PRUNING

A. All shrubs and trees shall be pinch pruned as necessary to encourage new growth and to eliminate rank sucker growth. Old flowers, and dead foliage and damaged limbs shall be removed. No major pruning shall be done without the approval of the Landscape Architect. Any damage to shrubs and trees that drastically changes structure and or appearance shall require the Contractor to replace in kind with an approved replacement at no additional cost per the direction of the Landscape Architect.

3.10 MAINTENANCE

A. All areas landscaped by Contractor under this contract shall be maintained by said Contractor for a minimum plant establishment period of not less than ninety (90) days or as called for by the Contract documents from the date of written acceptance of initial installation and substantial completion per the requirements of the plans, specifications, and contract documents.

3.11 START OF PLANT ESTABLISHMENT

A. Criteria for start of plant establishment period:

1. The plant establishment period shall not start until all elements of the project that impact the landscape are completed in accordance with the contract documents. Projects will not be segmented into phases or have portions separated for multiple Plant Establishment programs.
2. Permanent Water and Power for the irrigation system shall be established.
3. Fully automatic irrigation including acceptance of installation and as-builts/controller charts.
4. Written acceptance of the Owners Representative must be obtained prior to the start of the plant establishment period.
5. If project maintenance fails to continuously meet standards required, the plant establishment period "day count" will be suspended and will not recommence untilContractor has corrected all deficiencies.
6. The 90-day establishment period is the minimum required and will be extended as neededat no additional cost to remedy issues with failure to service/meet the requirements and bring the project into compliance.

3.12 LANDSCAPE MAINTENANCE (PLANT ESTABLISHMENT)

A. Refer to section 32 90 05 Landscape Maintenance

3.13 CLEAN UP

A. Upon completion of the work, the Contractor shall smooth all ground surfaces; remove excess materials, rubbish, debris, etc.; sweep adjacent streets, curbs, gutters, walkways, and trails; andremove construction equipment from the premises.

B. This shall include power washing all hardscape, site structures, site furnishings to return them to a state ofclean and unsoiled. If the finish has been soiled past the ability to be washed off the Contractor shall be responsible to returning it to a new finish

state, including repainting, refinishing, and in extreme cases replacing in whole.

PART 4 - PAYMENT

4.01

A. Full compensation for finishing all labor, materials, tools, equipment, and incidents for doing all work involved in section 32 90 00 Planting complete in place shall be included per the bid documents, and no additional payment will be made**.**

END OF SECTION

SECTION 32 90 05
LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing and implementing a complete landscape maintenance program to maintain all planting areas from time of Accepted plant installation through the (90) ninety-day or per contract document Plant Establishment Period and accepted Final Completion. Contractor shall note the (90) ninety-day period is the minimum for plant establishment and that failures of plant performance/establishment and or Contractor failures to properly meet all requirements shall extend the period as deemed necessary by the Owner's Representative.

1.02 SCOPE OF WORK

A. Furnish all supervision, labor, materials, equipment and transportation required to maintain the landscape in a thriving condition as it establishes and take root, as specified herein.

1. Care of all lawn and ground cover areas if present, including watering, cutting, edging, trimming, fertilizing and pest control within all ground cover areas as directed herein.
2. Care of all shrubs, trees, and groundcover areas, including watering, cultivation, pruning, fertilization, debris removal, and pest control including but not limited to:
    a. All cultivation and soil aeration as necessary to maintain optimum conditions for plant growth.
    b. Fertilization of all plant material on a regular schedule, including soil testing as necessary to determine requirements and application methods with reference to the project soil analysis.
    c. All pruning, re-staking, tightening or adjustment of guy wires or straps and trimming of plant material that is required in landscape areas to promote growth and proper structure.
    d. Control and/or prevention of diseases, insect and or rodent infestation using methods and techniques approved by State Licensing Agency.
3. Supplemental watering of plant material on a regular basis through use of automatic irrigation systems and/or hand watering as needed, while consistently monitoring and adjusting water needs to maintain optimum conditions for plant growth per each species/ hydrozones requirements.
4. Maintenance of irrigation systems, including adjustment of heads and valves and regular controller program updating, cleaning of filters, and fertilizer injection systems if included per plans.
5. General maintenance of the site and associated amenities including removal of litter and debris, cleaning of site features, graffiti removal, and reapplication of any anti-graffiti coatings as required.
6. Replacement of plantings, or other materials, that, in the Owner's Representatives opinion, require replacement due to failure, decline or the Contractor's neglect in care or maintenance at no cost to owner.

