STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

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

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

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

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

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

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

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

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

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

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

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

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

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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

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

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

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other

professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

   a. reviewing and checking all such information and data;

   b. locating all Underground Facilities shown or indicated in the Contract Documents;

   c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

   d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price

or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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

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

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

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by

Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

    a. Such insurance shall remain in effect for two years after final payment.

    b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property

insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery

against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

   a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

   b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

   c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

   d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

      1) shall certify that the proposed substitute item will:

         a) perform adequately the functions and achieve the results called for by the general design,

         b) be similar in substance to that specified, and

         c) be suited to the same use as that specified;

      2) will state:

         a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

         b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

         c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

      3) will identify:

         a) all variations of the proposed substitute item from that specified, and

         b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or

other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor

shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

    a. Submit number of copies specified in the General Requirements.

    b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

    a. Submit number of Samples specified in the Specifications.

    b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

    a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

    b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

    c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

    d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop

Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

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

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits

and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The

opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on

Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

   c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

   d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

   e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and

equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the

Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

   d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

   a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

   b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

   c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities

pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

   d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

Section 00800

SUPPLEMENTARY CONDITIONS

SCOPE. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) and other provisions of the Contract Documents as indicated herein. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1. DEFINITIONS AND TERMINOLOGY.

SC-1.01. DEFINED TERMS. The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) have the meanings assigned to them in the General Conditions.

Amend the terms as follows:

15. Delete the term "Contractor" and substitute therefore the terms "Contractor or Prime Contractor."

17. Add the following sentence to the definition: "Drawings may also be described as Plans."

22. Delete the words " or Radioactive Material" and substitute therefore the words "Radioactive Material or other pollutants or contaminants".

44. Add the following to the first sentence: "and a Certificate of Substantial Completion has been completed."

Additional terms used in these Supplementary Conditions have the meanings indicted herein, which are applicable to both the singular and plural thereof.

Add the following new definitions to paragraph 1.01:

"52. Final Completion – The time when all work is complete, including all punch list items, and all documents required for occupancy of the facility are completed and submitted to the OWNER. These documents include, but are not limited to, Certificate of Occupancy, Letters of Approval from various regulatory agencies, inspection certificates, and all other items as required in paragraph 14.07."

"53. General Contractor – The person, firm, or corporation with whom OWNER has entered into an Agreement for a complete project, general trades, or complete project less a part of the project."

"54. Without exception – The term "without exception", when used in the Contract Documents following the name of a Supplier or a proprietary item of equipment, product, or material, shall mean that the sources of the product

are limited to the listed Suppliers or products and that no like, equivalent, or "or-equal" item and no substitution will be considered."

"55. Written Notice -- Notice to any party which is in writing and which shall be considered delivered and the service thereof completed once posted by certified or registered mail to the party to whom the notice is sent at its last given address or delivered in person to said party or its authorized representative on the work."

SC-102. TERMINOLOGY. Add the following paragraphs G, H, and I.

"G. Imperative Mood. These specifications are written to the BIDDER before the award of the Contract and to the CONTRACTOR after award of the Contract. The sentences that direct the CONTRACTOR to perform work are mostly written as commands. For example, a requirement to provide cold-weather protection would be expressed as, 'Provide cold-weather protection for concrete,' rather than 'The Contractor shall provide cold-weather protection for concrete.' In the imperative mood, the subject "the Bidder" or "the Contractor" is understood.

"H. Engineer Interpretations. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, if, as, or, when, or where 'demonstrated, contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned,' it shall be understood as if the expression were followed by the words 'by the Engineer' or 'to the Engineer.'

"I. 'Shown.' When this term is used in the specifications, it means 'shown on the Drawings' unless stated otherwise."

SC-2. PRELIMINARY MATTERS.

SC-2.02. Copies of Documents. Delete the second sentence of paragraph 2.02.A and insert the following new sentence in its place:

"Five (5) sets of contract drawings and specifications will be furnished the Contractor without charge. Additional sets will be furnished upon request at the cost of reproduction. The Contractor shall keep one (1) set of approved plans and specifications on the site of the work. This set shall be kept current by addition of all approved changes, addenda and amendments thereto. One set of as-built plans shall be returned to the Owner after the project is complete."

SC-2.03. Commencement of Contract Times; Notice to Proceed. Delete the paragraph and insert in its place:

"A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. The date for the Contract Times may be extended by mutual agreement between the OWNER and the CONTRACTOR."

SC-3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE. No modifications.

SC-4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.

SC-4.02. Subsurface and Physical Conditions. Replace paragraph 4.02 with the following:

"A. Reports and Drawings:

"1. No reports of explorations and tests of subsurface conditions at the Site are available.

SC-4.03. Differing Subsurface or Physical Conditions.

Replace paragraph 4.03.A with the following:

"A. Notice: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

"1. Is of such nature as to require a change in the Contract Documents; or

"2. Differs materially from that shown or indicated in the Contract Documents; or

"3. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent on work of the character provided for in the Contract Documents;

"then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any work in connection therewith (except as aforesaid) until receipt of written order to do so."

SC-4.04. Underground Facilities.

Add the following immediately after paragraph 4.04.A.2.

"4.04.A.3 Location of Subsurface Utilities.

"a. The location of subsurface utilities is shown on the plans from information furnished by the utility owners.

"b. The CONTRACTOR shall, no later than 2 working days, excluding Saturdays, Sundays, and legal holidays, prior to construction in the area of the

subsurface utility, notify the subsurface utility Owner in writing, by telephone, or in person. The marking or locating shall be coordinated to stay approximately 2 days ahead of the planned construction.

"c. The CONTRACTOR shall alert immediately the occupants of nearby premises as to any emergency that it may create or discover at or near such premises.

"d. The CONTRACTOR shall have full responsibility for coordination of the work with owners of such underground facilities during construction, for the safety and protection thereof as provided in paragraph 6.13 and repairing any damage thereto resulting from the work, the cost of all of which will be considered as having been included in the Contract Price.

"4.04.A.4 Where existing utilities and structures are indicated as being in the line of the proposed improvement, the CONTRACTOR shall expose them sufficiently in advance of the construction operations to permit adjustments in line or grade, if required, to eliminate interferences.

"4.04.A.5 Existing pipes or conduits crossing a trench, or otherwise exposed, shall be adequately braced and supported to prevent movement during construction.

"4.04.A.6 Broken Utility Services.

"a. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers and utility owners.

"b. Temporary arrangements, as approved by the ENGINEER, may be used until any damaged items can be permanently repaired.

"c. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the CONTRACTOR.

"d. CONTRACTOR must work 24 hours a day until service is restored to a damaged utility.

"4.04.A.7 Existing Utility Relocation.

"a. Where it is necessary to relocate an existing utility or structure, the work shall be done in such manner as is necessary to restore it to a condition equal to that of the original utility or structure.

"b. No such relocation shall be done until approval is received from the authority responsible for the utility or structure being changed."

SC-4.06 Hazardous Environmental Conditions at Site.

Delete paragraph 4.06.A. in it entirety and substitute the following paragraph therefore:

A. The following reports and drawings related to Hazardous Environmental Conditions identified at the Site are known to Owner: None.

Amend paragraph 4.06.B by adding the words "that is created by, or" immediately after the words "a Hazardous Environmental Condition" in the fourth line.

Amend paragraph 4.06.G by deleting all words following the words "Hazardous Environmental Condition" in the seventh line and substituting therefore the following words: "was created by Owner or by anyone for whom Owner is responsible, other than Contractor and all persons, subcontractors and entities for which Contractor is responsible."

SC-5. BONDS AND INSURANCE.

SC-5.02. Licensed Sureties and Insurers. Add the following new sentence at the end of paragraph 5.02.A:

The insurance company shall be rated "A" by AM BEST.

SC-5.03. Certificates of Insurance. Add the following new sentence at the end of paragraph 5.03.A:

Contractor shall deliver to Owner properly completed certificates of insurance prior to the start of any Work at the Site, on the forms included in the Contract Documents.

SC-5.04. Contractor's Insurance.

Add the following new paragraphs immediately after paragraph 5.04.A.6:

7. Claims arising out of pollution and excluded from the Contractor's general liability and comprehensive automobile liability policies. This insurance shall be coordinated with the Contractor's general liability policy and shall provide bodily injury and property damage coverage similar to the Contractor's general liability policy. Coverage shall include contractual liability.

Add the following new paragraphs immediately after paragraph 5.04.B.6:

7. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, and all other liability insurance specified herein to be provided by Contractor, Contractor shall require its insurance carriers to waive all rights of subrogation against Owner, Engineer, and their respective officers, directors, partners, employees, and agents.

Add the following new paragraphs immediately after paragraph 5.04.B:

C. The insurance required by paragraph 5.04 shall include coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. This policy shall include an "all states" endorsement.

D. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts but shall provide coverage in greater amounts where required by Laws and Regulations. This coverage may be primary or a combination of primary and umbrella excess liability.

1. Workers' Compensation, and related coverage under paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

a.	State	Statutory
b.	Applicable Federal (e.g., Longshoreman's)	Statutory
b.	Employer's Liability	$1,000,000 each occurrence

2. Commercial General Liability under paragraphs 5.04.A.3 through 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include a per project aggregate limit endorsement, personal injury liability coverage, contractual liability coverage for blasting, explosion, collapse of buildings, and damage to underground property.

a.	General Aggregate	$1,000,000
b.	Products – Completed Operations Aggregate	$1,000,000
c.	Personal and Advertising Injury	$1,000,000
d.	Each Occurrence (Bodily Injury and Property Damage)	$1,000,000

e. Property Damage liability insurance will provide Explosion, Collapse and Underground coverage's where applicable.

3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project site whether they are owned, nonowned, or hired. The liability limit shall be not less than:

a. Bodily Injury
   Each Person $1,000,000
   Each Accident $1,000,000

b. Property Damage
   Each Accident $1,000,000

c. Combined Single Limit $1,000,000

4. Umbrella Liability Insurance shall protect Contractor, Owner, and Engineer as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the forms of the primary insurance, including the application of the primary limits. The liability limits shall be not less than:

Bodily injury and Property damage	$4,000,000 combined single limit for each occurrence
	$4,000,000 general aggregate

SC-5.05. Owner's Liability Insurance. Delete paragraph 5.05 in its entirety and insert the following new paragraph in its place:

5.05. *Owner's Liability Insurance*. This insurance shall be obtained by Contractor and issued in the name of Owner, and shall protect and defend Owner against claims arising as a result of the operations of Contractor or Contractor's Subcontractors. The liability limits shall be not less than:

a. Bodily Injury
   Each Occurrence $1,000,000
   General Aggregate $1,000,000

b. Property Damage
   Each Occurrence $1,000,000
   General Aggregate $1,000,000

SC-5.06. Property Insurance. Delete paragraph 5.06 in its entirety and insert the following new paragraphs in their place:

5.06. *Property Insurance*

A. Contractor shall purchase and maintain property insurance coverage upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them,

each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, flood, damage caused by frost and freezing, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment accepted by Owner;

4. include expenses incurred in the repair or replacement of any insured property (including, but not limited to, fees and charges of engineers and architects);

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer, with 30 days' written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Contractor shall be responsible for any deductible or self-insured retention.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. If Owner requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, Contractor shall, if possible, include such insurance, and the cost thereof will be charged to Owner by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, Contractor shall in writing advise Owner whether or not Contractor has procured such other special insurance.

SC-6. CONTRACTOR'S RESPONSIBILITIES.

SC-6.02. Labor; Working Hours. Add the following new paragraphs immediately after paragraph 6.02.B:

C. No Work shall be done between 6:00 p.m. and 7:00 a.m. without permission of Owner. However, emergency work may be done without prior permission.

D. Night Work may be undertaken as a regular procedure with the permission of Owner; such permission, however, may be revoked at any time by Owner if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the Work at night.

SC-6.05. Substitutes and "Or-Equals'. Add the following new paragraph after paragraph 6.05.A.2.d:

e. "If a proposed substitute item is accepted, all incidental costs associated with the use of the substitute including, but not limited to, redesign, claims of other Contractors, changes to electrical supply equipment, additional equipment or material required for the installation, etc., shall be at the expense of the Contractor proposing the substitute unless otherwise agreed to by the Owner."

SC-6.06. Concerning Subcontractors, Suppliers, and Others. Delete paragraph 6.06.B in its entirety and insert the following new paragraph in its place:

B. Contractor must identify to Owner the following Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner by the date indicated: (You must provide/insert a list or write in "Not applicable".) _____ _____, Date:_____.
If Contractor has submitted a list thereof in accordance with these Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity without an increase in the Contract Price. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

SC-6.08. Permits. Add the following new paragraph immediately after paragraph 6.08.A:

B. Owner will obtain and pay for the following permits: Road & Highway Encroachment Permits, Kentucky Division of Water, and Stream Crossing Permits.

SC-6.09. Laws and Regulations. Add the following new paragraph immediately after paragraph 6.09.C:

D. Employment requirements shall be as specified herein and in the attachments at the end of the Supplementary Conditions.

SC-6.10. Taxes. Add the following new paragraph immediately after Paragraph 6.10.A of the General Conditions:

B. Portions of this project may be exempt from taxes. It is the Contractor's responsibility to determine any applicable exemptions.

SC-6.19. Contractor's General Warranty and Guarantee. Delete paragraph 6.19.C.7 and substitute the following new paragraph therefore:

7. any correction of defective Work by Owner; or

Add the following new paragraph immediately after paragraph 6.19.C.7:

8. any expiration of a correction period.

SC-7. OTHER WORK. No modifications.

SC-8. OWNER'S RESPONSIBILITIES. No modifications.

SC-9. ENGINEER'S STATUS DURING CONSTRUCTION.

SC-9.02. Visits to Site. Delete paragraph 9.02.A in its entirety and insert the following new paragraph in its place:

A. Engineer may make visits to the Site as Owner deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, at the request and benefit of Owner, may determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will advise Owner of the progress of the Work and will endeavor to guard Owner against defective Work.

SC-10. CHANGES IN THE WORK. No Modifications.

SC-11. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK. No modifications.

SC-12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES.

SC-12.03. Delays Beyond Contractor's Control. Insert the following new paragraph 12.03.F immediately after paragraph 12.03.E:

F. In no event shall Owner or Engineer be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages (including acceleration costs) arising out of or resulting from any delay.

SC-12.04. Delay Damages. Add the following new paragraph after paragraph 12.03.E:

F. Except as set forth in paragraph 3.3 of the Agreement, in no event shall Owner or Engineer be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages (including acceleration costs) arising out of or resulting from any delay.

SC-13. TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK.

SC-13.02. Access to Work. Add the following new paragraph immediately after paragraph 13.02.A:

B. Authorized representatives of the U.S. Environmental Protection Agency and the Kentucky Division of Water shall have access to the Work whenever it is in preparation or progress. Contractor shall provide proper facilities for such access and inspection.

SC-13.07. Correction Period. Add the following new paragraph after paragraph 13.07.E:

F. Nothing in Article 13 concerning the correction period shall establish a period of limitation with respect to any other obligation which Contractor has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Contractor to correct the Work, and has no relationship to the time within which Contractor's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than to specifically correct the Work.

SC-14. PAYMENTS TO CONTRACTOR AND COMPLETION.

SC-14.02. Applications for Payments. Add the following new paragraphs immediately after paragraph 14.02.A.3:

4. Contractor's Applications for Payment shall be accompanied by the documentation specified herein.

5. Payments for stored materials and equipment shall be based only upon the actual cost to Contractor of the materials and equipment and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.

6. During the progress of the Work, each Application for Payment shall be accompanied by Contractor's updated schedule of operations, or progress report, with such shop drawings schedules, procurement schedules, value of material on hand

included in application, and other data specified in Contract Documents or reasonably required by Owner.

Delete paragraphs 14.02.C in its entirety and insert the following new paragraphs in its place:

C. *Payment Becomes Due*

1. Twenty-five days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

SC-14.04. Substantial Completion. Add the following new paragraphs following paragraph 14.04.A:

To be considered substantially complete, the following portions of the Work must be operational and ready for Owner's continuous use as intended: All twelve filters shall be operable for the filtering of settled water at nominally 5 gpm/sf and be capable of being suitably backwashed with both water and air using the existing control system, per the specific requirements noted in the technical specifications.

Portions of the Work not essential to operation, which can be completed without interruption of the Owner's operation, may be completed after the Work is accepted as substantially complete, and may include the following items: Seeding and sodding, infill wall replacement and painting, filter window sill repair, and filter wall tile replacement.

SC-14.07. Final Application for Payment. Add the following new sentence immediately after the last sentence of paragraph 14.07.A.2.b.:

Consent of the surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the surety. The Contractor shall be responsible for providing all of the documents identified in this paragraph.

SC-15. SUSPENSION OF WORK AND TERMINATION.

SC-15.01 Owner may suspend Work. Delete the word "shall" in the fifth line of paragraph 15.01.A and substitute the word "may" therefore.

SC-16. DISPUTE RESOLUTION.

Delete Article 16 in its entirety and insert the following new article in its place:

ARTICLE 16 - DISPUTES.

Arbitration will not be acceptable as a means for settling claims, disputes, and other matters.

SC-17. MISCELLANEOUS.

SC-17.04. Survival of Obligations. Add the following new paragraph immediately after paragraph 17.04.A:

B. Contractor shall obtain from all Suppliers and manufacturers any and all warranties and guarantees of such Suppliers and manufacturers, whether or not specifically required by the Specifications, and shall assign such warranties and guarantees to Owner. With respect thereto, Contractor shall render reasonable assistance to Owner when requested, in order to enable Owner to enforce such warranties and guarantees. The assignment of any warranties or guarantees shall not affect the Correction Period or any other provisions of these Contract Documents.

End of Section

ADDENDA TO CONTRACT

All addenda that are posted for this project shall be filed behind this cover sheet and acknowledged on Section 00 41 00, "Bid Form," and Section 00 52 00, "Agreement."

SPECIFICATIONS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General.** Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General.** Provide all labor, materials, tools, and equipment necessary to construct the project in accordance with the plans and as specified herein.

B. **The project consists of** renovation of 12 gravity water filters and addition of an air scour system. Filter renovation component consists of underdrain and media replacement. Air scour component consists of adding piping and an aeration blower to the system. Building improvements include painting, window sill upgrades, and infill wall renovations.

1.3 QUALITY ASSURANCE

A. **Codes and Standards**. Perform all work in compliance with all federal, state, and local codes.

1.4 SUBMITTALS

A. **Submittal Requirements**. See other Division 1 sections for required administrative submittals and for procedures necessary for transmittal of submittals.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

A. **Warranty Requirements.** Provide as specified in Section 44 43 50.02.

1.8 OWNER FURNISHED ITEMS

A. **General.** The Owner will provide control system coordination.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 SEQUENCE OF CONSTRUCTION

A. **The filter building** is divided into two banks of filters. Bank 1 consists of Filters 1-6 and Bank 2 consists of Filters 7-12. A maximum of one filter from each bank at any one time shall be removed from service.

B. **Each renovated filter** must be successfully water and air tested for backwash operations and tested for filtering operations prior the next filter in that respective bank being renovated.

C. **Pressure testing** for the filter box air piping and the gallery piping can be undertaken separately, with the control valve being the separation point.

D. **Testing of the piping and underdrain air distribution** can be from a source other than the air scour blower, provided the testing equipment has the capacity to match the volumetric air flow requirements of the air scour blower.

E. **The existing surface washwater system** can be removed from service for the duration of the project.

END OF SECTION

SECTION 01 14 00

WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide the labor, materials, tools, and equipment necessary, temporary or permanent, required to construct the project and improvements in accordance with the drawings and specifications, including the work restrictions specified herein.

1.3 QUALITY ASSURANCE

Not used.

1.4 SUBMITTALS

A. **Written Notice**. Submit a written notice to the Engineer/Architect 72 hours in advance of any cut-in that requests consent to proceed, including:

1. Identification of project.

2. Description of affected work and work areas of the facility.

3. Effect on other work and on structural integrity and safety of the project.

4. Description of the proposed work including:

   a. Scope of connection.
   b. Contractor and trades to execute work.
   c. Products proposed to be used.
   d. Extent of refinishing.
   e. Schedule of operations including required downtime for any of the Owner's facilities, starting time, duration, and completion.

1.5 JOB CONDITIONS

A. **General Requirements**. It is imperative that existing facilities remain functional during the construction unless noted otherwise in the Contract Documents.

B. **Coordination**

1. Coordinate the work of all subcontractors, crafts, and trades engaged in the work.

2. The General Contractor shall coordinate the work of all the other Prime Contractors and subcontractors on-site. Two other project may be concurrently constructed on the FTTP site during the allotted duration of the filter renovations project. Those additional projects include the new advanced treatment facility and existing sedimentation basin covering installation.

C. **Site Accessibility**

1. Keep driveways and entrances clear and available to the Owner at all times.
2. Do not use these areas for parking or storage.
3. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

D. **Noise, Dust, and Odor Control**

1. Conduct all construction activities to minimize all unnecessary noise, dust, and odors.
2. Do not use oil, or other materials which may cause tracking, to control dust.

E. **Specific Requirements**

1. Meet with the Engineer/Architect and Owner to determine which systems or facilities must be maintained in use or operation and to determine the acceptable timing of shutdowns.
2. The Owner has the authority to stop or prohibit work which would interfere with or jeopardize the continuous operation of the facility.

1.6 **DELIVERY, STORAGE, AND HANDLING**

Not used.

1.7 **SPECIAL WARRANTY**

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 **EXAMINATION**

A. **Site Verification**

1. Confirm all requirements, conditions, dimensions, and time intervals prior to beginning actual construction in any given area.
2. Confirm that the conditions have not changed since preparation, submission, and approval of the shut down plan.