7. Protection of Property and Landscape During Inclement Weather: During periods of inclement weather, Contractor shall provide supervisory inspections of the project during regular hours to prevent of minimize possible damage from storms or weather events. Contractor shall report any storm damage to Owner's Representative.
8. Protection of Existing Facilities and Structures: Contractor shall exercise due care in protecting from damage all existing facilities, structures, and utilities both above and below grade from maintenance activities- any damage from equipment or personnel shall be repaired or replaced immediately to the original condition of a new installation.
9. Project Inspection: Contractor will meet with Owners Representative per approved schedule to verify compliance with specifications. Following each meeting, Contractor will submit written reports noting problems cited during inspections and any actions taken.
10. Work Schedule: A monthly schedule shall be prepared and submitted to the Owner prior to the beginning of each month. Schedules shall indicate times, days of the week and type of work to be performed including manpower for approval.

B. Section also includes notification and coordination with the Recreation & Park Department if present prior to completion of the Plant Maintenance Period.

1.03 RELATED WORK

A. Section 32 84 00 – Planting Irrigation

B. Section 32 90 00 – Planting

1.04 REFERENCE STANDARDS

A. Plant Material Standards: "American Standard for Nursery Stock", current edition, American Association of Nurserymen.

B. Staking and Guying Procedures: "Staking Landscape Trees", University of California Extension Publication #2576.

C. Pruning Procedures: "Pruning Landscape Trees", University of California Extension Publication #2574.

D. ISA standards and BMP

1.05 WORK FORCE

A. Supervision: Contractor shall furnish competent supervisors, to be present on the job site at all times during which work is being performed. Supervisors must possess adequate technical background, preferably with formal education in ornamental horticulture. Supervisors must be English speaking and preferably bilingual (in Spanish) if crews are Spanish speaking.

B. General Personnel: In addition to Supervisors, Contractor shall supply sufficient working personnel capable of promptly accomplishing, on schedule, all work required under this contract during regular hours.

C. All such personnel shall be physically able to perform their assigned work. The Contractor and his employees shall conduct themselves in a proper and efficient manner at all times and shall cause the least possible annoyance to the public. They shall be fully clothed in uniforms and suitable attire. All maintenance staff shall have ID badges and the current PPE as required by OSHA. The Owner may require the Contractor to remove from the work site any employee(s)

deemed careless, incompetent, or otherwise objectionable, whose continued employment on the job is considered to be contrary to the best interest of the Owner. All personnel shall be U.S. citizens or legal residents.

1.06 WARRANTY

A. Refer to Section 32 90 00 – Planting.

1.07 SCHEDULE

A. Submit a proposed maintenance work schedule to the Owner's Representative in writing for review at least 10 days prior to commencement of maintenance work. All maintenance work shall be done at times approved by the Owner's Representative so as not to conflict with the operation of the project.

B. Project site must be visited twice weekly for the first (30) days and once weekly as a minimum thereafter until the end on establishment.

C. For Projects with extended maintenance periods over 90 days see below for a reference of general required activities.

Frequency Per Month:

Operation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Site Check	4	4	4	4	4	4	4	4	4	4	4	4
Debris Removal	2	2	3	3	4	4	4	4	3	3	2	2
Pruning	0	1	0	0	0	0	0	0	0	1	0	0
Weed Control	0	2	3	3	4	4	4	4	3	2	2	0
Clean + Sweep	2	2	3	3	4	4	4	4	4	4	2	2
Irrigation Adjustment	1	1	1	1	2	2	2	2	2	1	1	1

1.08 TECHNICAL SPECIFICATIONS

A. Turf-Mow-Edge

1. Mowing

a. All turf areas shall be mowed once per week at a minimum- adjustments to mowing's per week may be directed dependent on turf and season.

b. Work shall be performed on the same day each week. Initial week schedule and any changes must be approved by the Owner prior to implementation.

c. Mowing's missed visits due to inclement weather or ground conditions from such weather shall be rescheduled and completed within 3 work days on weekly schedule and within 7 days on bi-weekly schedule.

d. Cutting heights shall be adjusted according to the type of grass in accordance with the following:

TURF TYPE	TIME OF YEAR	CUT HEIGHT
Bluegrass and Fescue	June through September	3"
Bluegrass and Fescue	September through May	2"
St. Augustine	Year-Round	2-1/4"
Bermuda	Year-Round	3/4"
Buffalo Grass	Year-Round	1-1/2"

e. All warm season grasses to include Bermuda, Buffalo and St. Augustine shall be mowed with a power-driven reel type mower. Bluegrass and Fescue may be mowed with either power-driven reel type or rotary type mowers. All equipment shall be adjusted to the proper cutting heights and shall be adequately sharpened.

f. All visible grass clippings shall be collected and removed from the site prior to the completion of that day's mowing operations or the end of the day, whichever occurs first.

g. All trash, leaves, paper and other debris shall be removed and disposed of off-site prior to mowing.

h. All walkways, roadways, trails or other areas dirtied by mowing operations shall be cleaned and all debris disposed of off-site prior to the completion of that day's mowing operations or the end of the day, whichever occurs first.