3. Notify the Owner and Engineer/Architect prior to commencing the connection if the proposed work is incompatible or incomplete.

3.2 REQUIREMENTS

A. Sequences and Interferences

1. Since alterations, additions, and tie-ins are included in this work that potentially could interfere with the existing facilities' function, take any and all steps necessary to avoid this interference. Complete as much work as possible before making tie-ins or switchovers.

2. Install and start-up new components prior to removal of the existing components from service.

3. Install and maintain temporary parallel components until service is restored.

4. When interferences are unavoidable by the above methods, take the following additional steps:

   a. Schedule the work so as to minimize the time interval and/or frequency that any critical facility or component is out of service.

   b. Coordinate all labor, materials, and equipment to be on the site at the start of a shutdown.

   c. Work continuously (24 hours per day, 7 days per week) until service is restored.

   d. Schedule the work to correspond with minimum demands on any system or facilities. This may include weekend or evening work.

   e. Notify the Owner in writing 72 hours in advance of a shutdown so that the Owner can make the necessary preparations.

      1) Signed Notice. Each written notice must be signed by the Owner and Engineer/Architect prior to the start of work.
      2) Notify all utility companies whose equipment and facilities are directly involved with the proposed work prior to the start of work. Coordinate all work with the utility companies.
      3) Notify the Owner when connection has been completed and normal operations can resume.

   f. Shutdown Time.

      1) Allow for a minimum of 7-day window (float time) per shutdown when assembling connection schedule. Owner will use this window only to maintain or ensure

continuous plant operation during critical operating conditions.

2) If the scope of the connection requires the shutdown of all or part of the facility, work continuously around the clock to complete the connection and return the facility to normal operations.

B. **Construction Compliance**

1. The Engineer/Architect will judge the practicality of compliance with this specification in any given situation.
2. The Engineer/Architect will approve the shutdown plan in the written notice only. Any deviations from the proposed plan will require further review and approval.
3. Furnish all labor, equipment, and materials, temporary or permanent, required for compliance at no additional cost to the Owner.

C. **Coordination**. Coordinate and schedule the activities of subcontractors and utility work forces with the Owner. The following list of interconnections and sequencing requiring special coordination is provided for the Contractor's convenience. Do not consider this list complete; any omissions of interconnections or sequencing from this list shall not relieve the Contractor of his responsibility.

1. Each Contractor and subcontractor shall coordinate installation of materials and equipment so as to not interfere with the work of other Contractors or subcontractors. Where interferences are anticipated, they shall be brought to the attention of the General Contractor for resolution, which shall be subject to approval by the Engineer/Architect.
2. Each Contractor and subcontractor shall locate and install embedded materials before concrete is poured and shall do so as directed by the General Contractor and shown in an approved shop drawing.
3. No extra compensation will be allowed to cover the cost of removing piping, conduit, ducts, etc., or equipment due to a lack of coordination or communication between Contractors and subcontractors.
4. Each Contractor or subcontractor shall be responsible for coordinating and scheduling the activities of their subcontractors and utility work forces with the General Contractor.

D. **Existing Units**. The Owner's personnel shall operate all existing valves, gates, and equipment required for the work to be completed.

E. **Asbestos Removal**. If, during progress of the work, suspected asbestos-containing products are identified, Contractor shall stop work in the affected area and engage an asbestos removal subcontractor to verify the materials and , if necessary, encapsulate, enclose, or remove and dispose of all asbestos in accordance with current regulations of the Environmental Protection Agency and the U.S. Department of Labor Occupational Safety and Health Administration, the state asbestos regulating agency, and any local government agency. Payment for such work shall be made by change order.

3.3 DEMONSTRATION

A. **Records and Responsibility**. Maintain all approved schedules, sequences of construction, copies of communications of all coordination, and other information as required at the construction site. Designate a single point of coordination in one responsible individual.

END OF SECTION

SECTION 01 31 19.01

PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General**. Provide the labor and materials necessary to attend and participate in project meetings in accordance with the plans and as specified herein.

B. **Conferences and Meetings**. This section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Preconstruction conference.
2. Progress meetings.

1.3 QUALITY ASSURANCE

Not used.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION CONFERENCE

A. **Schedule**. The Engineer/Architect will schedule and conduct a preconstruction conference and organizational meeting at the project site or other convenient location after execution of the agreement and prior to commencement of construction activities. No work shall commence prior to the meeting.

B. **Attendees**. The Owner, Engineer/Architect and their consultants, the Prime Contractors and their superintendents, major subcontractors, manufacturers, suppliers, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. **Agenda**. Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of shop drawings, product data, and samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, work, and storage areas.
11. Equipment deliveries and priorities.
12. Site safety.
13. Security.
14. Housekeeping.
15. Working hours.
10. Others as appropriate.

D. **Minutes**. Within 7 days of the preconstruction conference, the Engineer/Architect shall distribute minutes to all attendees.

3.2 PROGRESS MEETINGS

A. **Schedule**. The Engineer/Architect shall conduct progress meetings at the project site on a monthly basis at regularly scheduled intervals. Coordinate dates of meetings with preparation of the monthly payment requests.

B. **Attendees**. In addition to representatives of the Owner, Engineer/Architect, and all Prime Contractors, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the project and authorized to conclude matters relating to progress.

C. **Agenda**. Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.

1. Contractor's Construction Schedule.

   a. Review progress since the last meeting.
   b. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead of or behind schedule.
   c. Determine how construction behind schedule will be expedited.
   d. Secure commitments from parties involved to do so.
   e. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

2. Review the present and future needs of each entity present, including such items as:

   a. Interface requirements.
   b. Completion times.
   c. Preferred sequences.
   d. Delivery schedule.
   e. Off-site fabrication problems.
   f. Access issues.
   g. Site utilization.
   h. Temporary facilities and services.
   i. Hours of work.
   j. Hazards and risks.
   k. Housekeeping.
   l. Quality and work standards.
   m. Change Orders.
   n. Documentation of information for payment requests.

D. **Schedule Updating**. The General Construction Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized and submit the revised schedule within 3 days of each progress meeting for distribution with the minutes.

E. **Minutes**. Within 7 days of the progress meeting, the Engineer/Architect shall distribute minutes to all attendees.

END OF SECTION

SECTION 01 32 16

SCHEDULES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Perform the work necessary to provide the Critical Path Method (CPM) schedules for all work in accordance with the drawings and as specified herein.

B. **Requirements**. This section specifies administrative and procedural requirements for the CPM of scheduling and reporting progress of the work.

1. Refer to General Conditions and the Agreement for definitions and specific dates of Contract Time.
2. In case of multiple Contractors, the General Contractor shall prepare the CPM schedules. All other Contractors must submit and coordinate activities.

1.3 QUALITY ASSURANCE

A. **Consultant**. Retain a Consultant to provide CPM scheduling services, including planning, evaluating, and reporting.

1. The Consultant shall be a recognized specialist, expert in the CPM of scheduling and reporting, and acceptable to the Engineer/Architect.
2. The Consultant shall have computer facilities available with sufficient capacity to process detailed network diagrams within 48 hours of a request.

B. **In-House Option**. The requirement to retain a Consultant may be waived if the Contractor can demonstrate that:

1. The Contractor has the computer equipment required to produce CPM network diagrams.
2. The Contractor employs skilled personnel who are experienced in CPM scheduling and reporting techniques.

C. **Program**. Use a computer software program for network analysis that has been developed specifically to manage CPM construction schedules and is acceptable.

D. **Standards**. Comply with procedures contained in "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry," published by The Associated General Contractors of America.

1.4 **SUBMITTALS**

Not used.

1.5 **JOB CONDITIONS**

Not used.

1.6 **DELIVERY, STORAGE, AND HANDLING**

Not used.

1.7 **SPECIAL WARRANTY**

Not used.

1.8 **DEFINITIONS**

A. **Critical Path Method**. CPM is a construction scheduling technique using network analysis diagrams to plan and organize construction activities in an orderly manner along the critical path.

B. **Network**. A network diagram is a graphic representation showing the relationship of activities and events in the correct sequences required to complete the project within the Contract Time.

C. **Activity**. An activity is any single identifiable step in the project. It depends upon and cannot begin until completion of all preceding activities.

1. Critical activities are activities with no (zero) float time and are, therefore, operations that determine the critical path and control project completion.

D. **Event**. An event is the starting or ending point of an activity and occurs only when all preceding activities have been completed.

E. **Float Time**. The amount of time available for a given activity in excess of its estimated duration. It represents the amount of leeway available in scheduling an activity. All float time belongs to the Owner.

1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
2. Total float is the amount of time an activity can be delayed without adversely affecting overall time for project completion.

PART 2 - PRODUCTS

2.1 **CPM SCHEDULE**

A. **General**. Prepare a CPM schedule in accordance with Part 3 of this section. The CPM schedule shall include a complete listing of all abbreviations and symbols utilized within the CPM schedule.

PART 3 - EXECUTION

3.1 CPM SCHEDULE

A. **General**. Prepare a CPM Construction Schedule using the network analysis diagram system known as the Critical Path Method (CPM) following procedures outlined in "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry," as published by The Associated General Contractors of America.

1. Follow the steps necessary to complete development of the network diagram in sufficient time so that the CPM schedule can be submitted and accepted for use before the first progress payment.
2. Conduct educational workshops to train and inform key project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating the CPM schedule and for reporting progress; coordinate procedures with progress meeting dates. Use "one working day" as the unit of time.

B. **CPM Schedule Preparation**. Prepare a listing of all activities involved in the project; include every activity having a bearing on the time required to complete the work. Provide the best data available for generation of the network diagram and CPM schedule.

1. Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities.

2. Indicate estimated times for the following activities to be performed:

   a. Preparation and processing of submittals.
   b. Temporary construction services and facilities.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Installation.
   g. Start-ups.
   h. Operational demonstration.
   i. Training.
   j. Progress meetings.
   k. Preconstruction conference.

C. **Processing**. Enter prepared data on the processing system. Process data to produce output data or a computer-drawn time-scaled network based on calendar days. Draw network by hand if the equipment is unable to do so. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the best possible CPM construction schedule within the limitations of Contract Time.

D. **Format**. Display the full network on a single sheet of stable transparency, or other reproducible media, of sufficient width to show data clearly for the entire construction period.

1. Mark the critical path. Locate the critical path near the center of the network; locate paths with the most float near the edges.
2. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. **Initial Issue**. Prepare the initial issue of the CPM Schedule network diagram from a listing of straight "early-start total-float" sort. Identify critical activities. Prepare tabulated reports to show the following:

1. Contractor or subcontractor and work or activity.
2. Principal events of that activity.
3. Early and late start dates.
4. Early and late finish dates.
5. Activity duration in working days.
6. Total float or slack.

F. **Submittal and Distribution**. Submit the initial issue of the network for acceptance. When authorized, distribute copies to the Engineer/Architect (three copies), Owner, principal subcontractors and suppliers or fabricators, and others identified by the Contractor with a need-to-know-schedule responsibility.

1. Post copies in the project meeting rooms and temporary field office.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.
3. Submit copies of each computer-produced report (listing).

G. **Schedule Updating**. Revise the schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each project meeting.

END OF SECTION

SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General**. Provide the labor, tools, equipment, and materials necessary to furnish the construction photographs in accordance with the plans and as specified herein.

B. **This section specifies administrative** and procedural requirements for construction photographs.

1.3 QUALITY ASSURANCE

A. **Codes and Standards**. Perform all work in compliance with applicable requirements of governing agencies having jurisdiction and in accordance with these plans and as specified herein.

B. **Qualified Photographer**. Engage a commercial photographer to take photographs during construction. Photographer shall be a firm or an individual of established reputation who has been regularly engaged as a professional photographer for not less than 3 years.

C. **Associated Services.** Cooperate with the photographer's work. Provide reasonable auxiliary services as requested, including access and use of temporary facilities including temporary lighting.

1.4 SUBMITTALS

A. **General**

1. Submit all submittals in accordance with the Division 1 Submittal Requirements and the requirements within this specification section.

2. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction videos and photographs of the project. Videos shall be in both VHS format and recorded on a compact disc, in DVD format.

3. Photo and video files shall become the property of the Owner, and none of the videos or photographs produced as part of this project shall be published or used without the written permission of the Owner.

B. **Pre- and Post-Construction Videos and Photographs**

1. Prior to beginning any work, the Contractor shall take project videos and photographs of the work area to record existing conditions.

2. Following completion of the work, the Contractor shall take project videos and photographs of the completed equipment and modifications, in the same way as the pre-construction areas were documented.

3. All conditions which might later be subject to disagreement shall be shown in sufficient photographic detail to provide a basis for decisions.

4. The pre-construction videos and photographs shall be submitted to the Engineer within 25 calendar days aft the date of receipt by the Contractor of the Notice to Proceed. Post-construction videos and photographs shall be provided prior to final acceptance of the project.

C. **Progress Photographs**

1. Photo files shall be provided on compact discs.

2. Photographs shall include the date and time marking of the recording. All photographs shall be labeled on a tab connected to the bottom of the photo to indicate date and description of work shown.

3. A minimum of 10 photographs shall be submitted with each request for payment. The view shall be as agreed to with the Engineer. Prints of each photograph are not required.

D. **Submittals**

1. Construction photographs on compact discs shall be submitted with each payment request.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide all labor and materials necessary to furnish the following submittals as required by each individual section of the specifications.

1. Shop drawings.
2. Product data.
3. Samples/mock-ups.
4. Operation and Maintenance (O&M) manuals.
5. Personnel qualifications.
6. Training documents.
7. Source quality control documents.
8. Material field test reports.
9. Start-up documents.
10. Operational demonstration documents.
11. Product/material certifications.
12. Special warranties.
13. Project record documents.
14. Others (as specified in the individual technical specifications).

1.3 QUALITY ASSURANCE

Not used.

1.4 SUBMITTALS

A. **General**

1. Submit all submittals in accordance with the requirements within this specification section.

B. **Submittal Package No. 1 – Submittal Schedule**

1. Submit a submittal schedule according to paragraph 2.05 of Section 00 70 00, "General Conditions."

a. This schedule shall include all submittals (including all Prime Contractors' submittals) that are required to be used on the project, and the date of submittal to the Engineer/Architect.

b. Include in schedule a milestone for notification of the Engineer/Architect prior to field-verifying operation and maintenance manuals.

c. Submittals requiring multiple submissions shall include multiple listings on the documents.

d. The Engineer/Architect will review the list and make any necessary comments.

e. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

f. Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review submittals concurrently.

g. Multiple Prime Contracts. Allow time in schedule for all submittals to go through the Prime General Contractor for coordination purposes before they are forwarded to the Engineer/Architect.

h. Processing. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals, depending upon the complexity of the submittal.

1) Allow 4 weeks for processing each submittal.
2) No extension of the Contract Time will be authorized because of failure to transmit submittals to the Engineer/Architect sufficiently in advance of the work to permit processing.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Store and protect large samples and mock-ups** until the Project is completed, then properly dispose of off-site.

B. **Maintain and make available** to the Engineer/Architect, at the job site, a complete file of all approved submittals as part of the project record documents.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 SUBMITTAL TRANSMITTAL

A. **Transmit each submittal** from the Contractor to Engineer/Architect using a transmittal form. Include the following on the transmittal form.

1. Relevant information and requests for data.
2. Deviations from Contract Document requirements, including minor variations and limitations.
3. The specification section number.
4. Other pertinent information to identify the items being submitted.

2.2 GENERAL REQUIREMENTS FOR SUBMITTALS

A. **Originals.**

1. The Contractor, the subcontractors, or suppliers shall generate submittal information.
2. No reproductions of partial (or complete) versions of the plans, sections, details, schematics, specification pages, etc., from the Contract Documents are acceptable.

B. **Complete Submittals.** Clearly describe the equipment to be furnished with complete and detailed submittal information.

C. **Identification.** Properly identify all submittal-related documents and arrange in a logical order to best present the information. Provide an index that includes the following on every submittal.

1. Manufacturer's name and address.
2. Submittal date and revision number, if applicable.
3. Contract identification and specification section.
4. Drawing scale and orientation.
5. Submittal page number or sequence of pages.
6. Drawing number.

D. **Verification.**

1. Where existing conditions or structures exist, field-verify dimensions, elevations, clearances, etc.
2. The submittal shall not be accepted for review until such verified data is clearly indicated.

E. **Legends.**

1. All submittal diagrams, drawings, schematics, etc., shall include complete keys, legends or similar explanation as to the graphics, and symbols and abbreviations used.
2. In general, all graphics, symbols, abbreviations, and equipment nomenclature used for a submittal shall duplicate those used on the Contract Drawings.

F. **Approvals**. Provide the following on each submittal.

1. A space approximately 4" x 5" on to record the Contractor's review and approval markings and the action taken. These shall include the Contractor's:

   a. Approval stamp.
   b. Signature.
   c. Date of approval.
   d. Deviations from the Contract Documents.

2. An equal area beside the Contractor's review and approval markings for the Engineer/Architect's review stamp.

G. **One Section per Submittal**. Each submittal shall pertain to only one specification section.

H. **All submittal information shall be**:

1. Neatly arranged.
2. Legible.
3. Not distorted or faded.
4. English.
5. In United States standard units.
6. Typed.

I. **All letters, certifications, and similar documents** shall be submitted in their entirety. Single pages of multiple-page letters, or letters with deleted passages will not be acceptable for submittal purposes.

J. **"Generic" letters, test reports**, material certifications, or similar documents which do not specifically address the requirements of the Contract Documents for the actual materials being furnished will not be acceptable.

K. **Mark all submittals** to clearly indicate the full extent of the equipment to be furnished.

1. Indicate all options to be provided, materials of construction, dimensions, and other information pertinent to the submittal.
2. Options, materials, and dimensions which do not pertain to the materials or equipment to be furnished shall be neatly marked out so as to avoid confusion and doubt during review, delivery, and installation.

L. **Resubmittals must clearly identify** all changes and revisions.

1. The drawing shall be marked "revised" with the revision date indicated.
2. Each resubmittal shall reference the previous submittal by the Engineer/Architect's log number.

M. **"By Others."**

1. All submittals are reviewed as if prepared by the Prime Contractor.

2. The term "By Others" is appropriate to indicate supply by the Owner or another Prime Contractor.
3. Where a subcontractor or supplier uses the term "By Others" to indicate work by the Prime Contractor or another subcontractor or supplier, the Prime Contractor shall change "By Others" to indicate the actual source.

N. **Deviations from Contract**. Highlight, encircle, or otherwise indicate deviations from the Contract Documents in all submittals.

2.3 SPECIFIC SUBMITTAL-TYPE REQUIREMENTS

A. **Shop Drawings**. The following paragraphs detail the general requirements for shop drawings and specific requirements for specific types of shop drawings.

1. General Requirements.

a. A shop drawing is a detailed representation of the work to be performed to demonstrate compliance with the Contract Drawings including:

1) Material and equipment layout.
2) Fabrication drawings.
3) System and electrical schematic diagrams.
4) Equipment and material schedules.
5) Installation details.

b. Submit newly prepared information, drawn to accurate scale.

c. Standard information prepared without specific reference to the project is not considered shop drawings.

2. Equipment/Material Layout Drawings.

a. Include:

1) Plot plans.
2) Plant site maps.
3) Equipment location plans.
4) Equipment and material layout plans and sectional views.
5) Connection detail drawings.
6) Similar drawings showing the incorporation of materials and equipment into the work.
7) The physical layout to scale, including elevations, plant grid coordinates, dimensions to new/existing structures, and other items of the work.
8) Dimensions.
9) Labeling.
10) Notes.
11) Legends.
12) Bills of materials.
13) All other information required to graphically describe the proposed work.

3. System Schematics and Diagrams.

   a. These include schematic representations of systems and equipment in a manner which shows the relative relationship of the components within the system and interconnections or interfaces with other systems or equipment.

   b. These systems shall be shown on the most appropriate type and format of schematic diagram.

   c. Diagrams shall identify all equipment and other components.

   d. Indications shall be provided of system features such as flow directions, flow ranges, component sizes, capacities, settings, interlocks, component identification, and component or subsystem function.

   e. Various types of systems for which schematic diagrams shall be required include:

      1) Process Piping Systems.
      2) Plumbing and Utility Piping Systems.
      3) Heating and Air Conditioning Systems.
      4) Ventilating Systems.
      5) Pneumatic Systems.
      6) Hydraulic Systems.
      7) Conveying Systems.
      8) Process and Chemical Feed Equipment Systems.
      9) Electrical Distribution Systems.
      10) Control Systems.
      11) Alarm Systems.
      12) Communication Systems.

   f. In some instances it may be appropriate to combine multiple types of system schematics onto a single drawing. In general, this practice would be appropriate for simple, self-contained systems and the adjacent subsystems and when required to clearly show system functionality.

B. **Product Data**

1. General. Product data is submittal information that fully describes the item to be incorporated into the work. Product data shall include when applicable:

   a. Manufacturer name.
   b. Catalog cut-sheets.
   c. General descriptive bulletins/brochures/specifications.
   d. Materials of construction data and parts list.
   e. Finish/treatment data.
   f. Equipment/material weight/loading data.
   g. Power/utility requirements.

h. Engineering design data, calculations, and system analyses.
i. Digital system documentation.
j. Any deviations from the contract documents.
k. Material Certifications. These include signed certificates or declarations by the Contractor, supplier, manufacturer, testing laboratory, or recognized certification agency which document that materials and product composition or construction comply with specified requirements and stated reference standards.
l. Manufacturer's printed recommendations.
m. Compliance with recognized trade association and testing agency standards.
n. Application of testing agency labels and seals.
o. Notation of dimensions verified by field measurement.
p. Notation of coordination requirements.
q. Specific response to detailed specification requirements.
r. Maximum operating pressure and temperature ratings.
s. Other information specifically called for under the sections of Divisions 1 through 44 shall be included in this category.

C. **Samples or Mock-Ups**

1. Samples. Samples are portions of or complete units of the precise article proposed to be furnished.
2. Color and Pattern Charts. When the precise color and pattern are not specifically prescribed in the Contract Documents, or when the Contract Documents require that a product be furnished in a color or pattern directed by the Owner or Owner's Representative, submit accurate color charts and pattern charts of the available ranges for review and selection.
3. Mock-Ups. Mock-ups are to be built with full-size products to match the scale of the proposed construction to demonstrate compliance with specified requirements and construction standards.

D. **O&M Manuals**

1. General.

   a. Bind each copy in an appropriately sized three-ring notebook a cover designating the name of equipment, maintenance, and specification section number.
   b. Bind operation and maintenance instructions for each specification section in a separate notebook.

2. Required Information. Include the following information to provide a description of the incorporation of the equipment into the work and with functional data to evaluate equipment operation.

   a. Operation Sequence Descriptions. These shall:

      1) Include complete, detailed written descriptions of the operating sequence of all control systems and operations in all modes.
      2) Be specifically prepared for this work.

3) Be fully referenced to control diagrams and system components.
4) Include start-up and shut-down procedures and operations under manual, automatic, and emergency (alarm) conditions and any alternate operating modes.
5) Include operation of switches, lights, timers, relays, contacts, valves, motors, and equipment components.
6) Describe interlock functions including system safety functions.

b. Software/Programming Documentation.

1) Reference this documentation to the Operating Sequence Descriptions and include flow charts, program source codes listings, and documentation ladder diagrams with detailed descriptions for each rung of the software provided.
2) Provide information to instruct and to familiarize the operator with the system programming to enable a step-by-step evaluation of the program.
3) Provide notations, remarks, and labeling on the program source code listing to indicate the program operation and function.
4) Provide any additional narrative description of the program operation to fully describe the system parameters and functionality in a clear and logical manner.

c. Manufacturer's Instructions. Include:

1) Installation, routine preventive maintenance, troubleshooting, and lubrication instructions.
2) Procedures for moving, supporting, and anchoring of equipment, including tolerances for settings and adjustment.
3) Storage requirements to protect products prior to installation and during periods of prolonged shutdown.
4) Storage requirements of extra materials.

d. Parts List. Include assembly, exploded-view illustrations, or sectional drawings with all parts identified. Also include descriptions, quantity (per assembly) required, and original equipment manufacturer's part numbers.

e. Supplier Data. Provide addresses, telephone numbers, and names of contact persons for equipment manufacturer and manufacturer's representative. Include both regional (local) and home offices.

f. Warranties and Guarantees. Include copies of the approved draft warranties in the initial operation and maintenance manual submittal. Following substantial completion, provide copies of

the executed final warranties for insertion into the final operation and maintenance manuals.

g. Approved Submittals. Provide a complete list (including submittal numbers) of all approved submittals pertaining to the operation and maintenance instructions.

h. Copies of all materials shipped with the equipment.

i. Copies of all approved submittals including control wiring diagrams.

E. **Personnel Qualifications**

1. General. These qualification statements and information pertain to personnel and entities employed in the prosecution of the work.

2. Specific Information. Provide the following information regarding the proposed personnel or entity.

a. Education/training.
b. Company employment history.
c. Professional experience.
d. References.
e. Certifications or licenses.

Stated qualifications shall be pertinent to the specific task for which qualifications are requested.

F. **Training Documents**

1. Instructors' Qualifications. See paragraph 2.3 E.

2. Proposed schedule for the training sessions.

3. Lesson Plan. Lesson plans shall:

a. Be O&M manual-based.
b. Cover all components of each system regardless of source of supply or manufacturer.
c. Detail the instructional objective statement on the goal(s) intended to be achieved by the end of the training session.
d. Indicate the category of training (operation, maintenance, and electrical instrumentation); describe the session including length and type (classroom or field) and the instructor.

4. One copy of all instructional material to be used during training.

5. A sign-in sheet containing the signature of each attendee, training topic, and date after the training is completed.

G. **Source Quality Control Documents**

1. Inspection.

   a. Inspection data includes inspection procedures and results of factory inspections of products, equipment, or systems.
   b. Within this type of submittal information are factory witness test procedures, schedules and reports, and similar data.

2. Testing.

   a. Test data is the information leading to or resulting from tests performed on materials, equipment, or systems at the manufacturer's facilities or in testing laboratories.
   b. This also includes data on testing equipment.
   c. Examples of test data include all information, test arrangement, drawings, illustrations, diagrams, curve plots, graphs, and other data which substantiates or establishes a material or product characteristic, quality, or other trait as a result of test required by the Contract Documents.

H. **Material Field Test Reports**

1. Report Data. Written reports of each inspection, test, or similar service shall include, but not be limited to:

   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the work and test method.
   g. Identification of product and specification section.
   h. Complete inspection or test data.
   i. Test results and interpretations of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on testing.

2. Example reports covered by this paragraph include compaction tests and concrete, leakage, and disinfection tests.

I. **Start-Up Documents**

1. Start-Up Request.

   a. Start-up requests shall include the following:

      1) Qualifications of Manufacturer's Representative. See paragraph 2.3 E.

2) Field Test Procedures.

a) List of materials and equipment necessary for testing.
b) Calibration. Certification of calibration of all test instruments used.
c) Test Form Report. Copy of testing results report form.

3) Proposed start-up schedule including all field testing.

2. Manufacturer's Representative's Reports.

a. Each manufacturer's representative shall prepare a report on every site visit for each system or item of equipment inspected, adjusted, started up, or worked on.

b. If a manufacturer's representative visits the site for equipment specified in several specification sections, a separate report shall be filed for each specification section.

c. The report shall state:

1) The purpose of the visit.

2) The representative's observations and conclusions.

3) Recommendations for further visits or action.

4) A tabulation or log of the settings of all adjustable components.

a) Initial settings shall be recorded and submitted on the first visit.
b) During subsequent visits, the manufacturer's representative shall add the current or adjusted setting to the tabulation or log.

5) Include manufacturer's certification that equipment being tested has been inspected with regard to conformance to the plans, specifications, and shop drawings and that it has been tested and is ready for operational demonstration.

6) All test reports for all required field testing.

J. **Operational Demonstration Documents**

1. Operational Demonstration Request.

   a. Include the following:

      1) Name, address, and telephone number of all representatives during the operational demonstration.
      2) Sample operational demonstration log for Engineer/Architect review.

2. Operational Demonstration Log.

   a. An operational demonstration log is a continuous chronological record of operational status of the system and equipment.
   b. Include all changes in status or system parameters, adjustments, and results of tests.
   c. Make entries, noting the date and time, at the occurrence of each event.
   d. Use acceptable operational demonstration log forms.

K. **Special Warranties**

1. General. There are two general types of warranties covered by this specification.

   a. Manufacturer's Express Warranties.

      1) These are formal statements of certifications by manufacturers which warrant to the Owner that products and equipment are free from defects in material and workmanship.
      2) These are standard warranties issued with products and equipment which supplement the Contractor's warranty and may also extend coverage past the expiration of the Contractor's warranty.
      3) Include with the manufacturer's warranty data shall be a notification of the availability of an extension to the standard warranty including terms.

   b. Special Express Warranties.

      1) The form, format, and conditions of special warranties are described in the various specification sections of the Contract Documents.
      2) These are formal warranties above and beyond the Contractor's warranty and manufacturer's standard warranties.
      3) These warranties may be based on performance, power consumption, maintenance projects, or other operating parameters.
      4) Extended warranties, service contracts, and performance bonds are also included under this category.

2. Term or Period.

   a. General. Unless otherwise established by individual sections in Divisions 2 through 44, all Contractor express warranties shall extend for 1 calendar year from the date of substantial completion of the project or acceptance date of the product or portion of work thereof, whichever is the later date.

3. Content of Warranty.

   a. General. The warranty shall contain, as applicable:

      1) Effective starting date of the warranty period.
      2) Statement of the terms and conditions of the warranty, if any.

L. **Project Record Documents**

1. General. Project record documents are to be in accordance with paragraph 6.12 of Section 00 70 00, "General Conditions."

2. Record Contract Drawings. Legibly mark contract drawings to record actual construction including:

   a. Depths of various elements of foundation in relation to data.
   b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
   c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
   d. Field changes of dimension and detail.
   e. Changes made by change order or field order.

M. **Extra Materials / Spare Parts**

1. General. Coat or package extra materials to prevent corrosion or deterioration during long-term indoor storage.

2. Clearly label all packaging with:

   a. Part name.
   b. Part number.
   c. Associated equipment name and number.
   d. Manufacturer's name and address.
   e. The required storage environment for the materials.

N. **Other**. These include special tools/repair parts list, photographs, videos, certificates, construction schedules, drawings, reports, meeting minutes, data, and information required by the Contract Documents which do not logically fall into the submittal types defined above.

PART 3 - EXECUTION

3.1 SUBMITTAL PREPARATION AND TRANSMITTAL

A. **Coordination**

1. Coordinate preparation and processing of submittals with performance of construction activities.
2. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay and in accordance with the submittal schedule.
3. The General Contractor is responsible for resolving any disputes between Prime Contractors over submittals.

B. **Verification**

1. Verify the correctness and completeness of all submittals prior to forwarding same for review.
2. All submittals shall comply with the Contract Documents.

C. **Package each submittal** appropriately for transmittal and handling including a transmittal form.

D. **The Prime General Contractor shall submit** the minimum number of submittals as listed in paragraph 3.3 of this specification.

E. **Submittals received from sources** other than the Prime General Contractor will be returned without action.

F. **Other Prime Contractors shall submit** all submittals through the Prime General Contractor.

3.2 ENGINEER/ARCHITECT'S REVIEW AND ACTION

A. **General**

1. Except for submittals for record, information, or similar purposes where action and return is not required or requested, the Engineer/Architect will review each submittal, mark to indicate action taken, and return promptly.
2. Cost to review any submittal more than twice will be deducted from Contractor's monthly estimates and final payments.
3. The Engineer/Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. **Action Stamp**. The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate action taken.

1. Final Unrestricted Release. Where submittals are marked "Approved," that part of the work covered by the submittal may proceed provided it

complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-but-Restricted Release. When submittals are marked "Approved as Noted," that part of the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal. When submittal is marked "Not Approved" and/or "Revise and Resubmit," do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked "Not Approved" and/or "Revise and Resubmit" to be used at the project site or elsewhere where work is in progress.

3.3 MINIMUM NUMBER OF SUBMITTALS AND DISTRIBUTION

A. **After a submittal has been approved**, the Engineer/Architect will make the following distribution:

	Submittal	Minimum No. of Submittals	Distribution Owner	Engineer/ Contractor	Architect
1.	Shop Drawings	7	1	4	2
2.	Product Data	7	1	4	2
3.	Samples/Mock-Ups	2	1	0	1
4.	O&M Manuals	7	4	1	2
5.	Personnel Qualifications	4	1	1	2
6.	Training Documents	4	1	1	2
7.	Source Quality Control Documents	4	1	1	2
8.	Material Field Test Reports	4	1	1	2
9.	Start-Up Documents	4	1	1	2
10.	Operational Demonstration Documents	4	1	1	2
11.	Special Warranties	4	1	1	2
12.	Project Record Documents	1	1	0	0
13.	Extra Materials	1	1	0	0
14.	Others	4	1	1	2

B. **Multiprime Contract Distribution.**

1. The Engineer/Architect will forward all reviewed submittals to the Prime General Contractor only.
2. The Prime General Contractor is then responsible to send each submittal to every Prime Contractor that it affects for their use.

3.4 SPECIFIC SUBMITTAL-TYPE EXECUTION REQUIREMENTS

A. O&M Manuals

1. Submittal Procedure. Submit one initial copy of the O&M manual for review. After approval of the initial copy, submit the remainder of the revised manuals.

2. Verification. Verify the accuracy of the initial O&M manual by visual and physical inspection of the installed equipment during start-up.

    a. Perform field verification in the presence of the Owner or Owner's Representative.
    b. Physically trace and document as required all wiring and piping.
    c. Visually inspect equipment and components and compare configurations and nameplate information to O&M manual.
    d. Make any changes, additions, or deletions to the O&M manual identified during field verification.
    e. In the event changes are made to the equipment following field verification, submit a final supplement of the revisions of the O&M manuals before approval.

B. Sample Panels

1. Construct any required sample panels on-site.
2. Construct sample panels only after the individual samples and components used in the sample panel have been approved.
3. If a sample panel does not conform to the Contract requirements, construct additional ones until conformance is achieved.

C. Samples for Tests

1. Furnish samples of material as may be required for examination and test. Take all samples of materials for tests according to standard methods or as provided in the Contract Documents.

END OF SECTION

SECTION 01 50 00

TEMPORARY CONSTRUCTION SERVICES AND FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General.** Drawings and general provisions of each Prime Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General.** Provide the labor, tools, equipment, and material necessary to furnish, install, and maintain the temporary construction services and facilities in accordance with these plans and as specified herein. Temporary construction services and facilities include the following.

1. Temporary utilities required include, but are not limited to:

   a. Water service and distribution.
   b. Temporary electric power and light.
   c. Telephone service.
   d. Storm and sanitary sewer.

2. Temporary construction and support facilities required include, but are not limited to:

   a. Hoists and temporary elevator use.
   b. Temporary heat.
   c. Field offices and storage sheds.
   d. Temporary roads and paving.
   e. Sanitary facilities, including drinking water.
   f. Temporary enclosures.
   g. Temporary project identification signs and bulletin boards.
   h. Waste disposal services.
   i. Construction aids and miscellaneous services and facilities.
   j. Dewatering facilities and drains.
   k. Rodent and pest control.

3. Security and protection facilities required include, but are not limited to:

   a. Temporary fire protection.
   b. Barricades, warning signs, lights.
   c. Sidewalk bridge or enclosure fence for the site.
   d. Environmental protection.

1.3 QUALITY ASSURANCE

A. **Regulations**. Comply with industry standards and with applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. **Standards**. Comply with National Fire Protection Association (NFPA) Code 241, "Building Construction and Demolition Operations"; American National Standards Institute (ANSI) A10 Series standards for "Safety Requirements for Construction and Demolition"; and National Electrical Contractors Association (NECA) Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services" prepared jointly by Associate General Contractors of America (AGC) and Adhesive and Sealant Council, Inc. (ASC) for industry recommendations.
2. Electrical Service. Comply with National Electrical Manufacturers Association (NEMA), National Electrical Contractors Association (NECA), and Underwriters' Laboratories, Inc. (UL) standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NEC) (NFPA 70).

C. **Inspections**. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits and keep on file for Owner review.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

A. **Conditions of Use**

1. Keep temporary services and facilities clean and neat in appearance.
2. Operate in a safe and efficient manner.
3. Take necessary fire-prevention measures.
4. Do not overload facilities.
5. Do not allow hazardous, nuisance, or unsanitary conditions to develop or persist on the site.
6. Do not permit facilities to interfere with progress.
7. The installer of each permanent service or facility shall assume responsibility for its operation, maintenance, and protection during its use as a construction service or facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.
8. At the earliest feasible time, when acceptable to Owner, change over from use of the temporary service to use of the permanent service.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

1.8 DIVISION OF RESPONSIBILITIES

A. **General**

1. Each Prime Contractor is assigned specific responsibilities for certain temporary services and facilities used by other Prime Contractors and other entities at the site.

2. The General Contractor is responsible for providing temporary services and facilities that are:

   a. Not normal construction activities of other Prime Contractors.
   b. Not specifically assigned otherwise in the Contract Documents.
   c. Listed as a responsibility for another Prime Contractor that does not exist on this project.

B. **Prime Contractor** is responsible for:

1. Installation, operation, maintenance, and removal of each temporary service or facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each such service or facility.
2. Plug-in electric power cords and extension cords, and supplementary plug-in task lighting and special lighting necessary exclusively for its own activities.
3. Its own field office, complete with necessary furniture, utilities, and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary heat, ventilation, humidity control, and enclosure of the building where these utilities are necessary for its construction activity, but where these utilities have not yet been installed by the responsible Prime Contractor.
6. Special or unusual hoisting requirements, including hoisting loads in excess of 2 tons, hoisting material or equipment into spaces below grade, and hoisting requirements outside the building enclosure.
7. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
8. Secure lockup of its own tools, materials and equipment.
9. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

C. **General Contractor** is responsible for:

1. Temporary telephone service for General Construction.
2. Temporary roads and paving.
3. Temporary toilets, including disposable supplies.
4. Temporary wash facilities, including disposable supplies.
5. Containerized bottled water type drinking water units.
6. Temporary enclosure of the building.
7. Project identification and temporary signs.
8. General collection and disposal of wastes.
9. Barricades, warning signs, and lights.
10. Enclosure fence.
11. Security enclosure and lockup.
12. Environmental protection.

D. **Electrical Contractor** is responsible for:

1. Temporary telephone service for Electrical Contractor.
2. Temporary electric power service and distribution.
3. Temporary lighting.
4. Connections for illuminated signs.

1.9 USE CHARGES

A. **General**. Cost or use charges for temporary facilities are not chargeable to the Owner or Engineer/Architect; Prime Contractor's cost or use charges for temporary services or facilities will not be accepted as a basis of claim for an adjustment in the Contract Sum or Contract Time.

B. **Water Service**. Water from the Owner's existing water system shall be used without metering and without payment of use charges.

C. **Electric Power Service**. The Electrical Contractor shall pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at the project site.

D. **The costs of providing and using temporary services** and facilities, including use charges, are divided between all of the Prime Contractors and shall be totally included in the Contract Sums.

E. **Other entities using temporary services** and facilities include, but are not limited to:

1. Other nonprime Contractors.
2. The Owner's work forces.
3. Occupants of the project.
4. The Engineer/Architect.
5. Testing agencies.
6. Personnel of government agencies.

F. **Gas Service**. The HVAC Contractor shall pay natural gas use charges, whether metered or otherwise, for natural gas used for temporary heat.

PART 2 - PRODUCTS

2.1 MATERIALS

A. **General**. Provide new or acceptable previously used materials. Provide materials suitable for the use intended.

B. **Open Mesh Fencing**. Provide 11-gauge, galvanized 2-inch, chain-link fabric fencing 6 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2-inch inside diameter (I.D.) for line posts, and 2-1/2-inch I.D. for corner posts.

2.2 EQUIPMENT

A. **General**. Provide new or acceptable previously used equipment. Provide equipment suitable for the use intended.

B. **Fire Extinguishers**. Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, class "ABC" dry-chemical extinguishers, or a combination of extinguishers of NFPA recommended types for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. **Use qualified personnel** for installation of temporary facilities.

B. **Location**. Coordinate location with Owner and Engineer/Architect. Locate facilities where they serve the project adequately and result in minimum interference with performance of construction activities. Relocate facilities as required.

C. **Provide each facility ready for use** when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. **General**. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

B. **Water Service**. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. Disinfect temporary water piping prior to use.

C. **Temporary Electric Power Service**

1. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction.
2. Include meters, transformers, overload protected disconnects, automatic ground fault interrupters, and main distribution switch gear.
3. Power Distribution System. Install wiring overhead, and raise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125-Vac 20-ampere rating and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. **Temporary Lighting**. Whenever an overhead floor or roof deck has been installed, install temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire lighting system, and will provide adequate illumination for construction operations and traffic conditions.

E. **Temporary Telephones**. Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station.

1. At each telephone, post a list of important telephone numbers.

F. **Sewers and Drainage**.

1. If sewers are available, provide temporary connections to remove influent that can be discharged lawfully.
2. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities.
3. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.
4. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
5. Connect temporary sewers to the municipal system as directed by the sewer department officials.
6. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

G. **Provide earthen embankments and similar barriers** in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. **Temporary Heat**

1. Provide temporary heat required by construction activities, for curing or drying of completed installations, or protection of installed construction from adverse effects of low temperatures or high humidity.
2. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
3. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
4. Provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
5. Do not use gasoline-burning space heaters, or open-burning or salamander-type heating units.

B. **Field Offices**. Provide an insulated, weathertight, heated, or air-conditioned temporary office of sufficient size to accommodate required office personnel at the project site.

1. The General Contractor shall provide, either as a part of its field office or as a separate facility, a room of not less than 240 square feet (sf) for project meetings. Furnish the room with a conference table, eight folding chairs, and a tackboard. Keep the office clean and orderly.

C. **Storage and Fabrication Sheds**. Install storage and fabrication sheds, sized, furnished, and equipped to accommodate materials and equipment including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

D. **Sanitary facilities include** temporary toilets, wash facilities, and drinking water fixtures.

1. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities.
2. Install where facilities will best serve the project's needs.
3. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
4. Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
5. Provide bottled-water-type drinking water units.
6. Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully

enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

E. **Temporary Enclosures**. Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely, with fire-treated wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load bearing wood framed construction.

F. **Project Identification and Temporary Signs**

1. Project Identification Sign. Per Owner requirements.
2. Temporary Signs. Prepare signs to provide directional information to construction personnel and visitors.
3. Support on posts or framing of preservative-treated wood or steel.
4. Do not permit installation of unauthorized signs.

G. **Temporary Site Lighting**. Install exterior yard and sign lights so that signs are visible when work is being performed.

H. **Collection and Disposal of Waste**. See Section 01 74 23, "Cleaning."

I. **Stairs**

1. Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
2. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

J. **Rodent and Pest Control**

1. Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests.
2. Employ this service to perform extermination and control procedures at regular intervals so the project will be relatively free of pests and their residues at Substantial Completion.
3. Perform control operations in a lawful manner using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. **General.** Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested.