2. Edging

a. All turf grass borders shall be neatly and uniformly edged or trimmed concurrent with every mowing with bladed tools- no string trimmers will be allowed for edging.

3. Turf Maintenance

a. All turf areas shall be irrigated as required to maintain adequate growth and appearance.

b. Contractor shall monitor the requirements of the plant material, soil conditions, seasonal temperature variations, wind conditions and rainfall and shall recommend appropriate changes in duration of watering cycles. No actual changes will be implemented without prior approval of the Owner.

c. Special areas of consideration:

1) Special irrigation zones may exist such as, sub irrigation zones for turf adjacent to hardscape. In some situations, for example in hydroseeded applications, the Contractor shall hand water as required for initial germination and establishment as part of the installation and establishment period if deemed

necessary. This will be included with the contract price and no additional cost or charges will be allowed.

4. Weed Control
   a. A regular program of approved chemical application shall be used to control weed growth, supplemented by hand removal of noxious weeds or grasses as necessary.
   b. In areas of native planting, hand removal may ne the only method allowed.
5. Fertilization
   a. All turf areas shall be fertilized in accordance with soils report, specific turf requirements and or recommendations when granular fertilization is used; if no soils report exists, the following criteria shall prevail.

TURF	FORMULA	RATE	CYCLE
Bluegrass	16-6-8 w/trace elements	1 lb. actual nitrogen/ 1,000 S.F.	45 days
Bermuda	Ammonia Nitrate 33.5-0-0 16-6-8 w/trace elements	1 lb. actual nitrogen/ 1,000 S.F.	45 days
Fescue	16-6-8 w/trace elements	1 lb. actual nitrogen/ 1,000 S.F.	45 days
St. Augustine	Ammonia Nitrate 33.5-0-0	1 lb. actual nitrogen/ 1,000 S.F.	45 days
Buffalo grass	Manufacture approved crab grass preventer	Per manufacturer	45 days

B. Fallen Vegetation and Debris Removal
   1. The contractor shall police the entire project area including all paved areas, planters, lawn areas, sidewalks (including common area sidewalks) and trash enclosures and collect fallen leaves, branches and limbs regardless of length or diameter, dead vegetation, paper, trash, cigarette butts, garbage, rocks, and any and all other debris to prevent unsightly and inordinate accumulations during normal maintenance working hours. Sidewalks shall be swept or washed as necessary to keep free of trash and graffiti. Collected items shall be promptly removed and taken to a legal disposal site.

C. Removal of Dead Animals or animal waste
   1. Removal and legal disposal of animal carcasses and animal waste are considered a normal maintenance task for the duration of the maintenance period. Dead carcasses shall be legally removed immediately when discovered by the contractor. For areas that include dog parks all animal waste shall be immediately removed once discovered by the contractor.

D. Erosion Control
   1. Any installed erosion control measures such as straw wattles, silt fences, sand/gravel bags, etc. are to be continually maintained throughout the project by the Contractor. This shall

include sediment/soil removal and replacement, BMP maintenance and replacement to due to damage, failure, or end of life.

2. The contractor is responsible for daily visual inspection of landscape areas and slopes and immediately reporting areas experiencing erosion to the landscape architect and/or owner's representative on the same day noticed. If the contractor fails to notify the landscape architect and/or owner's representative of areas experiencing erosion on the same day noticed, then the contractor assumes full responsibility for any erosion control measures and/or repairs as directed by the landscape architect and/or owner's representative at no additional cost to the owner.
3. The contractor is responsible for immediately repairing and correcting any progressive rilling that may occur.
4. Erosion control measures may include but not be limited to:
    a. Filling
    b. Raking
    c. Redirecting runoff
    d. Properly programming irrigation operations
    e. Replanting
    f. Replacing mulch
    g. Providing additional erosion control materials such as:
        1) Jute matting
        2) Filter Fabric
        3) Hay bales
        4) Hay rolls
        5) Silt fencing
        6) Sand Bags
        7) And/or other erosion control items as required to maintain healthy plant material and stable slopes.

E. Additional erosion control measures required due to irrigation operations programmed by the contractor that did not take into account cycle and soak functions of the controller will be installed and/or repaired as directed by the landscape architect and/or owner's representative at no additional cost to the owner.

F. Mulch replenishment

1. Contractor to replenish mulch levels as required to match installation levels with the same type as listed in the documents

1.09 PROTECTION

A. Maintain all planting areas from time of plant installation, through the Plant Establishment Period and final acceptance, in accordance with Standard Specifications.

B. Maintain weed levels to less than 5% of total area with a final goal of less than 3% at completion of the establishment period.