B. **Temporary Fire Protection**

1. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses.
2. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations and Demolition Operations."
3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
4. Store combustible materials in containers in fire safe locations.
5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
6. Prohibit smoking in hazardous fire exposure areas.
7. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. **Permanent Fire Protection.** At the earliest feasible date in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. **Barricades, Warning Signs, and Lights**

1. Comply with standards and code requirements for erection of structurally adequate barricades.
2. Paint with appropriate colors, graphics, and warning signs to warn personnel and the public of the hazard.
3. Where needed, provide lighting including flashing lights.

E. **Enclosure Fence**

1. When excavation begins, install an enclosure fence with lockable entrance gates.
2. Locate where indicated, or enclose the portion determined sufficient to accommodate construction operations.
3. Install in a manner that will prevent people and animals from easily entering the site, except by the entrance gates.
4. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

F. **Security Enclosure and Lockup**

1. Install substantial temporary enclosure of partially completed areas of construction.
2. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
3. Storage of Valuable Material. Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. **Environmental Protection**

1. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result.
2. Avoid use of tools and equipment which produce harmful noise.
3. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. **Supervision**. Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. **Maintenance**

1. Maintain facilities in good operating condition until removal.
2. Protect from damage by freezing temperatures and similar elements.
3. Maintain operation of temporary construction services and facilities on a 24-hour-day basis where required to achieve indicated results and to avoid possibility of damage.
4. Prevent water filled piping from freezing. Maintain markers for underground lines.
5. Protect from damage during excavation operations.

C. **Termination and Removal**

1. Unless requested that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion.

2. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility.

3. Repair damaged work, clean exposed surfaces, and replace work which cannot be satisfactorily repaired.

4. Materials and facilities that constitute temporary facilities are property of each Prime Contractor. The Owner reserves the right to take possession of project identification signs.

5. Temporary Pavement.

   a. Remove temporary paving that is not intended for or acceptable for integration into permanent paving.
   b. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area.
   c. Remove materials contaminated with road oil, asphalt and other petrochemical compounds and other substances which might impair growth of plant materials or lawns.
   d. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.

6. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:

   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
   c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION

SECTION 01 55 27

INTERFERENCE WITH TRAFFIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General**. Provide the labor, tools, equipment, and materials necessary to maintain traffic in accordance with the drawings and as specified herein.

1.3 QUALITY ASSURANCE

A. **Codes and Standards**. Perform all work in the maintenance of traffic in compliance with applicable requirements of governing agencies having jurisdiction.

B. **Maintenance of Traffic**. Maintain traffic in accordance with the *Manual of Uniform Traffic Control Devices*.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

A. **Owner Requirements**. If proper maintenance of traffic facilities and proper provision for traffic control are not being provided and the safety of the public is thus endangered, the Owner may take the necessary steps to place them in proper condition and the cost of such services will be deducted from any payment which may be due or become due the Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 **DESCRIPTION**. Furnish, erect, maintain, and remove lights, signs, barricades, temporary guardrails, and other traffic control devices, and furnish watchpersons and flag persons as may be necessary to maintain safe traffic conditions.

3.2 **MAINTAINING TRAFFIC**

A. **Traffic Diversion**. Whenever it is necessary to divert traffic from its normal channel, mark the diversion clearly by cones, drums, barricades, or temporary guardrail. Provide and maintain suitable lights if the markers are left in place at night.

END OF SECTION

SECTION 01 57 13

SEDIMENT AND EROSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide all labor, tools, equipment, and materials necessary to furnish and maintain the soil erosion controls, shown on the Contractor's Storm Water Pollution Prevention Plan (SWPPP), where directed by the Owner or Engineer/Architect, and as specified herein.

B. **SWPPP Preparation**. Prepare an SWPPP for this project, obtain necessary permits, provide dust control, and terminate coverage under the permits, if necessary, upon completion of the work.

1.3 QUALITY ASSURANCE

A. **Codes and Standards**. Perform all work required in the control of erosion during construction in compliance with applicable requirements of governing agencies having jurisdiction.

B. **Conflicts**. In the event of a conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, regulations, or standards shall apply.

1.4 SUBMITTALS

A. **General**

1. Submit all submittals in accordance with the Division 1 Submittal Requirements and the requirements within this specification section.

1.5 JOB CONDITIONS

A. **Construction Sites Less than 1 Acre**

1. SWPPP. Develop and implement an SWPPP for the control of sediment and erosion at this project site throughout construction. At a minimum the SWPPP shall include the following:

a. Site drawing showing the limits of all earth-disturbing activities, location of proposed temporary access roads or stockpiles, and location of all proposed sediment and erosion control features

(such as silt fencing, sediment basins, and temporary seeding). Include details for installation and material specifications for each erosion control feature.

b. Written description of the proposed sediment and erosion control measures that will be employed, including a schedule for installation and removal of temporary controls as they are related to actual site construction. Also include information regarding any permanent or temporary seeding, an inspection and maintenance schedule, and all measures that will be employed by any subcontractors.

B. **Sediment and Erosion Control Shown on the Plans**. The sediment and erosion control measures shown on the plans, if any, are considered to be the minimum level of control required. Prepare the final SWPPP and use, if appropriate, alternate methods and locations of sediment and erosion control to meet the site requirements provided they are approved.

1.6 **DELIVERY, STORAGE, AND HANDLING**

A. **General**. Handle all sediment and erosion control materials in accordance with the manufacturer's recommendations.

B. **Storage**. Store all seeds for temporary seeding in a safe, dry location protected from weather conditions that may affect the seed viability.

1.7 **SPECIAL WARRANTY**

Not used.

PART 2 - PRODUCTS

2.1 **GENERAL**. The SWPPP shall incorporate some or all of the following equipment and materials for sediment and erosion control measures, as appropriate.

A. **Sediment Barriers**. Sediment barriers are temporary measures using woven wire or other approved material attached to posts with filter cloth of burlap and plastic filter fabric to intercept, detain, and control sediment and erosion from leaving the construction site.

1. Materials.

a. Filter Fabric/Silt Fence. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester, or ethylene yarn.

b. Wire Fencing. Wire fence reinforcement for silt fences at storm drain inlets shall be a minimum of 42 inches in height and a minimum of 14 gauge, and shall have a maximum mesh spacing of 6 inches.

c. Silt Fence Posts. Posts for silt fences shall be either 2-inch-by-2-inch hardwood or equivalent steel with a minimum length of 32 inches. Steel posts shall have projections for fastening wire to them.

d. Storm Drain Inlet Protection Framing. Stakes and framing for yard, drainage ditch, or parking lot inlet protection shall be 2-inch-by-4-inch wood (preferred) or equivalent metal with a minimum length of 3 feet for the stakes/posts.

B. **Matting**. Matting shall be agricultural straw or coconut fiber within photodegradable netting, jute, excelsior, or approved equal synthetic material.

C. **Temporary Seeding and Mulching**. Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting used to reduce erosion. All cut-and-fill slopes including borrow pits shall be seeded and/or mulched where and when necessary to eliminate erosion.

1. Materials.

a. Mulch.

1) Straw. Straw mulch shall be unrotted small-grain straw, free of sticks or other foreign material.
2) Wood Cellulose Fiber. Wood cellulose fiber mulch shall be dyed green and not inhibit seed germination.

2. Fertilizer. Fertilizer shall contain 12 percent total nitrogen, 12 percent available phosphoric acid, and 12 percent water-soluble potash. The name of plant nutrients, weight, and quarantined percentages shall be marked on the sealed containers.

D. **Sediment Structures**. Sediment basins, dams, and dikes are prepared storage areas to trap and store sediment from construction areas and to protect properties and stream channels below the construction areas from siltation.

PART 3 - EXECUTION

3.1 GENERAL

A. **Examination**. Inspect the existing and proposed site drainage patterns in order that the most efficient methods of erosion control may be selected through the duration of construction.

B. **Fill material and equipment storage** is prohibited within 200 feet of the stream bank, in the floodplain, in wooded areas, or in other environmentally sensitive areas. Dispose of surplus excavated materials off-site.

C. **Maintenance**. Be responsible for ongoing inspection and maintenance of the sediment and control features. At a minimum, complete an inspection log at least every 7 calendar days and within 7 days of each rainfall event. Repair/replace damaged features.

D. **Dust Control**. Minimize dust generation, including wetting down unpaved areas during the construction activities.

3.2 PREPARATION

A. General

1. Limit the surface area of erodible earth material exposed by the clearing and grubbing, excavation, borrow, and fill operations and provide immediate permanent or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment.
2. Such work will involve the construction of temporary ditch checks, filters, benches, dikes, dams, sediment basins, and slope drains, and use of temporary mulches, mats, seeding, or other control devices or methods necessary to control erosion and sedimentation.
3. Prepare and submit an SWPPP in advance of the work.
4. Limit the area of excavation, borrow, and embankment operations in progress commensurate with capability.
5. Deliver sediment and erosion control materials at appropriate times so that the project is not delayed.
6. Do not commence with any earth-disturbing activity until the appropriate sediment and erosion control features are in place.

B. **Sediment and Erosion Control Devices**. Minimization of denuded areas and the length of time that any area is denuded is the primary method of sediment and erosion control at any site.

Areas that are to be denuded shall have structural control measures in place prior to exposure of the soil and such measures shall remain until the area is established and permanent measures are in place. In the case of silt fencing, which may require the rough grading to be completed prior to installation, it shall be installed as soon as practical. Structural measures shall include at a minimum:

1. Sediment basins for all drainage areas greater than 5 acres.
2. Aggregate construction entrances at all points of construction traffic egress from the site onto pavement.
3. Silt fencing at all areas of sheet flow.
4. Inlet protection at all storm water inlets.
5. Matting at all slopes greater than 3:1 and drainage swales/ditches.
6. Sediment traps or basins at all drainage areas that can not be adequately protected with silt fencing as determined by the Contractor developing the SWPPP.
7. Silt fencing around soil stockpiles or cover them with tarps.

3.3 EROSION CONTROL

A. Permanent Erosion Control

1. Incorporate all permanent erosion control features into the project at the earliest practicable time.
2. Perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available.

3. Establish final grades and application of fertilizer, seed, and mulch.
4. Maintain sediment barriers until grass has grown.

B. **Temporary Erosion Control**

1. Provide temporary seeding and mulching as delineated in the SWPPP, as directed, as specified in the general NPDES permit, and for all denuded areas that are to remain dormant for more than 21 days.
2. Apply temporary erosion control within 7 days after final or temporary grade has been reached that will remain dormant for more than 21 days.
3. For areas within 50 feet of a stream, apply temporary erosion control within 2 days after the most recent disturbance of an area that will remain dormant for more than 21 days.
4. Install temporary erosion control measures including seeding and mulching immediately if seasonal limitations make permanent control measures unrealistic.

Temporary seed shall be of the type appropriatel for the time of year that it is applied. Temporary seeding shall also include application of 12-12-12 fertilizer at the rate of 6 pounds per 1,000 square feet.

3.4 SEDIMENT BARRIERS

A. **Filter Barriers (FB)**. Construct the FBs using synthetic filter fabric. They are designed for sediment removal and erosion control of low or moderate channelized flows not exceeding 1 cubic foot per second (cfs).

1. The height of an FB shall be between 15 inches and 18 inches.
2. Purchase filter fabric in a continuous roll and avoid the use of joints by cutting to the length of the barrier.
3. Space the stakes a maximum of 3 feet apart at the barrier location and drive them securely into the ground (minimum of 8 inches).
4. Excavate a trench approximately 4 inches wide and 4 inches deep along the line of stakes and upslope from the barrier.
5. Staple the filter material to the wooden stakes, and extend 8 inches of the fabric into the trench. Use heavy-duty wire staples at least 1/2 inch long. Do not staple filter material to trees.
6. Backfill the trench and compact the soil over the filter material.
7. Install straw bales on the downstream side of all filter barriers. Install bales in a single row and securely anchor them with a minimum of two stakes per bale.
8. If an FB is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope.
9. Remove FB when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

B. **Silt Fence (SF)**. SF is designed for situations in which only sheet or overland flows are expected, and the following drainage area limits are applied.

Silt Fence Maximum Drainage Area (Based on Slope of Drainage Area)	
Slope	Maximum Drainage Area (Acres) to 100 Linear Feet of Silt Fence
0-2% (<50:1)	0.5
2%-20%	0.25
>20%	0.125

1. Locate the silt fence at the flattest area available and follow a level contour of the land so that flows are dissipated into uniform sheet flow.
2. The height of an SF shall not exceed 36 inches (higher fences may impound volumes of water sufficient to cause failure of the structure).
3. Purchase the filter fabric in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, splice filter cloth together only at a support post, with a minimum 6-inch overlap, and securely seal.
4. Drive posts securely into the ground (minimum of 12 inches).
5. Excavate a trench approximately 4 inches wide and 4 inches deep along the line of posts and upslope from the barrier.
6. Staple or wire the filter fabric to the fence, and extend 8 inches of the fabric into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Do not staple filter fabric to trees.
7. Backfill the trench and compact the soil over the filter fabric.
8. Remove SF when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

C. **Maintenance**

1. Inspect SF and FB a minimum of every 7 days and immediately after each rainfall or at least daily during prolonged rainfall. Make any required repairs immediately.
2. Should the fabric on an SF or FB decompose or become ineffective prior to the end of the expected useable life and the barrier is still necessary, replace the fabric promptly.
3. Remove sediment deposits after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
4. Dress any sediment deposits remaining in place after the SF or FB is no longer required to conform with the existing grade, and prepare and seed them.

3.5 MATTING

A. **General**. Provide matting:

1. On all final slopes 3:1 or greater.
2. Along the bottom of all drainage ditches until permanent seeding has grown and is established.
3. In areas where establishing vegetation is difficult.
4. Where mulch is difficult to hold in place due to wind or water.
5. Where water velocities exceed 3.5 feet per second.

B. **Securing**. Secure matting in accordance with the manufacturer's instructions or with No. 11 gauge, or heavier, sod staples that are a minimum of 6 inches in length.

C. **Erosion Stops**

1. Erosion stops are narrow trenches (6 to 12 inches deep) across the full channel section to prevent undermining and gullies from forming below the matting.
2. Provide them at a maximum spacing of 50 feet apart (more frequently if recommended by the matting supplier) in areas of high erosion potential and at the leading edge of a matting roll.
3. High erosion potential is in rocky areas that prevent soil-to-matting contact, erosive soils, and steep slopes.
4. Place the leading edge or piece of matting (for intermediate stops) within the narrow trench and secure it in place before backfilling the trench.

3.6 STORM DRAIN INLET PROTECTION (IP)

A. **General**

1. Provide temporary sediment control around all storm inlets until the tributary drainage area is permanently stabilized.
2. This shall consist of an inlet sediment filter of silt fencing as specified and detailed herein.
3. Utilize storm drain IP at all storm drain inlets in addition to matting and sediment barriers previously discussed.

B. **Yard, Drainage Ditch, or Parking Lot Inlet Protection**.

1. Filter Fabric.

   a. Excavate earth to a minimum depth of 18 inches around inlet.
   b. Construct wood framing with a minimum burial depth of 8 inches at each corner of the inlet.
   c. Filter fabric shall include a wire mesh backing for structural support.
   d. Place backfill in 6-inch compacted lifts.

e. Install a compacted earth check dam in the ditch line below the inlet if runoff bypassing the inlet will not flow to a sediment pond.

2. Drop Inlet Sediment Protection. Inlets may utilize an excavated drop inlet consisting of a 1- to 2-foot-deep excavation around the inlet to serve as a sediment trap.

a. Expanded trap volume shall be in accordance with the requirements for sediment traps contained in this specification.
b. Install 1-inch-diameter weep holes in the side of the inlet near the bottom of the excavated areas. Provide a gravel filter around weep holes. Weep holes shall be grouted before filling excavated area.
c. Remove accumulated sediment when it has reached 40 percent of the trap depth.

C. **Curb Inlet Protection.**

1. Frame. Construct a wooden frame that is anchored to the soil located behind the curb.
2. Screen. Form a geotextile fabric screen with wire mesh backing to the concrete gutter and against the face of the curb. Extend the screen 2 feet beyond the inlet throat on either end and fasten to the frame.
3. Stone. Place 2-inch stone over the screen to prevent water from entering the inlet under or around the geotextile fabric.

3.7 **ADDITIONAL MEASURES.** Select the sediment and erosion control measures utilized for a site based on the proposed construction activities, existing and proposed contours, site drainage system, and other site requirements or restrictions. Additional or alternative erosion and sediment control measures may be utilized with approval.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Transport and handle materials and equipment in accordance with the manufacturer's recommendations and requirements of Contract Documents. Make all arrangements for transportation, delivery, storage, and handling of equipment and materials required for prosecution and completion of the work.

1.3 QUALITY ASSURANCE

Not used.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Delivery**. Deliver shipments of materials and equipment to the site only during regular working hours. Shipments shall be addressed and consigned to the proper party giving name of Contract, street number, and city. Shipments shall not be delivered to the Owner or Owner's Representative, except as otherwise directed. Transportation shall be in accordance with Part 3 of this section.

B. **Storage and Handling**

1. Store, handle, and protect materials in accordance with the manufacturer's recommendations and the requirements of Part 3 of this section.
2. Maintain equipment in an undeteriorated and fully serviceable condition and as specified in Part 3 of this section.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 TRANSPORTATION

A. **General**. Arrange deliveries of products in accordance with the construction schedule and in ample time to facilitate inspection prior to installation.

B. **Coordination**

1. Coordinate deliveries to avoid conflict with work and conditions at site and to accommodate the following:

   a. Work of other contractors.
   b. Limitations of storage space.
   c. Availability of equipment and personnel for handling products.
   d. Owner's use of premises.

2. Do not have products delivered to project site until related shop drawings have been approved.

3. Do not have products delivered to site until required storage facilities have been provided.

4. Have products delivered to site in manufacturer's original, unopened, labeled containers. Keep Engineer/Architect informed of delivery of all equipment to be incorporated in the work.

C. **Inspection**

1. Immediately upon delivery, inspect shipment to ensure that:

   a. Product complies with requirements of Contract Documents and reviewed submittals.
   b. Quantities are correct.
   c. Containers and packages are intact and labels are legible.
   d. Products are properly protected and undamaged.

3.2 HANDLING

A. **Methods**

1. Provide equipment and personnel necessary to handle products without soiling or damaging products or packaging.
2. Lift heavy components only at designated lifting points.
3. Handle materials and equipment at all times in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them.

4. Do not drop, roll, or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.
5. Keep interiors completely free of dirt and foreign matter.

3.3 STORAGE AND PROTECTION

A. General

1. Make all arrangements and provisions necessary for the storage of materials and equipment.
2. Place all excavated materials, construction equipment, and materials and equipment to be incorporated into the work so as not to damage anything.
3. Keep materials and equipment neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, adjoining owners, tenants, and occupants.
4. Arrange storage in a manner to provide easy access for inspection.

B. Storage Areas

1. Areas available on the construction site for storage of material and equipment shall be as shown on the drawings or otherwise approved by the Engineer/Architect.
2. Store materials and equipment which are to become the property of the Owner in a way to facilitate their inspection and ensure preservation of the quality and fitness of the work, including proper protection against damage by freezing and moisture.
3. Lawns or other private property shall not be used for storage purposes without written permission of the Owner in control of such premises.
4. Restore all storage areas to their original condition.

C. Storage Methods

1. Do not open manufacturer's containers until the time of installation unless recommended by the manufacturer or otherwise specified.

2. Do not store products in the structures being constructed unless approved in writing.

3. The following types of materials may be stored out-of-doors and on wood blocking so there is no contact with the ground.

    a. Masonry units.
    b. Reinforcing steel.
    c. Structural steel.
    d. Piping.
    e. Precast concrete items.
    f. Castings.
    g. Handrailing.

4. The following types of materials may be stored out-of-doors if covered with material impervious to water and sunlight. Store materials on wood blocking and tie down covers with rope and slope to prevent accumulation of water on covers.

   a. Construction lumber.
   b. Wood for formwork.
   c. Fiberglass and plastic materials which are not ultraviolet (UV) protected.

5. Store all products not listed above in buildings or trailers which have a concrete or wooden floor, a roof, and fully closed walls on all sides.

6. Provide heated storage space for materials that would be damaged by freezing.

7. Protect mechanical and electrical equipment from contamination by dust, dirt, and moisture.

8. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

D. **Inspection**

1. Regularly inspect stored products to ensure that:

   a. State of storage facilities is adequate to provide required conditions.
   b. Required environmental conditions are maintained on continuous basis.
   c. Products exposed to elements are not adversely affected.

2. Be fully responsible for loss or damage to stored materials and equipment.

3.4 MAINTENANCE

A. **Maintenance Log**. Prepare a maintenance log for all equipment.

1. This log shall include a list of required maintenance services and inspections, as provided by the manufacturer.
2. The log shall include checklists for the periodic services and inspections required.
3. Initial and date the checklist upon completion of the individual servicing or inspection.
4. Locate the maintenance log in the field office and have it available for review until it is submitted for record purposes upon completion of the work and the start of the warranty period.

B. **Preparation**

1. Before removing an item from storage, review the installation location. Protection and services at the installed location must meet the equipment storage requirements.
2. Before moving equipment to the installed location, have materials available for temporary shelter or services required to establish the proper storage environment.

C. **Performance of Maintenance**

1. Perform all storage and preventive maintenance and inspections required by the manufacturer at the specified intervals from the time of delivery until completion of the work.
2. When notified by the Owner or Owner's Representative of a maintenance deficiency, perform corrective maintenance. Corrective maintenance will be performed per the manufacturer.
3. Reestablish storage maintenance in the event an item or equipment is removed from service.

END OF SECTION

SECTION 01 74 23

CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General.** Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work.** Throughout the construction period, maintain all areas of new and existing buildings and site constructed or affected by the work of the Contract in a standard of cleanliness as described in this section.

B. **Related Work Described Elsewhere.** In addition to standards described in this section, comply with all requirements for cleaning up as described in various other sections of these specifications.

1.3 QUALITY ASSURANCE

A. **Inspection.** Conduct daily inspections, and more often if necessary, to verify that requirements of cleanliness are being met.

B. **Codes and Standards.** In addition to the standards described in this section, comply with all pertinent requirements of governmental agencies having jurisdiction and comply with Occupational Safety and Health Administration (OSHA) Housekeeping Standards, Subpart C, Section 1926.25.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 **MATERIALS AND EQUIPMENT.** Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 **COMPATIBILITY**. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of the work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Comply with OSHA Section 1926-252 of Subpart H of Part 1926, Disposal of Waste Materials.
5. Provide adequate storage for all items awaiting removal from job site, observing all requirements for fire protection and protection of the environment.
6. Do not bury waste materials within the project site.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site; restack, tidy, or otherwise service all arrangements to meet the requirements of Paragraph 3.1 A of this section.
3. Maintain the site in a neat and orderly condition at all times and comply with OSHA Housekeeping Standards, Subpart C, Section 1926.25.

C. Structures

1. Weekly, and more often if necessary, inspect the structures, pick up all scrap, debris, and waste material.
2. Weekly, and more often if necessary, sweep all interior spaces clean. Interpret "Clean" (for the purpose of this subparagraph) as meaning free from dust and other material capable of being removed by use of reasonable effort and hand-held broom, except that vacuum cleaning shall also be employed if dust accumulates on surfaces above floor.
3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean finish floor daily (and more often if necessary) while work is being performed in the space. Interpret "Clean" (for the purpose of this subparagraph) as

meaning free from all foreign material which may be damaging to the finish floor material.

3.2 FINAL CLEANING

A. **Definition**. Except as otherwise specifically provided, interpret "clean" (for the purpose of this paragraph) as meaning the level of cleanliness generally provided by skilled cleaners using commercial-quality building maintenance materials.

B. **General**. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final cleaning as described in paragraph 3.1 of this section.

C. **Site**. Unless otherwise directed, broom-clean all paved areas on the site and all public paved areas directly adjacent to the site. Completely remove all resultant debris.

D. **Structures**

1. Exterior.

   a. Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter.
   b. Remove all traces of splashed materials from adjacent surfaces.
   c. If necessary to achieve a uniform degree of exterior cleanliness, hose and brush down the exterior of the structure.
   d. In the event of stubborn stains not removable with water, lightly sandblast to remove the stain.

2. Interior.

   a. Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter.
   b. Remove all traces of splashed materials from adjacent surfaces.
   c. Remove all paint droppings, spots, stains, and dirt from finished surfaces.
   d. Sweep, vacuum, and hand-dust all areas, including concealed surfaces and overhead spaces, to remove all dust.

3. Glass. Clean all glass inside and outside.

4. Polished surfaces. To all surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

END OF SECTION

SECTION 01 79 00

START-UP, DEMONSTRATION, AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. This section includes general requirements for start-up, training, and operational demonstration as required by the specifications.

1.3 QUALITY ASSURANCE

A. **Test Instruments**. Provide all instruments required for testing. Calibrate all test instruments to within appropriate test standards as established by American Society for Testing and Materials (ASTM) or the governing technical standard. Retain calibration data at the Contractor's site office for Owner or Owner's Representative's review.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

1.8 DEFINITIONS

A. **Operational Demonstration**. An activity performed by the Contractor wherein the Owner operates and the Contractor maintains a fully functional component, system, or unit process for a minimum period of 30 continuous calendar days after start-up has been completed and stable operation has been achieved.

B. **Field Testing**. Testing performed on-site by the Contractor to satisfy requirements of the manufacturer and Contract Documents.

1. Dry Testing. Dry testing is performed by the Contractor without introducing either process material or other test material into the component, system, or unit process.

2. Wet Testing. Wet testing is performed by the Contractor utilizing test material in the component, system, or unit process. Process tankage shall be filled with test material to operating level.
3. Performance Testing. Performance testing is performed by the Contractor to demonstrate system performance in accordance with specification requirements.

C. **Start-Up**. An activity performed by the manufacturer's representative with the Contractor immediately after equipment or system is completed to verify the installation.

1. Check the installation for conformance with the plans and specifications.
2. Check the installation for conformance with the shop drawings and manufacturer's data.
3. Verify quantities and data with the operation and maintenance (O&M) manuals.
4. Verify that equipment is ready for operation.
5. Place component, system, or unit process on-line.
6. Perform all required field testing.
7. Prepare and submit a manufacturer's representative's report including certification, recommendations, and conclusions.

D. **Training**. To educate Owner's personnel to become qualified and proficient in the operation, maintenance, and repair of the complete system. Training shall include:

1. Classroom instruction.
2. In-plant, on-site demonstration.
3. Equipment demonstration.
4. Actual hands-on operation by the Owner's staff.

E. **Adjusting**. To install or change setting, parameters, calibrations, flows, and processes so that the equipment or system operates in a logical or more efficient state.

F. **Balancing**. To make equipment or subsystems operate in harmony or equilibrium by adjusting, altering, or modifying parts of the system.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 START-UP EXECUTION

A. **Start-Up Preparation**

1. Prior to beginning a start-up, inspect the systems and equipment to verify their readiness to begin with the manufacturer's representative.

2. Correct hazardous conditions to equipment or personnel prior to start-up of equipment.

3. Do not proceed with start-up operations using temporary power or temporary instrumentation and control wiring unless approved. All electrical and control connections shall be permanent and complete, and all such electrical components and equipment fully functional.

4. Design, fabricate, and install all necessary testing and monitoring equipment before commencing the test.

   a. Quality. Use materials and equipment of good quality and suitable for the intended service. The use of miscellaneous items found at the job site is not acceptable.
   b. Maximum Gauge Readings. Select capacity or range of test equipment to provide meaningful test results. Select pressure or differential pressure gauges so that test pressure is 50 percent to 75 percent of maximum gauge reading.
   c. Temporary Equipment. Fabricate, as necessary, any temporary equipment used in testing. This equipment shall remain the property of the Contractor who will remove it from the site upon substantial completion.

5. Manufacturer's representatives shall be present for the initial start-up of all systems or equipment.

6. Request permission to start up equipment, including electrical gear, and notify the Engineer/Architect of the start-up.

   a. Submit the start-up request a minimum of 72 hours before the scheduled start-up. Make requests in writing during normal working hours.
   b. Start-up request shall be in accordance with Section 01 33 00, "Submittals."
   c. The Owner and/or Engineer/Architect shall have the right to reject the use of an individual for facility start-up.
   d. Approval of the request is based solely on impact on plant operations. Approval does not relieve the Contractor of any responsibility for plant and personnel safety.
   e. Coordinate the start-up of each piece of equipment with the Owner and the Engineer/Architect so that operation does not interfere with the normal operation of the facility.

7. Normal installation checks, such as for rotation, are not considered start-ups and do not require start-up notification. Clearly mark all electrical apparatus which is energized.

B. **Conduct of Start-Up**

1. Equipment Adjustments. Make all adjustments, corrections, and calibrations to set points, and process parameters necessary to achieve normal, stable operation of systems.

2. Equipment Failure. Consider any failures of equipment or systems as deficiencies and correct them. Stop testing and the start-up until all deficiencies have been corrected.

3. System Failure.

   a. When there appears to be a system failure and the system is composed of separate but functionally codependent individual pieces of equipment and check-out of each piece of equipment by its respective manufacturer's representative verifies that the equipment is functioning properly, then the Contractor's remains responsible for overall system operation.
   b. Verify compatibility of equipment during the submittal process to minimize overall system operating problems.
   c. Reconfigure, repair, modify, or replace parts or all the equipment in order to provide a system that shall perform as specified at no additional cost to the Owner.

4. Dry Testing.

   a. Test, adjust, align, lubricate, and balance all equipment and systems in accordance with the manufacturer's instructions prior to testing.
   b. Test individual components prior to testing the system of which they are a part.

5. Wet Testing.

   a. After dry testing, wet test all equipment and systems for a minimum of 72 hours under the design operating conditions utilizing a test material similar to or same as the process material.
   b. All costs, including materials and equipment, for delivery of the test material shall be at the Contractor's expense. Test each component or item of equipment to demonstrate compliance with the design criteria and operating range specified.
   c. Suspend or secure all tests in the event that test failures or hazardous conditions occur. Make repairs, replacements, or adjustments and restart test in its entirety.
   d. Dispose of the test material at no additional cost to the Owner.
   e. Clean all equipment systems and structures upon conclusion of testing at no additional cost to the Owner.
   f. Comply with any performance testing requirements specified.

6. Retesting. Repeat tests if results fail to meet test criteria, whether the failure is identified during field testing or through reviewing the test report later.

7. Performance Testing. Verify operating ranges, capacities, low and high limits, efficiencies, temperatures, speeds, pressures, sequences, etc., of each piece of equipment being tested. Check monitors, indicators, alarms, and fail-safe devices.

8. Do not use repair parts during start-up operations unless approved.

9. Furnish all lubrication and operating fluids per the manufacturer's instructions.

10. Field-verify initial copy of O&M manual according to Section 01 33 00, "Submittals."

C. **Start-Up Conclusion**

1. Submit manufacturer's representative's report within 48 hours of conclusion of each start-up. Report shall be in accordance with Section 01 33 00, "Submittals."

3.2 OPERATIONAL DEMONSTRATION EXECUTION

A. **Operational Demonstration Preparation**. Prior to the operational demonstration beginning:

1. Complete start-up procedures including submitting all reports for all parts of the work designated for the operational demonstration.
2. Complete all required construction activities, including any activities by any entity that would interrupt the normal operations of the demonstration.
3. Ensure that adequate parts and supplies for routine maintenance and replacement are on hand to support system operation through the demonstration period.
4. Deliver all repair parts to the Owner.
5. Submit an operational demonstration request according to Section 01 33 00, "Submittals," 48 hours prior to start of operational demonstration.

B. **Conduct of Operational Demonstration**

1. During the operational demonstration and at other times, the work will be on-line and an integral part of the plant operations and process. The Owner maintains control of plant operations and processes at all times. Therefore:

   a. Do not commence, resume, modify, terminate, or suspend the operations without the permission of the Owner and only in a sequence and manner suitable to the Owner except in the case of an emergency.
   b. The operation of the work shall be in strict accordance with the operational orders of the Owner.
   c. Adjust or repair immediately, on a 24-hour-per-day, 7-day-per-week basis, any malfunction in the work which in the opinion of the Owner jeopardizes or may jeopardize the proper operation of the total facility.

2. Perform operational demonstrations of the entire work. With approval, individual systems may be independently demonstrated as long as their complete range of operation and performance can be shown without the rest of the facility.

3. Update. Keep the log on-site during the operational demonstration and updated on a regular basis. The log shall be available for review by the Owner or Owner's Representative at all times during the operational demonstration.

4. Maintenance. Perform all required maintenance and servicing during the operational demonstration at the specified intervals and as necessary. Note all maintenance and servicing in the operational demonstration log.

5. Time.

   a. The operational demonstration shall last for a period of 30 consecutive days.

   b. All equipment and systems shall remain totally operational during this period.

   c. Upon successful completion of the operational demonstration, the work is considered to be ready for its intended use, and the Contractor may make recommendation for substantial completion.

   d. Outages.

      1) Note all outages of equipment, systems, or the plant in the operational demonstration log.
      2) Plant power outages such as power failure, process failure or existing equipment, and planned outages of existing systems for cleaning, maintenance, or repair are considered a part of normal plant operation and will not invalidate the operational demonstration.
      3) Be responsible for the safe and orderly shutdown and restart of equipment as necessary in the event of an outage.
      4) Do not include outage time in the demonstration time period.

   e. Do not count activities such as filling, draining, purging, heating or cooling to temperature, stabilizing, adjusting, testing, or other start-up activity time as operational demonstration time.

f. Failed Operational Demonstration.

1) If, during the operational demonstration, any part of the work fails to fully conform to the requirements of the Contract Documents, consider the operational demonstration to have failed, and the work not to be substantially complete.
2) Upon failure of the operational demonstration, promptly remedy any defects in the work and promptly reschedule and restart the complete operational demonstration time period. No operational demonstration time will be considered to have accrued to any part of the work by reason of a failed operational demonstration.

g. Suspension of Operational Demonstration.

1) During the operational demonstration, the Owner may require or permit the operational demonstration to be suspended upon the written request of the Contractor to correct or adjust the work, when in the judgement of the Owner or Owner's Representative such required correction or adjustment is insufficient to deem the operational demonstration to have failed.
2) If an operational demonstration is suspended for any reason except failure, operational demonstration time shall accrue to the work from the time of the beginning of the operational demonstration to the time of the suspension. No operational demonstration time shall accrue during the period of suspension.
3) If an operational demonstration is suspended at the request of the Contractor, continue operation and maintenance of the work without additional charges to the Owner, according to all provisions of this section of the specifications, and to the extent required by the Owner.

6. O&M Manuals. Start-up and operation of the system and all associated equipment shall be in accordance with the O&M manuals. If deviations from the manuals are necessary, note these in the operational demonstration log, and subsequently submit as revisions to the O&M manuals.

7. Personnel and Consumables.

a. Have sufficient personnel available during the entire demonstration to ensure proper maintenance, adjusting, troubleshooting, and any and all repairs to equipment and controls to maintain and keep the entire facility operating continuously for 30 consecutive days (720 hours).
b. The Owner will remain in control of the facility processes and provide the manpower to operate the facility.

c. The Owner will furnish all consumable supplies and power required for the 30 day complete facility operational demonstration.
d. Contractor's Supervision. When Owner personnel are operating systems or equipment under supervision of the Contractor during operational demonstration, make available, at all times, persons knowledgeable about the systems or equipment to direct the Owner personnel in its operation.

8. To the extent possible, operate all equipment or individual components throughout their range during this period.

C. **Operational Demonstration Completion**

1. Within 2 weeks of the termination or completion of the operational demonstration, submit for approval:

a. Any changes to O&M Instructions.
b. The completed operational demonstration logs according to Section 01 33 00, "Submittals."

2. The Owner will not assume full responsibility for operation and maintenance of the system and equipment until successful completion of the operational demonstration and all conditions for substantial completion have been satisfied and both the Contractor and Owner have accepted the Certificate of Substantial Completion.

3.3 TRAINING EXECUTION

A. **Training Preparation**. Coordinate and verify to ensure that, prior to the scheduled training times:

1. The equipment is ready for operation and has completed its start-up.
2. That all associated construction required to operate the equipment in all normal and anticipated operating modes is complete.
3. That the equipment area is safe, well lit, and unobstructed, so that all training class attendees may access, hear, view, and participate in the training.
4. That the equipment area is free of construction activities that could present a hazard to training class participants.
5. That adequate training materials, as required, are on hand for use during the training session.
6. Any representatives of interfacing Prime Contractors, subcontractors or equipment suppliers needed to perform supporting operations allowing demonstration of equipment operation, have been notified and will be available.
7. Schedule training sessions through Owner and the Engineer/Architect. Cooperate with the Owner in scheduling all required training sessions.
8. Verify that the training materials are compatible with this equipment. Provide other audio/visual equipment and training aids as needed.
9. The approved O&M manuals shall be available and frequent reference shall be made to the equipment O&M manuals.

10. The instructor's qualifications, the training schedule, the lesson plan, and any instructional materials have been submitted and approved before training begins. Submittals shall be in accordance with Section 01 33 00, "Submittals."
11. Training schedules should be submitted far enough in advance that the Owner can adjust work schedules so that all participants are available for the training sessions.

B. **Conduct of Training**

1. Provide at least one copy of instructional materials used for training at the time of the first training session for each attendee.
2. Before the training is complete, have all training session attendees sign an attendance sheet.
3. Discuss all items of the approved lesson plan in the classroom or the field, in complete and sufficient detail to allow the Owner's operating personnel to knowledgeably operate and maintain the equipment in accordance with manufacturer's recommended procedures and safety considerations during all anticipated operational and maintenance situations.
4. Address safety concerns and features intended to enhance safety.
5. Address tasks required to maintain the warranty.
6. The Owner reserves the right to record the training session for the future use in training employees.
7. Address all questions and comments as they are raised by the training session participants to the maximum extent practicable. If questions or comments cannot be addressed during the training session, additional materials and/or training may be required.
8. O&M material and instructional material shall not conflict.

C. **Training Conclusion**. Within 2 weeks of the training being completed:

1. Correct, revise, and update the O&M manuals as necessary to agree with training.
2. Submit completed sign-in sheet in accordance with Section 01 33 00, "Submittals."

END OF SECTION

SECTION 01 89 19

LEAKAGE TEST AND DISINFECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. The Contractor shall provide the labor, tools, equipment, and materials necessary to perform the leakage tests and disinfection of pipes, equipment, and tanks in accordance with the drawings and as specified herein.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies**. Perform all work to provide leakage tests and disinfection in compliance with all federal, state, local codes and regulatory agencies.

B. **Standards**. Materials and workmanship shall be in accordance with the following standards as referenced herein:

1. AWWA – American Water Works Association.
2. ASTM – American Society for Testing and Materials.
3. ACI – American Concrete Institute.

1.4 SUBMITTALS

Not used.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

Not used.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Site Verification of Conditions.** Examine conditions under which the pipe test section, facility, or part of a facility is to be tested or disinfected and verify that conditions are satisfactory and ready for the test to proceed.

3.2 PREPARATION

A. **Protection**. Protect adjacent equipment, materials, piping, and valving against drainage from testing and/or disinfection.

B. **Notification**. The Engineer/Architect shall be notified at least 24 hours prior to any testing and/or disinfecting. The Owner shall be notified at least 48 hours prior to any disinfecting. Notify the Engineer/Architect immediately of all unsatisfactory or nonconforming conditions.

C. **Responsibility**. Beginning the test means the Contractor accepts all the existing surfaces and conditions.

3.3 PRESSURE MAIN AND PROCESS PIPING LEAKAGE TESTING

A. **Description**. The Contractor shall provide the leakage tests as directed by the Engineer/Architect and as specified herein. Gauges for the tests shall be furnished by the Contractor with the most recent gauge calibration test report available for the Engineer/Architect's review on-site.

B. **Test Section.** No test section shall be longer than 500 feet without approval by the Engineer/Architect.

C. **Leakage Allowances** (unless noted otherwise)

1. Pressure Mains. The maximum leakage allowance for all pressure mains shall be 10.49 gallons per inch diameter per mile of pipe per 24 hours.
2. Process Air Piping. No leakage is acceptable.

D. **Test Procedure**

1. Each pressure main or process piping section shall be slowly filled with water to the specified test pressure in a manner satisfactory to the Engineer/Architect.

2. Before applying the specified test pressure, all air shall be expelled from the pipe.

3. The test water pressure shall be maintained for at least 2 hours.

4. Leakage will be determined by measuring the quantity of water added to the main to maintain the specified test pressure.

5. Unless noted otherwise, minimum test water pressure shall be the greater of 1.5 times the working pressure or the following:

   a. Mains or process piping carrying water – 150 pounds per square inch (psi).
   b. Force mains – 100 psi.
   c. Air piping – 10 psi.

3.4 DISINFECTION

A. General

1. Pipes, tanks, and equipment designed to carry water for domestic consumption shall be thoroughly cleaned, flushed, and disinfected before acceptance by the Owner.

2. Engineer/Architect shall confirm that the item to be disinfected is thoroughly cleaned and flushed prior to disinfection.

3. Disinfection shall be done by the addition of suitable amounts of chlorine in the form of liquid chlorine or high test hypochlorite of lime.

4. The application shall be as approved by the Owner and in accordance with the appropriate AWWA standard listed below.

   a. Water mains are under AWWA C651.
   b. Water storage tanks are under AWWA C652.
   c. Water treatment plants are under AWWA C653.

5. Tests for efficacy of disinfection, and repeated disinfection and tests shall be carried out by the Contractor, at no cost to the Owner.

6. Disposal of heavily chlorinated water shall be in accordance with AWWA C651 and AWWA C651 Appendix B, and shall not be disposed to a sanitary sewer or the environment unless dechlorinated sufficiently to not interfere with treatment of sanitary sewage or the environment.

3.5 FIELD QUALITY CONTROL

A. Field Tests

1. All test materials, equipment, chemicals, and water required for testing or disinfection shall be provided by the Contractor at no additional cost to the Owner.
2. Testing shall be done according to the methods described in this section.

B. Witness

1. All tests performed for each section to be tested shall be witnessed and approved by the Engineer/Architect before acceptance.

2. In the event the Contractor performs any test without witness by the Engineer/Architect, the Contractor may be required by the Engineer/Architect to test the section again in conformance with this specification at no cost to the Owner.

3.6 ADJUSTING

A. Test Results

1. If the field tests show excessive leakage, the Contractor shall repair, adjust, modify, or replace the noncomplying sections until the tests are successfully completed.
2. If the field tests show noncompliance with the disinfection requirements, the Contractor shall repeat the disinfection procedure until the tests are successfully completed.
3. This shall be done at no additional cost to the Owner.

3.7 CLEANING AND DISPOSAL

A. **Disposal**. The Contractor is responsible for the removal from the job site and, if necessary, safe disposal of all excess material and debris as a result of the work completed under this section, including testing procedures.

3.8 PROTECTION

A. Requirements

1. The Contractor shall be responsible for provisions to protect the sections tested and approved, but prior to acceptance by the Owner.
2. Protection of the tested and approved piping sections shall include provisions during installation and testing of nearby piping, valving, or other adjacent equipment.
3. The Contractor shall remove all protective measures installed at completion and acceptance of the project.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide the labor, tools, and equipment necessary to remove and salvage or dispose of the structures or portions thereof as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies**. Perform all demolition and disposal work in compliance with all federal, state, and local codes and regulatory agencies.