C. Maintenance also includes temporary fences, barriers, and signs as required for protection.

D. The Contractor shall treat or replace any plant that becomes damaged, fall in decline or be injured, as directed by the Owner’s Representative at no additional cost to the Owner.

E. The Contractor shall be responsible for protecting the health and function of the soil including;

1. Maintaining mulch cover
   a. Using powered blowers in mulched areas is prohibited.
2. Stripping soil cover and exposing soil is prohibited.
3. Allowing soil to dry out or over watering causing an anaerobic conditions.
4. Compaction of soil due to equipment is prohibited.

   If any of the above issues develop or occur during the maintenance period the contractor shall be responsible to correct in full at no cost to the owner, this shall include soil tillage, de-compaction, adding additional amendments, replacing mulch, and removal and replacement of damage soil if mitigation is not feasible.

1.10 FERTILIZATION

A. Groundcover and all planting shall be fertilized in accordance with soils report recommendations when granular fertilization is used; if no soils report exists, the following criteria shall prevail: apply certified organic compost mulch at the rate of 3 cu yards per 1000 square feet 30 days after installation. Repeat application every 60 days if maintenance period is longer than 90 days. Organic Compost shall be Custom Amendment Mix (WCP 33) by Earthworks Soil Amendments, Inc., 951-782-0260.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Perform Site Observations: For the purpose of establishing the 90-day Maintenance Period and observing completion of the work of this Section through final acceptance. A minimum of (6) six separate field visits, occurring chronologically as follows:

1. Observation for Maintenance at Commencement
2. 15-day Progress Maintenance Observation
3. 30-day Progress Maintenance Observation
4. 60-day Coordinate Site Meeting with Client's Site Maintenance Staff
5. 60-day Progress Maintenance Observation
6. 90-day Observation for Final Acceptance

B. Observation for Plant Establishment Period Commencement: Request observation and acceptance by Owner's Representative after all plant material is installed and after all irrigation work and other work of this Section is completed. Plant Establishment Period shall begin upon acceptance of final planting and review by the Owner's Representative. The Period shall continue for a minimum of 90-calendar days until Final Acceptance.

C. At any time, deficiencies are found such as underperforming plants or a lack of maintenance, the Owner's Representative will notify the Contractor immediately that the 90-day period has been suspended until such time as the deficiencies are fully corrected.

D. The Contractor has 3 days to respond to any notices of deficiencies and make appropriate corrections including plant replacements.

3.02 PROGRESS MAINTENANCE OBSERVATION

A. General: Notify the Owner's Representative 72 hours prior to a required scheduled Progress Maintenance Observation. All items determined to be deficient during the previous observation shall be completed prior to the meeting. FAILURE TO DO SO MAY RESULT IN AN EXTENSION OF THE PLANT ESTABLISHMENT and MAINTENANCE PERIOD. In addition, prior to first Progress Maintenance observation, furnish the Owner's Representative with the following information:

1. An "As-Built" irrigation plan, as specified.
2. All supplier invoices for the nursery stock, commercial fertilizers, soil amendments, mulches and herbicides as shown and specified and as installed.
3. Maintenance schedule for fertilization, irrigation, and for all planting areas.

B. Failure to provide the above submittals may result in the re-scheduling of the Progress Maintenance Observations and extend the Maintenance Period.

C. Notify the Owner's Representative in writing, prior to any of the Progress Maintenance Observations of any conditions, which may impede proper plant establishment and or growth.

D. Final Maintenance Observation: Notify the Owner's Representative at least 7 days before the expiration of the Plant Establishment Period for Final Maintenance Observation. Prior to this observation, all items determined to be deficient during the Progress Maintenance Observations shall be completed and signed-off by the Owner's Representative.

3.03 FINAL COMPLETION

A. General: Work under this Section will be accepted by the Owner's Representative upon satisfactory completion of all work of this Section, Section 32 90 00 Planting, and Section 32 84 00 Planting Irrigation, including 90-Day Plant Establishment Period, exclusive of replacement of plant material under the terms of the Warranty.

B. Termination of Observation: During any Observations, any landscape item previously identified as deficient in the Progress Maintenance Observations and determined by the Owner's Representative to be still deficient, shall automatically terminate the Final Completion and result in the extension of the Plant Establishment Period an additional 30 days. Additional costs associated with subsequent Observations that are a result of the Contractor's failure to correct deficient items shall be paid by the Contractor. There shall be no conditional final completion agreement for any work.

3.04 NOTIFICATION TO OWNER FOR TRANSFER OF MAINTENANCE

A. At least one month prior to the end of the 90-Day "Plant Establishment Period," the Contractor shall notify the Owner's Representative to coordinate a meeting between the Recreation & Park Department staff and the Contractor to ensure a smooth transition for turn-over of plant maintenance.

END OF SECTION