B. **Protection**. Ensure safe passage of persons and vehicles around area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities and injury to persons.

1.4 SUBMITTALS

A. **Schedule of Demolition**. Submit to the Owner a proposed schedule of demolition for the purposes of coordinating shutoff, capping, and continuation of utility services as required to operate the facility.

B. **Photographs**. Submit photographs of adjacent areas and structures affected by this demolition.

1.5 JOB CONDITIONS

A. **Beginning Work**. Structures to be demolished will be vacated and their use discontinued prior to start of work.

B. **Protection**

1. Structural. Prior to the removal of any wall, beam, or column, or cutting of any openings, examine the existing structure and, when required, protect the structure by shoring, bracing, or underpinning.
2. Equipment and Tanks. Protect all equipment and tanks from dust, dirt, debris, and damage by covering with planking and tarpaulins during demolition.

C. **Explosives**. Do not use explosives.

1.6 **DELIVERY, STORAGE, AND HANDLING**

A. **General**. Handle, store, and protect items removed and stored or reset in accordance with Section 01 60 00 and the manufacturer's instructions.

1.7 **SPECIAL WARRANTY**

Not used.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 **EXAMINATION**

A. **Site Verification**. Verify the actual areas, structures or parts of structures, pipes, or other items to be demolished in the presence of the Owner and Engineer/Architect.

3.2 **PREPARATION**

A. **Equipment and Manpower**. Have all required equipment and manpower available at the job site prior to beginning of demolition. This includes any special equipment to permit continued uninterrupted Owner operations as required.

B. **Coordination**. Provide adequate but no less than 48 hours of notice when any Owner operations are affected by demolition.

3.3 **DEMOLITION**

A. **Demolition Schedule**. Perform demolition work in accordance with the final approved schedule of demolition.

B. **Salvage**

1. Material and Equipment. Remove with care, clean, and store at the site in an approved area all material and equipment designated to be salvaged.

C. **Openings**

1. Concrete. Close concrete openings using a nonshrink, nonmetallic grout.
2. New. Neatly cut or drill new openings to prevent face chipping or spalling. Repair all damaged areas to a condition equivalent to that which existed prior to the start of work.

D. **Patching Concrete**

1. Repair all concrete that has been marred, damaged, or defaced as a result of demolition.

2. Procedure. Repair concrete surfaces as follows:

   a. Saw cut and remove concrete to a depth of not less than 1 inch.
   b. Remove exposed reinforcing where noted.
   c. Apply an approved bonding agent to the cut surface.
   d. Patch with a nonshrink, nonmetallic grout finished to match the existing surface unless noted otherwise.

E. **Anchors**. Cut all embedded anchors of removed items flush with the existing surface.

F. **Pipe**. Plug all abandoned pipe at each end.

G. **Cleanup**. Remove from the site all debris, rubble, unusable materials, and items not salvaged.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Furnish and install the cast-in-place concrete in accordance with the drawings and as specified herein.

1. This section specifies cast-in-place concrete, including formwork, reinforcing, mix design, accessories, placement procedures, joints, finishes, curing, supports for equipment and piping, and grout toppings for tanks.
2. Other specification sections may reference this section for other cast-in-place concrete items.
3. Install embedded items required for material and equipment specified in other divisions of these specifications.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies**. Perform all work in compliance with all federal, state, and local codes and regulatory agencies.

B. **Standards**. Comply with the provisions of the following standards:

1. ACI – American Concrete Institute.
2. ASTM – American Society for Testing and Materials.
3. CRSI – Concrete Reinforcing Steel Institute.
4. AASHTO – American Association of State Highway and Transportation Officials.
5. AWWA – American Water Works Association.
6. NSF – National Science Foundations.

C. **Concrete Testing Service**. Engage an acceptable laboratory to perform material evaluation tests and to design concrete mixes.

D. **Testing**. Materials and installed work may require testing and retesting at any time during progress of work. Retesting of rejected materials or installed work shall be done at Contractor's expense.

E. **Concrete Conference**. Conduct conference at project site to comply with the following:

1. Prior to submittal of design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Request that representatives of each entity directly concerned with cast-in-place concrete attend conference, including, but not limited to, the following:

   a. Contractor's superintendent.
   b. Laboratory responsible for concrete mix design.
   c. Laboratory responsible for field quality control.
   d. Ready-Mix concrete supplier.
   e. Concrete subcontractor.
   f. Primary admixture manufacturers.
   g. Engineer/Architect or Owner's Representative.

2. Concrete conference may be waived by the Engineer/Architect or Owner's Representative.

1.4 SUBMITTALS

A. General

1. Submit all submittals in accordance with the Division 1 Submittal Requirements and the requirements within this specification section.

B. Submittal Package No. 1 – Shop Drawings and Product Data

1. Product Data. Submit product data for materials and items, such as cement, reinforcement, embedded forming accessories, admixtures, patching compounds, waterstops, joint systems, and curing compounds.

2. Shop Drawings and Submittals.

   a. Reinforcement. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 (88), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures, and dowel reinforcement for masonry.
   b. Concrete Mix Designs. Submit concrete mix designs for each class of concrete to be used on the project including specifics regarding admixtures proposed for each mix design. Include concrete test reports to substantiate trial batch mixes or previous performance of the same mix design.
   c. Materials Certificates. Submit materials certificates with the concrete mix design. Materials certificates shall be signed by manufacturer certifying that each material item complies with or exceeds specified requirements. Provide certification from

admixture manufacturers that chloride content complies with specification requirements.

d. Construction Joint Locations. Submit details which clearly show where construction joints are intended to be placed in walls, slabs, columns, beams, at stairwells, etc.

e. Box Outs. Submit proposed locations of box outs.

3. Testing Laboratories. Submit the names of the testing laboratories proposed for use to perform the material evaluation tests and also to perform the field quality control testing. An ACI certified technician shall perform all concrete testing.

C. **Submittal Package No. 2 – Batch Tickets**

1. Batch Tickets. Submit batch tickets for each load of concrete used on the job. Each ticket shall indicate the design mix, the project name, the date, the time of batching, and the truck number.

D. **Submittal Package No. 3 – Test Reports**

1. Concrete Test Reports. Submit two copies of all concrete test reports from the concrete testing laboratory directly to the Engineer/Architect.

1.5 JOB CONDITIONS

A. **Coordination**. Coordinate installation of joint materials, embedded items, vapor retarders, etc., with placement of forms and reinforcing steel. Coordinate concrete work with all other trades to prevent delays, errors, or omissions.

B. **Reference Material**. Provide a copy of ACI SP-15, Field Reference Manual, in the field office at all times during concrete construction.

C. **Climatic Conditions**. Perform placement and curing of concrete under various weather conditions in accordance with ACI 301, "Specifications for Structural Concrete for Buildings," ACI 305, "Hot Weather Concreting," and ACI 306, "Cold Weather Concreting," except as modified herein.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **General**. Comply with ACI 304, "Recommended Practice for Measuring, Mixing, and Placing Concrete."

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms

1. Forms for exposed finish concrete shall be plywood, metal, metal framed plywood faced, or other acceptable panel type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

2. Forms for unexposed finish concrete shall be plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

3. Forms for cylindrical columns and supports shall be metal, fiberglass reinforced plastic, or paper or fiber tubes. Provide paper or fiber tubes of laminated plies with water resistant adhesive and wax impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

4. Form coatings shall be commercial formulation form coating compounds with a maximum volatile organic compound (VOC) of 350 milligrams per liter (mg/l) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

5. Form ties shall be factory-fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1 inch to exposed surface.

   a. Provide ties that, when removed, will leave holes not larger than 1 1/2 inch diameter in concrete surface.

B. Reinforcing Materials

1. Reinforcing Bars. ASTM A 615, A 616, including Supplemental Requirement S1, or A 617; Grade 60, deformed.

2. Epoxy Coated Reinforcing Bars. ASTM A 775.

3. Welded Wire Fabric. ASTM A 185, welded steel wire fabric, provided in flat sheets.

4. Supports for Reinforcement. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use steel bar supports or precast concrete bar supports complying with CRSI specifications.

a. For slabs on grade, use steel bar supports with sand plates or horizontal runners or precast concrete bar supports where base material will not support chair legs.

b. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel (CRSI, Class 2).

C. **Concrete Materials**

1. Portland Cement. ASTM C 150, Type I or Type II in areas where alkali-aggregate reaction is a problem. Use one brand of cement throughout project.

2. Fly Ash. ASTM C 618, Type C or Type F including supplementary optional physical requirements, except loss on ignition shall not exceed 3 percent.

3. Normal Weight Aggregates. ASTM C 33 and as herein specified.

a. For exposed concrete, provide aggregates from a single source.

b. For exterior exposed surfaces, do not use fine or coarse aggregates containing deleterious substances which might cause spalling.

c. Fine Aggregate. Fine aggregate shall consist of natural sand or manufactured sand.

d. Coarse Aggregate. Coarse aggregate shall consist of crushed rock, gravel, or crushed gravel.

1) Grading. The coarse aggregate shall conform to requirements for Size 57, unless otherwise approved by the Engineer/Architect.
2) Deleterious substances shall not exceed the percentages for Class 4S in ASTM C 33.

4. Water. Potable.

5. Admixtures, General. Provide admixtures for concrete that contain not more than 0.05 percent chloride ions by weight of cement when tested in accordance with AASHTO T260. Certificate from admixture manufacturer will be required prior to mix design review.

a. Air-Entraining Admixture. ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1) Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a) Darex II or Daravair, W.R. Grace & Co.
b) MB-VR or Micro-Air, Master Builders, Inc.
c) Sika AER, Sika Corp.
d) AEA-92 or Air Mix 200, Euclid Chemical Co.

b. Water-Reducing Admixture. ASTM C 494, Type A.

1) Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a) Eucon WR-75 or WR-89, Euclid Chemical Co.
b) WRDA with Hycol, or Daracem-55, W.R. Grace & Co.
c) Pozzolith 220-N, Pozzolith 322-N, or Polyheed, Master Builders, Inc.
d) Plastokrete 161, Sika Corp.

c. High-Range Water-Reducing (HRWR) Admixture (Super Plasticizer). ASTM C 494, Type F or Type G.

1) Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a) Eucon 37, Euclid Chemical Co.
b) Daracem 19, Daracem ML330, or Daracem ML500, W.R. Grace & Co.
c) Rheobuild, Master Builders, Inc.
d) Sikament 300, Sika Corp.

d. Noncorrosive, Nonchloride Accelerating Admixture. ASTM C 494, Type C or E.

1) Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a) Accelguard 80, Euclid Chemical Co.
b) Polarset, W.R. Grace & Co.
c) Pozzutec 20, Master Builders, Inc.

e. Water-Reducing, Retarding Admixture. ASTM C 494, Type D.

1) Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a) Eucon Retarder 75, Euclid Chemical Co.
b) Daratard-17, W.R. Grace & Co.
c) Pozzolith R, Master Builders, Inc.
d) Plastiment, Sika Corporation.

2.2 ACCESSORIES

A. **Reglets**. Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217-inch-thick (26-gauge) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. **Polyvinyl (PVC) Chloride Waterstops**. Corps of Engineers CRD-C 572. Waterstops for construction joints shall be serrated type without center bulb and at least 3/8 inch thick and 6 inches wide. Waterstop for expansion joints shall be serrated type with center bulb and at least 3/8 inch thick and 9 inches wide.

1. Available Manufacturers. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

a. The Burke Co.
b. Greenstreak Plastic Products Co.
c. W.R. Meadows, Inc.
d. DuraJoint.

C. **Bitumen Waterstops**. Provide a single component self-sealing plastic adhesive type waterstop which is nonoxidizing, nonevaporating, nonexpanding, nonshrinking, and resistant to water, chemicals, and saturated hydrogen sulfide.

1. Available Manufacturers. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

a. Synko-Flex, Synko-Flex Products.
b. Seal-Tite, DuraJoint.

D. **Sand Cushion**. Clean, manufactured or natural sand conforming to ASTM C 33 or C 144.

E. **Vapor Retarder**. Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:

1. Polyethylene sheet not less than 10 mils thick.

F. **Chemical Hardener**. Chemical hardener shall be a colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 pounds of fluosilicates per gallon. Hardener shall be used on existing concrete where noted.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Surfhard, Euclid Chemical Co.
b. Lapidolith, Sonneborn-Rexnord.
c. Burk-O-Lith, The Burke Co.
d. Fluohard, L&M Construction Chemical, Inc.

G. **Sealer/Dustproofer**. Floor hardener compound for new concrete shall be an acrylic containing not less than 14 percent solids.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. VOC Compliant Products.

1) Super Diamond Clear VOX, Euclid Chemical Company.
2) Dress and Seal WB30, L&M Construction Chemicals, Inc.

H. **Absorptive Cover**. Burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard, complying with AASHTO M 182, Class 2.

I. **Moisture-Retaining Cover**. One of the following complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene coated burlap.

J. **Curing Compound**. The compound shall be a clear styrene acrylate type, 30 percent solids content minimum, and have test data from an independent testing laboratory indicating a maximum moisture loss of 0.55 kilograms (kg) per square meter when applied at a coverage rate of 200 square feet per gallon. Verify compatibility of curing compound with finishes to be used.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. VOC Compliant Products.

1) Super Diamond Clear VOX, Euclid Chemical Company.
2) Dress and Seal WB30, L&M Construction Chemicals, Inc.

K. **Evaporation-Control Compound**. Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Aquafilm, Conspec Marketing and Mfg. Co.
b. Eucobar, Euclid Chemical Co.
c. E-Con, L&M Construction Chemicals, Inc.
d. Confilm, Master Builders, Inc.

L. **Bonding Compound**. Polyvinyl acetate or acrylic base.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Polyvinyl Acetate (Interior Only).

1) Superior Concrete Bonder, Dayton Superior Corp.
2) Euco Weld, Euclid Chemical Co.
3) Weld-Crete, Larsen Products Corp.
4) Everweld, L&M Construction Chemicals, Inc.

b. Acrylic or Styrene Butadiene.

1) SBR Latex, Euclid Chemical Co.
2) Daraweld C, W.R. Grace & Co.
3) Acryl-Set, Master Builders, Inc.
4) Stonlock LB2, Stonhard, Inc.

M. **Epoxy Adhesive**. ASTM C 881, two-component material suitable for use on dry or damp surfaces.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Euco Epoxy System #452 or #620, Euclid Chemical Co.
b. Epabond, L&M Construction Chemicals, Inc.
c. Concresive 1001, Master Builders, Inc.
d. Sikadur 32 Hi-Mod, Sika Corp.

N. **Expansion Joint and Isolation Joint Material.** Self-expanding cork conforming to ASTM D 1752, Type III.

2.3 **MIXES**

A. **General.** Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, retain an independent testing facility acceptable to Engineer/Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

1. Submit mix designs to Engineer/Architect of each proposed mix for each class of concrete at least 15 days prior to start of work.
2. Do not begin concrete production until proposed mix designs have been reviewed by Engineer/Architect.
3. Limit use of fly ash not to exceed 25 percent of cement content by weight. In areas where alkali aggregate reaction is a problem, do not add less than 20 percent fly ash by weight. When used, fly ash shall replace cement at a 1:1 ratio for Class C fly ash and a 1.25:1 ratio for Class F fly ash (Class F fly ash to cement). Adjust weights of concrete materials to provide the correct yield.

B. **Design Mixes.** Provide normal weight concrete with the following properties, unless otherwise indicated on drawings and schedules. Tolerance for air content shall be ±1 percent.

1. Class A. 4,000 pounds per square inch (psi), 28-day compressive strength.
   a. Water/Cementitious Product (w/c) ratio, 0.45 maximum; minimum cement, 6.5 bags (611 pounds) per cubic yard (cy).
   b. 6 percent air.
2. Class B. 3,000 psi, 28-day compressive strength.
   a. w/c ratio, 0.50 maximum; minimum cement, 5.75 bags (541 pounds) per cy.
   b. 6 percent air.
3. Class C. 2,000 psi, 28-day compressive strength.
   a. w/c ratio, 0.6 maximum; minimum cement, 4.0 bags (376 pounds) per cy.
   b. 6 percent air.
4. Class D.
   a. w/c ratio, 0.45 maximum; minimum cement, 9.0 bags (846 pounds) per cy.
   b. Fine aggregate to cement ratio shall not exceed 3.0 by weight.
   c. 6 percent air.

C. **Slump Limits**. Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps and sloping surfaces. Not more than 3 inches.
2. Reinforced foundation systems. Not less than 2 inches and not more than 4 inches.
3. Concrete containing HRWR admixture (Superplasticizer). Not more than 8 inches after addition of HRWR to site verified 2-inch to 3-inch slump concrete without HRWR.
4. Other concrete. Not more than 4 inches for slabs and 5 inches for walls, curbs, bases, and other miscellaneous concrete.

D. **Chloride Content**. The maximum water-soluble chloride ion content, expressed as a percent by weight of cement contributed by all ingredients of the concrete mix shall not exceed 0.10 percent.

E. **Controlled Density Fill**. The fine aggregates shall be fine enough to stay in suspension in the mixture to the extent required for proper flow. Provide controlled density fill with the following properties, unless otherwise indicated:

1. 100 psi, 28-day compressive strength.

    a. Cement, 100 pounds.
    b. Fly Ash, 250 pounds.
    c. Fine Aggregate, Saturated Surface Dry, 2,800 pounds.
    d. Water, 500 pounds maximum.

2. For controlled density fill, it is necessary for bleed water to appear on the surface immediately after the fill is struck off. A delay in bleeding indicates there are too many fines in the mixture, so reduce the fly ash quantity in increments of 50 pounds until mixture is bleeding freely. Add approximately 60 pounds of sand to replace each 50-pound increment of fly ash to maintain the original yield.

F. **Dry Pack Mortar**. Mix dry pack, consisting of one part portland cement to 2 1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

G. **Cement Mortar**. A mixture of sand, cement, and water in the same proportions used for the concrete being placed, but with all coarse aggregate omitted.

H. **Adjustment to Concrete and Controlled Density Fill Mixes**. Request mix design adjustments when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer/Architect. Submit laboratory test data for revised mix design and strength results for acceptance before using in work.

I. **Admixtures**

1. Use of Admixtures.

a. Use water-reducing admixture for placement and workability in all classes of concrete unless noted otherwise.
b. A noncorrosive nonchloride accelerating admixture may be used in concrete slabs placed at ambient temperatures below 50 degrees Fahrenheit (° F.) (10 degrees Celsius [° C.]) when approved.
c. Use air-entraining admixture where specified in the design mix. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content as indicated in the design mix.

J. **Concrete Mixing**

1. Ready Mix Concrete. Comply with requirements of ASTM C 94 and as specified.

a. When air temperature is between 85° F. (30° C.) and 90° F. (32° C.), mixing and delivery time shall not exceed 75 minutes. When air temperature is above 90° F. (32° C.), mixing and delivery time shall not exceed 60 minutes unless approved otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Tolerances**. Unless otherwise specified, tolerances shall be in accordance with ACI 117 and ACI 301.

B. **Inspection**. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit installation of their work; cooperate with other trades in setting such work. Verify that all wood, dirt, foreign objects, and all other debris have been removed from inside the formwork. Verify that reinforcing steel is spaced to provide the proper coverage against forms and against earth for slabs on grade. When requested, provide documentation of inspection prior to placing concrete.

C. **Site and Weather Conditions**. Do not place concrete when site conditions exist such as standing water, extreme heat or cold, etc., unless the proper precautions have been taken to properly place and protect concrete as recommended by ACI and as acceptable. Do not place concrete on frozen ground.

3.2 PREPARATION

A. Forms

1. General. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Maintain formwork construction tolerances complying with ACI 347.

2. Forms. Construct forms to sizes, shapes, lines, position, elevation, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

3. Fabrication of Forms. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

4. Openings. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

5. Exposed Corners and Edges. Chamfer exposed corners and edges using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

6. Provisions for Other Trades. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

7. Cleaning and Tightening. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

8. Form Coatings. Coat contact surfaces of forms with an approved, nonresidual, low VOC, form coating compound before reinforcement is placed.

a. Do not allow excess form coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
b. Coat steel forms with a nonstaining, rust preventative material. Rust stained steel formwork is not acceptable.
c. Form coatings for use in water treatment plants shall be nontoxic after 30 days from the date the forms are removed.

B. **Reuse of Forms**

1. Clean and repair surfaces of all forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
2. Successive Reuse. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable.

3.3 INSTALLATION

A. **Vapor Retarder Installation**

1. General. Install vapor retarder where shown on drawings. Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour.
2. Lapping. Lap joints 6 inches and seal vapor barrier joints with manufacturer's recommended mastic and pressure sensitive tape.
3. Protection. After placement of vapor retarder, cover with sand cushion, dampen and compact to 100 percent as determined by ASTM D 698 to the depth as shown on drawings. Sand shall be free of self-draining water when concrete is placed.

B. **Placing Reinforcement**

1. General. Comply with CRSI's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as herein specified.

   a. Avoiding cutting or puncturing vapor retarder barrier during reinforcement placement and concreting operations.

2. Cleaning. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

3. Installation.

   a. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved.
   b. Place reinforcement to obtain at least minimum coverages for concrete protection as noted in ACI 301. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
   c. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh plus 2 inches or 8 inches and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. **Joints**

1. Construction Joints. Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable.

   a. Provide keyways 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.

   b. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.

   c. The maximum length of wall pours shall not exceed 40 feet, and slab pours shall not exceed 40 feet in length or width.

   d. Bond fresh concrete to hardened new concrete as follows:

      1) For horizontal joints, place new concrete on a 1-inch layer of cement mortar evenly spread over the previously placed concrete. Thoroughly clean and remove laitance of previously placed concrete.
      2) For vertical joints, thoroughly clean the surface of the hardened concrete and remove all laitance prior to placing new concrete.

   e. If noted on the drawings, prior to placement of new concrete against old existing concrete, apply bonding agent to surface of old concrete, if accessible, immediately before placement of new concrete.

f. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops in accordance with manufacturer's printed instructions. Provide continuous waterstops in construction joints as follows:

1) Liquid-bearing walls and slabs.
2) Walls or slabs subject to groundwater and/or in contact with ground.
3) Elsewhere as indicated.

2. Isolation Joints in Slabs-on-Ground. Construct isolation joints as indicated in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as shown. Fill joints where noted with sealant specified in Division 7 sections of these specifications.

3. Contraction (Control) Joints in Slabs-on-Ground. Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth, unless otherwise indicated. In lieu of saw cutting and with, the Contractor may form contraction 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. After concrete has cured, remove inserts and clean groove of loose debris.

a. Saw-cut as soon as possible after slab finishing without dislodging aggregate.
b. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
c. Provide joint, filler, and sealant materials where shown.

4. Control Joints in Retaining Wall. Provide control joints at 32 feet on center maximum unless otherwise shown. Provide 1-1/2 inch deep by 1/3 wall thickness vertical keyway. Horizontal reinforcing shall not pass through joint. Joints need not be provided in retaining wall footings.

5. Expansion Joints. Construct expansion joints where shown. If not shown, provide expansion joints at interval not to exceed the following:

a. Retaining Walls. 96 feet (not required in footings).

6. Waterstop. Provide waterstops in all joints shown on the drawings and as listed in this specification.

a. Provide PVC waterstops in all joints unless noted or specified otherwise.

b. Properly support and wire all waterstops to reinforcing to remain straight and true. Heat-splice all joints per manufacturer's recommendations.

c. Provide bitumen waterstop in joint between new and existing concrete.

D. **Installation of Embedded Items**

1. Set and build into the work, anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by other prime Contractors and suppliers of items to be attached thereto.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
3. Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting type screeds.

E. **Concrete Placement**

1. Location. Provide concrete as specified in the table below unless otherwise indicated on the drawings.

Location	Design Mix
All reinforced concrete and nonreinforced fillets	4,000 psi Class A
Nonreinforced concrete not designated as Class A, C, or D	3,000 psi Class B
Nonreinforced so designated on plans	2,000 psi Class C
Grout fill or topping as designated on plans	Class D

2. General. Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

a. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness, or to be resistant to the penetration of a vibrator. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

3. Placing Concrete in Forms. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

   a. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
   b. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete around reinforcement and other embedded items without causing segregation of mix.

4. Placing Concrete Slabs. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

   a. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners. When epoxy coated reinforced steel is used, vibrators shall have nonmetallic heads.
   b. Bring slab surfaces to correct level with straightedge and strike off. Use highway straightedge, bull floats, darbies, or other means to obtain a smooth surface which is free of humps or hollows and that conforms to the required flatness and levelness. Do not disturb slab surfaces prior to beginning finishing operations.
   c. Maintain reinforcing in proper position during concrete placement.

5. Cold Weather Placing. Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

   a. When air temperature has fallen to or is expected to fall below 40° F. (4° C.), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50° F. (10° C.) and not more than 80° F. (27° C.) at point of placement.
   b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

6. Hot Weather Placing. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

a. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90° F. (32° C.). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
b. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
c. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
d. Use water reducing retarding admixture when required by high temperatures or other adverse placing conditions, when acceptable to Engineer/Architect.
e. Use evaporation control compound in accordance with manufacturer's recommendations or fogging.

7. Adjusting Concrete Slump at Job Site.

a. Slump Greater than Specified. Do not use concrete with slump greater than specified.

b. Slump Less than Specified. If on arrival at the job site, the slump of the concrete is less than specified, the following remedies may be used at the Contractor's option.

1) Add water only if the maximum specified w/c ratio is not exceeded.
2) Additional water shall be accompanied by a quantity of cement sufficient to maintain the specified w/c ratio.
3) Add an approved water reducing admixture.

F. **Controlled Density Fill Placement**

1. General. Unless noted otherwise, place controlled density fill in overexcavated areas under slabs, in utility trenches within roadways, and as directed by the Engineer/Architect.
2. Mixing Equipment. Sufficient mixing capacity of mixers shall be provided to permit the fill to be placed without interruption.
3. Placing Fill. Flowable fill shall be discharged from the mixer by any reasonable means into the space to be filled. The fill material shall be brought up uniformly to the fill line shown on the plans or as directed.

Placing of any material over low strength fill may commence as soon as the surface water is gone or as directed.

G. **Finish of Formed Surfaces.** Inside face of covered basins, clear wells and reservoirs, filters below the media line, open tanks and flumes below water or flow lines, and the outside of structures below finish grade lines shall be classified as not exposed to view.

1. Finish. Finish formed concrete surfaces in accordance with the schedule below.

Location	Type of Finish
Concrete surfaces not exposed to view or surfaces to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or other similar system	Smooth form finish
Concrete exposed to view including surfaces which will be painted	Smooth rubbed finish or grout-cleaned finish

2. Smooth Form Finish. This is an as-cast concrete surface obtained with selected form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

3. Smooth Rubbed Finish. Provide smooth-rubbed finish not later than 1 day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

4. Grout-Cleaned Finish. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout with the consistency of thick paint. Substitute white portland cement for a part of the gray portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap, or other means. After the surface whitens from drying, rub with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

5. Related Unformed Surfaces. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed

surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

H. **Slab Finishes**

1. Finish. Finish slab surfaces in accordance with the schedule below unless finish is specifically noted on the drawings:

Location	Type of Finish
Slabs to receive grout topping	Rough finish
Slabs to receive concrete topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated	Scratch finish
Slabs to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated	Float finish
Slabs of tanks, flumes, channels, wet wells, etc., which are submerged including grout toppings	Trowel finish after float finishing
Slabs to be exposed to view or covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system	Trowel finish after float finishing
Location	**Type of Finish**
Slabs to be covered with ceramic quarry tile installed with thin set mortar	Float finish followed by trowel and fine broom finish
Exterior concrete platforms, steps, ramps, and elsewhere as indicated	Float finish followed by nonslip broom finish

2. Floor Levelness, General. Floor levelness requirements below do not apply to sloped slabs or unshored slabs on metal deck.

3. Scratch Finish. After placing slabs, plane surface to tolerances for floor flatness (Ff) of 20 and floor levelness (Fl) of 17. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

4. Float Finish. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of Ff 25 - Fl 20. Cut down high spots and fill

low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

5. Trowel Finish. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 50 - Fl 35. Grind smooth surface defects that would telegraph through applied floor covering system.

6. Trowel and Fine Broom Finish. Apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

7. Nonslip Broom Finish. Immediately after float finishing, slightly roughen concrete surface by brooming with stiff fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer/Architect before application.

8. Rough Finish. The bottom of concrete tanks which are to receive grout topping shall receive a rough finish for maximum adhesion. The surface to receive the grout topping shall be intentionally roughened to a minimum amplitude of 1/4 inch.

9. Chemical Hardener Finish. Apply chemical hardener finish to existing interior concrete floors where indicated. Clean floors and allow to dry before applying hardener.

   a. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.
   b. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

10. Sealer/Dustproofer Finish. All exposed surfaces and floors within buildings which will be subject to pedestrian or vehicular traffic under normal operation, shall be treated to seal and dustproof the surface. This shall be accomplished by the use of a liquid sealer/dustproofer applied in three applications in accordance with the manufacturer's directions. Application of the sealer/dustproofer shall be performed as late as possible and just prior to completion of construction.

I. **Placing Grout Toppings**. Grout toppings shall be Class D concrete mix design unless noted otherwise.

1. Procedure.

   a. Prior to placement of the structurally bonded topping, remove all laitance, debris, and loose and foreign material from the base

slab. Use water-blasting, sandblasting, or other methods acceptable to the Engineer/Architect.

b. Thoroughly wet the base slab before placing the grout topping. Remove all standing water from the surface prior to placing neat cement grout.

c. Brush in neat cement grout as a bonding agent immediately before application of grout topping. Do not allow neat cement grout to set prior to placing grout topping.

d. Where recommended by manufacturer; use the tank mechanism to screed the grout on the tank floor as it is placed. Screed in accordance with the manufacturer's instructions.

e. Trowel finish topping as specified above.

f. Moisture cure grout toppings as specified herein.

J. **Miscellaneous Concrete Items**

1. Filling In. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

2. Equipment Bases and Foundations. Provide machine and equipment bases and foundations, as shown on drawings. Set anchor rods for machines and equipment complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.4 CONCRETE SURFACE REPAIRS

A. **Patching Defective Areas**. Repair and patch defective areas and plug form tie holes with cement mortar immediately after removal of forms, when acceptable to Engineer/Architect.

1. Cut out honeycomb, rock pockets, and voids over 1/4 inch in any dimension down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding compound. Place patching mortar before bonding compound has dried.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface. After shrinkage has occurred, grind surface until flush.

B. **Repair of Formed Surfaces**. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer/Architect. 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.

C. **Repair of Unformed Surfaces**. Repair or replace supported slabs that fail to meet the specified finish requirements. Correct levelness and flatness, and low and high areas as herein specified. For slabs on grade, remove slab between control joints and replace with concrete slab meeting floor finish and tolerances. For all other unformed surfaces, repair as follows:

1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Underlayment compounds may be used when acceptable.
4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

D. **Miscellaneous Repairs**. Repair isolated random cracks and single holes not over 1 inch in diameter by dry pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry pack mortar before bonding compound has dried. Compact dry pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

E. **Approval**. Perform structural repairs with prior approval of Engineer/Architect for method and procedure, using specified epoxy adhesive and mortar.

F. **Alternative Repair Methods**. Repair methods not specified above may be used, subject to acceptance.

3.5 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. **General**. Employ an approved testing laboratory to perform tests and to submit test reports. ACI Grade 1 certified technician employed by the testing laboratory shall be present during the placing of all concrete. The concrete testing laboratory shall send two copies of all test reports directly to the Engineer/Architect.

B. **Sampling Fresh Concrete.** Sample concrete in accordance with ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump. Slump tests shall be performed at the point of truck discharge prior to adding plasticizers in accordance with ASTM C 143. For each class of concrete, perform one test for each compressive strength test and additional tests when concrete consistency seems to have changed. If the slump is adjusted at the job site, the concrete testing agency shall be responsible for reporting the following.

   a. Method used to adjust slump.
   b. Quantity of each material added.
   c. Resulting slump.

2. Air Content. Perform daily for each class of concrete placed in accordance with ASTM C 173 volumetric method for lightweight concrete; ASTM C 231 pressure method for normal weight concrete; one test for each compressive strength test, one test for the first load of each type of air entrained concrete delivered, and one test for each truck when air content is adjusted until consistent results are obtained.

3. Concrete Temperature. Test hourly when air temperature is 40° F. (4° C.) and below, when 80° F. (27° C.) and above, and each time a set of compressive test specimens is made.

4. Compressive Test Specimen. Perform in accordance with ASTM C 31 and as follows:

   a. Prepare one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are required. Contractor may also prepare field cured test specimens to be used for early form removal.
   b. Prepare one set of cylinders for each 100 cy of concrete or fraction thereof, of each concrete class placed in any one day.
   c. Perform compressive strength tests in accordance with ASTM C 39. Test one specimen at 7 days, and two specimens at 28 days, and hold one specimen in reserve for later testing if required.
   d. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
   e. When total quantity of a given class of concrete is less than 50 cy, Engineer/Architect may waive strength test if adequate evidence of satisfactory strength is provided.
   f. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

g. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. **Compressive Strength Test Reporting**. Test results will be reported in writing to Engineer/Architect, Ready-Mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. **Flatness and Levelness**. Conduct random tests for flatness and levelness in accordance with ASTM E 1155 within 24 hours after final finish and as directed. Pay the cost for testing and any retesting of the areas found not to conform to the specifications after the Contractor has corrected the defects.

E. **Floor Slope**. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope within 24 hours after final finish and as directed.

F. **Nondestructive Testing**. Impact hammer, ultrasonic pulse velocity, or other nondestructive device may be permitted if approved, but shall not be used as the sole basis for acceptance or rejection.

G. **Additional Tests**. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. These tests shall be as directed. Testing service shall conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Be responsible for all costs associated with such tests.

3.6 DEMONSTRATION

A. **General**. Prior to final acceptance of concrete work, demonstrate to representatives of the Owner and the Engineer/Architect that there are no mechanical defects or damaged areas and that concrete exposed to view is acceptable as to function and appearance.

1. Walls and Other Formed Surfaces. Representatives of the Owner, Contractor, and Engineer/Architect shall review concrete work to verify that tie holes and air voids have been patched, seams have been ground smooth, all surface defects have been repaired, and all rubbed or rubbed and painted surfaces are acceptable in appearance.
2. Floors. Representatives of the Owner, Contractor, and Engineer/ Architect shall review concrete work to verify that all surface defects have been repaired, all stains removed, residue from floor sealer/dustproof or chemical hardener has been removed, and that the

required finish is acceptable. Where requested, flood selected areas of floor to a depth satisfactory to demonstrate that the area or areas drain properly to the floor drains and sumps and that there are no areas ponding water outside acceptable tolerances. Furnish water for testing and convey it to the areas being examined.

3. Liquid-Bearing Structures. All structures designed to hold water or other liquids shall be demonstrated to be watertight in accordance with ACI 350 and Section 01 89 19, "Leakage Test and Disinfection."

B. **Repair or Replacement of Defective Work.** Correct concrete work which is unacceptable in accordance with paragraph 3.4 of this section entitled "Concrete Surface Repairs." Remove concrete which, in the opinion of the Engineer/Architect, cannot be repaired satisfactorily and replace in an acceptable manner at no additional cost to the Owner.

3.7 CONCRETE CURING AND PROTECTION

A. **General.** Protect freshly placed concrete from premature drying and excessively cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation control compound. Apply in accordance with manufacturer's instructions.

B. **Curing Duration.** Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 7 days. Maintain concrete temperatures as recommended in ACI 301 throughout the curing period.

C. **Curing Methods.** Perform curing of concrete by curing compound, by moist curing, by moisture-retaining-cover curing, and by combinations thereof in accordance with the schedule below unless curing method is specifically noted on the drawings. If unspecified, Contractor may opt for any of the methods specified below. Prior to use of curing compound on any surface, verify compatibility between curing compound and finish surface treatment.

Location	Curing Method
Floors and other unformed concrete surfaces	Any specified curing method
Formed concrete surfaces	Moist curing prior to form removal, followed by any of the methods specified below
Slabs to receive grout topping	Moisture cure
All other concrete	Any specified curing method

1. Moisture Curing. Provide moisture curing by following methods:

   a. Keep concrete surface continuously wet by covering with water.
   b. Use continuous water fog spray.
   c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete

surfaces and edges, with 4-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing. Provide moisture-cover curing as follows:

   a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound. Provide curing compound as follows:

   a. Apply specified curing compound to concrete as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). For formed surfaces, apply curing compound immediately after form removal. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Apply in two coats, spread in perpendicular directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
   b. Use curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
   c. Do not use curing compounds on surfaces which are to be covered with coating material applied directly to concrete, chemical hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue down carpet that is not compatible with curing compound), painting, and other coatings and finish materials, unless otherwise approved.

3.8 **SHORES AND SUPPORTS.** Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.

A. **Extend shoring from ground to roof** for structures four stories or less, unless otherwise permitted.

B. **Extend shoring at least three floors** under floor or roof being placed for structures over four stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

C. **Remove shores and reshore** in a planned sequence to avoid damage to partially cured concrete or to supporting floors. Locate and provide adequate reshoring to support work without excessive stress or deflection.

D. **Keep reshores in place** a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.9 REMOVAL OF FORMS

A. **Formwork which is not supporting** the weight of concrete, such as sides of beams, walls, columns, and similar parts of the work may be removed after cumulatively curing at not less than 50° F. (10° C.) for 24 hours after placing concrete, provided concrete is sufficiently hard not to be damaged by form removal operations, and provided curing and protection operations are maintained.

B. **Formwork supporting weight** of concrete, such as beam soffits, joists, slabs, and other structure elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field cured specimens representative of concrete location or members.

C. **Form facing material may be removed** 3 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.10 PROTECTION OF FORMED AND UNFORMED CONCRETE SURFACES.

Protect concrete from damage or discoloration during the construction period caused by subsequent work performed by all other trades, including, but not limited to, concrete forming, resteel placement, equipment installation, plumbing work, electrical work, construction loading to the point of overstressing concrete, and all other actions which might adversely affect the strength or appearance of the concrete. Repair of chipped or damaged concrete and removal of rust, stains, efflorescence, and surface deposits shall be accomplished by acceptable methods.

END OF SECTION

SECTION 05 00 00

MISCELLANEOUS METALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide the labor, tools, equipment, and materials necessary to furnish and install the miscellaneous metals in accordance with the drawings and the specifications.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies**. Furnish and install the miscellaneous metals in compliance with all federal, state, and local codes and regulatory agencies.

1. OSHA – Occupational Safety and Health Administration.

B. **Fabricator Qualifications.** The fabricator shall participate in the AISC Certification program and be designated as an AISC Certified Plant, Category STD at time of bid.

C. **Standards.** Ensure that materials and workmanship are in accordance with the following standards referenced herein.

1. ASTM – American Society for Testing and Materials.
2. AWS – American Welding Society.
3. AISC – American Institute of Steel Construction.

1.4 SUBMITTALS

A. **General**

1. Submit all submittals in accordance with the Division 1 Submittal Requirements and the requirements within this specification section.

B. **Submittal Package No. 1 – Shop Drawings and Product Data**

1. Submit shop drawings and product data for review and approval. No products shall be delivered or installed before this submittal package has been reviewed and approved. Shop drawings and product data shall include:

a. Manufacturer's name and model numbers.
b. Manufacturer's standard product data and equipment specifications.
c. Materials of construction.
d. Dimensional layouts and required clearances.
e. Connections including welding.
f. Weights.
g. Anchor bolts.
h. Bill of material.
i. Coatings.
j. Complete description in sufficient detail to permit an item by item comparison with the specifications.
k. Manufacturer's instructions.
l. Warranties.

1.5 JOB CONDITIONS

A. **Coordination with Other Work**. Coordinate all work to prevent interferences, delays, errors, and/or omissions.

B. **Dimensions**. Field-verify all dimensions, locations, and elevations of anchors, bolts, plates, openings, and other miscellaneous metal items and be responsible for their proper fit.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **General**. In accordance with Section 01 60 00 and the manufacturer's instructions.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 GENERAL

A. **Design**

1. Proportion components not sized on the plans to provide ample strength and stiffness for the loads expected.
2. All steel shall meet the requirements of ASTM A 36.
3. All cast iron shall meet the requirements of ASTM A 48.

B. **Fabrication**. Fabricate the miscellaneous metals in accordance with the approved shop drawings.

2.2 EQUIPMENT

A. **Floor Plate Covers**

1. Conform to ASTM A 786 made of A283 Grade D or A36 steel.

B. **Structural Shapes**

1. Steel. Structural shapes shall be ASTM A36 steel, hot dipped galvanized, unless noted otherwise.

2. Lintels.

   a. Lintels shall have not less than 8 inch bearing on each side of the opening, unless noted otherwise.
   b. All lintels shall meet the requirements of ASTM A36 and shall be hot dipped galvanized.

3. Other. All structural shapes other than lintels shall be as required to complete the work. All anchors, connections, bearing plates, and fabrication details shall be standard, unless otherwise noted.

C. **Fasteners for aluminum or stainless steel** shall be Type 316 stainless steel.

D. **Anchor Bolts**

1. Unless otherwise noted, all anchor bolts, washers, and nuts shall be Type 316 stainless steel.
2. Anchors shall be of a length for proper embedment and permit full threading of the nut.
3. Provide anchor bolts required to attach all miscellaneous metals.
4. Deliver to site for embedment into concrete or masonry.

E. **Rakes**. Rakes shall be of the asphalt type with prongs spaced to fit the bar screens. Two rakes shall be furnished with 10-foot aluminum handles.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Field Measurements**. Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

3.2 PREPARATION

A. **Coordination**. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 GENERAL

A. **Fasteners**

1. Conceal fasteners where practical.
2. Countersink all bolts, properly sized, and of proper length to permit full thread in the nut and project not more than a 1/4 inch beyond the nut.
3. Provide lock washers at all nuts and nick the bolt to prevent loosening.
4. All welds shall be smooth and regular, solid, and homogeneous throughout and free from pits, slag, scale, and other defects.
5. Make joints exposed to weather watertight with gaskets or continuous welding.
6. Grind smooth all welds in exposed finished work.

B. **Holes**. Drill or punch all holes with clean, true lines and surfaces.

C. **Welding**

1. Unless otherwise shown, all welding shall be continuous along all adjoining planes and shall produce a neat, even finish and smooth appearance.
2. Conform to welding requirements of AWS.
3. For all welding of aluminum use inert-gas shielded-arc method conforming to AWS D1.2.
4. Weld stainless steel conforming to materials and procedures set forth in "The Procedure Handbook of Arch Welding" by Lincoln Electric Co. or other approved procedures.

D. **Galvanizing**

1. Where galvanized or zinc coated is called for, it shall be hot dipped after fabrication in accordance with the standard specifications of the Hot Dip Galvanizers Association.
2. Do not paint galvanized metal, unless otherwise noted.
3. Coat all abraded areas, welds, or holes drilled in the field with a zinc-rich paint.

E. **Painting.** Unless otherwise noted, see Section 09 90 00, "Painting," for miscellaneous metal coating.

F. **Anchors**. Coat all ferrous anchors that are not galvanized with an asphaltic paint prior to installation.

G. **Aluminum**. Isolate all aluminum in contact with concrete, masonry, or dissimilar metals by coating the contact surfaces with a two-part water-based, gray epoxy primer.

3.4 INSTALLATION

A. **General**. Fabricate and install the miscellaneous metals specified herein as shown and in accordance with approved shop drawings and the manufacturer's recommendations.

B. **Railing Anchors**. Anchor railings as shown and meet all local, state, and OSHA requirements.

END OF SECTION

SECTION 05 05 23

ANCHOR BOLTS, EXPANSION ANCHORS, AND ADHESIVE ANCHORS AND DOWELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide all labor, materials, tools, and equipment necessary to furnish and install the anchor bolts, expansion anchors, and adhesive anchors and dowels in accordance with the drawings and as specified herein.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies**. Perform all work in compliance with all federal, state, and local codes and regulatory agencies.

B. **Standards**. Ensure that materials and workmanship are in conformance with the following standards as referenced herein:

1. AISI – American Iron and Steel Institute.
2. ASTM – American Society for Testing and Materials.

1.4 SUBMITTALS

A. **General**

1. Submit all submittals in accordance with the Division 1 Submittal Requirements and the requirements within this specification section.

B. **Submittal Package No. 1 – Shop Drawings, Product Data, and Design Criteria**

1. Submit shop drawings and product data for review and approval. No products hall be delivered or installed before this submittal package has been reviewed and approved. Include the following:

   a. Copies of manufacturer's specifications, load tables, data, and dimension diagrams for the devices including manufacturer's recommended working load for each size and type of adhesive anchor proposed for use.

   b. Certification that materials conform to ASTM specifications.

c. Certification that products conform to requirements of Underwriters' Laboratory or Factory Mutual.

d. Setting drawings and templates for location and installation of anchorage devices.

e. Anchor bolts showing dimensions and material of construction.

f. When the size, length, or load carrying capacity of an anchor bolt, expansion anchor, and adhesive anchor is not shown on the drawings, provide the size, length, and capacity required to carry the design load times a minimum safety factor of four.

g. Design Loads. Those imposed by the service conditions and as follows:

1) Equipment Anchors. Use the design load recommended by the equipment manufacturer and accepted by the Owner or Engineer.
2) Allowances for vibration are included in the safety factor specified above.

h. Design Data. Provide design load documentation and calculations for items sized or selected.

i. Installation instructions for adhesive anchors.

1.5 JOB CONDITIONS

A. **Coordination - Interfacing**. Coordinate with all other trades to prevent delays, errors, or omissions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Delivery**

1. Clearly mark all items according to purpose and intended location.

B. **Storage and Handling**

1. Store and handle all items in accordance with the manufacturer's recommendations, but in no case exposed to the weather.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 MATERIALS/MANUFACTURERS

A. **Anchor Bolts**

1. Provide stainless steel bolts, nuts, and washers with 4-inch-minimum hooks complying with ASTM A 276, AISI Type 316.

B. **Cracked Concrete Anchors**

1. Provide cracked concrete anchors where International Building Code (IBC) 2003 is the design code and specified on the drawing details. Anchors that are approved for "cracked concrete" situations shall meet the requirements stated in ACI-318 02 Appendix D.

2. Manufacturers.

   a. Simpson, Strong-Bolt.
   b. Hilti, Inc., KB-TZ.

C. **Expansion Anchors**

1. Provide stainless steel expansion anchors, nuts, and washers complying with ASTM A 276, AISI Type 316.

2. Expansion anchors shall be Underwriters' Laboratories, Factory Mutual, or International Code Council – Evaluation Service (ICC-ES) report approved.

3. Manufacturers.

   a. Simpson, Wedge-All.
   b. Wej-it Corporation.
   c. Hilti, Inc., KB II.
   d. Ramset Company, Red Head, Trubolt.
   e. Or equal.

D. **Adhesive Anchors**

1. Provide adhesive cartridge as recommended by the manufacturer for the loading and depth required.

2. Provide Type 316 stainless steel threaded rod, nut, and washer or a reinforcing bar of the size and embedment shown on the drawings and in accordance with ASTM A 615, Grade 60.

3. Manufacturer/Model.

a. Adhesive Cartridge.

1) Simpson, SET Epoxy.
2) Simpson, AT Acrylic Adhesive.
3) Hilti, HIT C-100.
4) ITW/Red Head, Ceramic 6 Epoxy.
5) Or equal.

E. **Adhesive-Anchored Reinforcing Bar**

1. Provide adhesive cartridge as recommended by the manufacturer to receive reinforcing bar as noted.

2. Manufacturer/Model.

a. Adhesive Cartridge.

1) Simpson, SET Epoxy.
2) Simpson, AT Acrylic Adhesive.
3) Hilti HAS.
4) ITW/Red Head, Ceramic 6 Epoxy.
5) Or equal.

3. Reinforcing Bar. Comply with Section 03 30 00.

F. **Powder-Actuated Fasteners**

1. Do not use powder-actuated fasteners and other types of bolts and fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

A. **Verification of Condition**

1. Examine conditions under which bolts and anchors are to be installed, and notify the Engineer in writing of unsatisfactory conditions existing. Do not proceed with the work until unsatisfactory conditions or deficiencies have been corrected.

3.2 PREPARATION

A. **Notification**

1. Notify the Engineer prior to the installation of all adhesive anchors.

3.3 INSTALLATION

A. Requirements

1. Do not install anchor bolts, expansion anchors, or adhesive anchors until the item to be anchored and the anchoring device as well as related layout drawings have been accepted.

2. Drilling and setting equipment used and installation of expansion anchors and adhesive anchors shall be in accordance with manufacturer's instructions. Drill holes to depth and diameter recommended by manufacturer. Clean all holes for adhesive anchors in strict accordance with the manufacturer's instructions.

3. Use the type of anchoring device shown on the drawings.

4. Unless otherwise shown, conform to following for expansion anchors.

   a. Minimum embedment depth in concrete – 5 diameters.
   b. Minimum anchor spacing on centers – 10 diameters.
   c. Minimum distance to edge of concrete – 5 diameters.
   d. Increase dimensions above if required to develop the required anchor load capacity.

5. Unless otherwise shown on the drawings, conform with the manufacturer's recommendations for minimum embedment depth, minimum anchor spacing, and minimum edge distance for adhesive anchors except that minimum embedment depth in concrete shall not be less than 4 inches unless noted otherwise on the drawings.

6. Use copper-graphite antiseize compound for all anchor nuts. Thoroughly lubricate all threaded fasteners with compound prior to assembly. Remove excess lubricant after fastener installation.

3.4 FIELD QUALITY CONTROL

A. **Inspection**. Inspect each installation for compliance with this specification and manufacturer's recommendations.

B. **Testing**. At the discretion of the Owner, adhesive anchors will be subjected to pullout-type testing up to the manufacturer's recommended working load for the anchor. If deficient anchors are found, the Contractor will be required to test all anchors and replace any deficient anchors found at no additional cost to the Owner.

C. Material Testing

1. At the discretion of the Owner up to 1 percent or up to three (whichever is greater) of each type and size of bolt, nut, washer, and anchor from each and every separate shipment or purchasing lot that are specified to be Type 316 stainless steel may be destructively tested to verify material

requirements. Samples will be randomly selected for this testing and such materials shall be provided by the Contractor at no additional cost to the Owner. Testing will be conducted at the Owner's expense.

2. The above testing may be performed at any time during the Contract or Contractor's warranty period. Any shipment or purchasing lot, installed or not, which fails to meet the requirements of the specifications will be rejected and shall be immediately removed from the job site and replaced with material that meets the specifications. Removal and replacement of noncomplying material shall be at the Contractor's expense.

3.5 CLEANING

A. General

1. After embedding concrete is placed, remove protection and clean bolts and inserts.

END OF SECTION

SECTION 05 10 00

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General.** Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work.** Provide the labor, tools, equipment, and materials necessary to furnish and install the structural steel in accordance with the plans and specifications.

B. **Types.** This section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown.
2. Miscellaneous metal fabrications are specified elsewhere in Division 5.
3. Refer to Division 3 for anchor bolt installation in concrete and Division 4 for anchor bolt installation in masonry.

1.3 QUALITY ASSURANCE

A. **Codes and Regulatory Agencies.** Perform all work to furnish and install the structural steel in compliance with all federal, state, and local codes and regulatory agencies. Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges."

   a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:

      1) "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."

2. AISC "Specifications for Structural Steel Buildings," including "Commentary."

3. "Specifications for Structural Joints Using American Society for Testing and Materials (ASTM) A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.

4. ASTM A 6 "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. **Qualifications for Fabricator**. The fabricator shall participate in the AISC Certification program and be designated as an AISC Certified Plant, Category STD at time of bid.

C. **Qualifications for Welding Work**. Qualify welding procedures and welding operators in accordance with American Welding Society (AWS) "Qualification" requirements.

1. If recertification of welders is required, retesting will be Contractor's responsibility.

1.4 SUBMITTALS

A. **General**. Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

B. **Product Data**. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel primer paint.
2. Shrinkage resistant grout.

C. **Shop drawings prepared under supervision** of a licensed 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. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

D. **Test reports conducted on field-bolted** and welded connections. Include data on type(s) of tests conducted and test results.

E. **Certified copies of each survey** conducted by a licensed Land Surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and Contract Documents.

F. **Provide certification** that welders to be employed in work have satisfactorily passed AWS qualification tests.

1.5 JOB CONDITIONS

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **General.** Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. **Deliver anchor bolts** and anchorage devices which are to be embedded in cast-in-place concrete or masonry in ample time as not to delay work.

C. **Store materials to permit easy access** for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SPECIAL WARRANTY

Not used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. **Structural Steel Wide Flange Shapes**. ASTM A 992.

B. **Structural Steel Shapes, Plates, and Bars**. ASTM A 36 unless noted otherwise.

C. **Cold-Formed Steel Tubing**. ASTM A 500, Grade B.

D. **Steel Pipe**. ASTM A 53, Type E or S, Grade B; or ASTM A 501.

1. Finish. Black, except where indicated to be galvanized.

E. **Steel Castings**. ASTM A 27, Grade 65-35, medium-strength carbon steel.

F. **Headed Stud-Type Shear Connectors**. ASTM A 108, Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC specifications.

G. **Anchor Bolts and Threaded Rods**. ASTM A F 1554, Grade 36, headed type unless otherwise indicated.

H. **Unfinished Threaded Fasteners**. ASTM A 307, Grade A, regular low-carbon-steel bolts and nuts.

1. Provide hexagonal heads and nuts for all connections.

I. **High-Strength (and Alternate Fastener Design) Threaded Fasteners**. Heavy hexagonal structural bolts, heavy hexagonal nuts, and hardened washers, as follows:

1. Quenched and tempered medium carbon steel bolts, nuts, and washers, complying with ASTM A 325.

a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot dip galvanized complying with ASTM A 153.

J. **Direct Tension Indicators**. ASTM F 959, type as required.

1. Use on all A 325 bolts in connections that are slip critical.

K. **Electrodes for Welding**. Comply with AWS Code.

L. **Structural Steel Primer Paint**. Steel Structures Painting Council (SSPC) - Paint 2 oil alkyd unless specified otherwise in Section 09 90 00, "Painting."

M. **Galvanizing**. Where hot-dip galvanizing or hot zinc coating is noted, it shall be done in accordance with ASTM A 123. See Section 05 05 14.

N. **Nonmetallic, Shrinkage Resistant Grout**. Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing, and water-reducing agents, complying with ASTM C 1007.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. Sure Grip Grout; Dayton Superior.
b. Euco N.S.; Euclid Chemical Co.
c. Crystex; L & M Construction Chemicals, Inc.
d. Masterflow 713; Master Builders.
e. Sealtight 588 Grout; W. R. Meadows.
f. Five Star Grout; U.S. Grout Corp.

2.2 FABRICATION

A. **Shop-Fabrication and Assembly**. *Fabricate and assemble* structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match mark materials for field-assembly. Fabricate for delivery sequence that will expedite erection and minimize field-handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. **Remove all surface blemishes** including rust and scale seam marks, roller marks, rolled trade names, and roughness by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes to steel which is exposed to view.

C. **Anchor Bolts**. Provide anchor bolts where indicated on the drawings.

D. **Connections**. Weld or bolt shop connections, as indicated.

1. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.
2. Design connections to develop 55 percent of the load capacity of the member as tabulated in the beam tables, Part 2, of the AISC "Manual of Steel Construction" unless reactions or specific details are shown.
3. Connections for bracing shall be designed to develop full strength of bracing members unless forces are shown.

E. **Bolt field connections,** except where welded connections or other connections are indicated.

F. **High-Strength Bolted Construction**. Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts."

G. **Welded Construction**. Comply with AWS code and appearance requirements specified herein.

H. **Shear Connectors**. Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions and AWS D1.1 requirements.

I. **Steel Wall Framing**. Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

J. **Build up welded door frames** attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross recessed-head machine screws, uniformly spaced not more than 10 inches on center (o.c.), unless otherwise indicated.

K. **Holes for Other Work**. Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members.

L. **Provide threaded nuts** welded to framing and other specialty items as indicated to receive other work.

M. **Cut, drill, or punch holes** perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

N. **Expansion Joints**. Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on drawings.

2.3 SHOP PAINTING

A. **General**. Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.

1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
3. Apply two coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. **Surface Preparation**. After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with SSPC as follows:

1. SP-6 "Commercial Blast Cleaning," unless specified otherwise in Section 09 90 00, "Painting."

C. **Painting**. If not specified otherwise in Section 09 90 00, "Painting," immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.4 SOURCE QUALITY CONTROL

A. **General**. Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. **Design of Members and Connections**. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify Engineer/Architect whenever design of members and connections for any portion of structure are not clearly indicated.

2. For connections not detailed on the plans and unless specific reactions, moments, shears, and axial forces are indicated, provide beam connections designed for the reaction due to the maximum uniform load which the beam can support at the span shown. Use the beam tables in the AISC "Manual of Steel Construction, Allowable Stress Design."

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Surveys**. Employ a licensed Land Surveyor for accurate erection of structural steel. Report discrepancies to Engineer/Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steelwork have been agreed upon.

1. Check elevations of concrete and masonry bearing surfaces and location of anchor bolts and similar devices.
2. Check camber and sweep of structural members and compare to permissible variations in AISC "Manual of Steel Construction."
3. Check levelness and elevations of leveling plates and bearing plates.

B. **Examine all structural steel** and discard all damaged members.

3.2 PREPARATION

A. **Anchor Bolts**. Provide anchors as to not delay work.

1. Provide setting drawings to ensure accurate placement.

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. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds and to resist wind and earthquake loads.

C. **Temporary Planking**. Provide temporary planking and working platforms as necessary to effectively complete work.

D. **Setting Bases and Bearing Plates**. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.

3.3 ERECTION

A. **General**. Comply with Occupational Safety and Health Administration (OSHA) and state safety requirements.

B. **Field-Assembly**. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

C. **Straightening of structural steel sections** by heating shall not be permitted unless approved.

D. **Level and plumb individual members** of structure within specified AISC tolerances.

E. **Splice members** only where indicated and accepted on shop drawings.

F. **Erection Bolts**. On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

1. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. **Gas Cutting**. Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress as acceptable. Finish gas-cut sections equal to a sheared appearance when permitted.

H. **Touch-Up Painting**. Unless otherwise specified in Section 09 90 00, "Painting," immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.4 QUALITY CONTROL

A. **General**. Engage an independent testing and inspection agency to inspect, perform test, and prepare test reports on high-strength bolted connections and welded connections. Welds will be visually inspected and some or all welds will be nondestructively tested.

B. **Testing agency shall conduct** and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations from them.

C. **Provide fabrication schedule** for testing agency so that required inspection and testing can be accomplished.

D. **Provide access for testing agency** to places where structural steelwork is being fabricated or produced and to the construction site so that required inspection and testing can be accomplished.

E. **Testing agency may inspect structural steel** at plant before shipment.

F. **Testing agency will inspect structural steel** at the site.

1. Field-Bolted Connections. Inspect in accordance with Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using A 325 or A 490 Bolts."

   a. For direct tension indicators, comply with requirements of ASTM F 959. Verify that gaps are less than gaps specified in Table 2.

2. Field-Welding. Inspect and test during erection of structural steel in accordance with Section 6 of AWS D1.1.

   a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

   b. Perform visual inspection of all welds.

   c. Perform tests on 100 percent of the full and partial penetration welds as follows. Inspection procedures listed are to be used at Contractor's option.

      1) Liquid Penetrant Inspection. ASTM E 165.
      2) Magnetic Particle Inspection. ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
      3) Radiographic Inspection. ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
      4) Ultrasonic Inspection. ASTM E 164.

3. Steel Framing. Inspect and verify compliance with the details shown on the approved Contract Documents.

G. **Correct deficiencies in structural steel work** that independent inspections and laboratory test reports have indicated to be not in compliance with Contract Documents. Perform additional tests, at Contractor's expense, as necessary to

reconfirm any noncompliance of original work and to show compliance of corrected work.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **Scope of Work**. Provide all labor, materials, tools, and equipment necessary to construct rough carpentry in accordance with the plans and as specified herein.

B. **Work Included**. This section includes the following:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood grounds, nailers, and blocking.
4. Wood furring.
5. Sheathing.
6. Subflooring.
7. Underlayment.

1.3 QUALITY ASSURANCE

A. **Codes**. Perform all work in compliance with all federal, state, and local codes.

B. **Standards**. Materials and workmanship shall be in accordance with the following standards:

1. AHA – American Hardwood Association.
2. AISI – American Iron and Steel Institute.
3. ALSC – American Lumber Standards Committee.
4. ANSI – American National Standards Institute.
5. APA – American Plywood Association.
6. ASTM – American Society for Testing and Materials.
7. AWPA – American Wood Preservers Association.
8. AWPB – American Wood Preservers Bureau.
9. FS – Federal Specifications.
10. NFPA – National Fire Protection Association.
11. SPIB – Southern Pine Inspection Bureau.
12. UL – Underwriters' Laboratories, Inc.

C. **Regulatory Agencies**. Perform all work in compliance with the requirements of the following regulatory agencies:

1. ADA - Americans with Disabilities Act.
2. NFPA - National Fire Protection Association.
3. OSHA - Occupational Safety and Health Administration.

D. **Single-Source Responsibility for Fire-Retardant-Treated Wood.** Obtain each type of fire retardant treated wood products from one source for both treatment and fire-retardant formulation.

1.4 SUBMITTALS

A. **General.** Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

B. **Product Data.** Submit product data for the following products:

1. Wood framing and panel products.
2. Air infiltration barrier.
3. Metal framing anchors.
4. Construction adhesives.

C. **Wood Treatment Data.** Submit wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing of treated material:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. For fire-retardant-treated wood products, include certification by treating plant that treated material complies with specified standard and other requirements.
4. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

D. **Warranties.** Submit copies of warranty of chemical treatment manufacturer for each type of treatment.

E. **Reports.** Submit research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for project.

1. Fire-retardant-treated wood.

1.5 **JOB CONDITIONS**

A. **Coordination/Interfacing**. Coordinate with all other trades to prevent delays, errors, and omissions.

B. **Environmental Requirements**. Follow manufacturer's instructions for limitations of specified materials with regard to exposure to climatic conditions.

1.6 **DELIVERY, STORAGE, AND HANDLING**

A. **Delivery and Storage**. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure-treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.7 **SPECIAL WARRANTY**

A. **Chemical Treatment Warranty**. Manufacturer's written warranty for each type of chemical treatment required for the project.

1.8 **DEFINITIONS**

A. **Rough carpentry includes carpentry work** not specified as part of other sections and generally not exposed, unless otherwise specified.

PART 2 - PRODUCTS

2.1 **LUMBER, GENERAL**

A. **Lumber Standards**. Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. **Inspection Agencies**. Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

1. SPIB.

C. **Grade Stamps**. Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. **Nominal Sizes**. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER

A. **Light Framing**. For light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species.

1. Standard grade.
2. Southern Pine graded under SPIB rules.

B. **Structural Light Framing**. For structural light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species.

1. No. 2 grade.
2. Southern Pine graded under SPIB rules.

C. **Structural Framing**. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species.

1. No. 2 grade unless indicated otherwise.
2. Southern Pine graded under SPIB rules.

2.3 BOARDS

A. **Exposed Boards**. Where boards will be exposed in the finished work, provide the following:

1. Moisture Content. 19 percent maximum, S-DRY or KD-19.

B. **Concealed Boards**. Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY or KD-19) and of following species and grade.

1. Southern Pine No. 2 Boards per SPIB rules.

C. **Board Sizes**. Provide sizes indicated.

2.4 MISCELLANEOUS LUMBER

A. **General**. Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. **Size and Shape**. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. **Moisture Content**. Nineteen percent maximum for lumber items not specified to receive wood preservative treatment.

D. **Grade**. Standard grade light framing size lumber or No. 2 Boards per SPIB rules.

2.5 CONSTRUCTION PANELS, GENERAL

A. **Construction Panel Standards**. Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

B. **Trademark**. Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.6 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

A. **General**. Where construction panels are indicated for the following concealed types of applications, provide APA Performance Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. **Subflooring**. APA-rated sheathing.

1. Exposure Durability Classification. EXPOSURE 1.
2. Span Rating. As required to suit joist spacing indicated.
3. Thickness. As indicated on drawings.

C. **Wall Sheathing**. APA-rated sheathing.

1. Exposure Durability Classification. EXPOSURE 1.
2. Span Rating. As required to suit stud spacing indicated.
3. Thickness. As indicated on drawings.

D. **Roof Sheathing**. APA-rated sheathing.

1. Exposure Durability Classification. EXPOSURE 1.
2. Span Rating. As required to suit rafter spacing indicated.
3. Thickness. As indicated on drawings.

2.7 CONSTRUCTION PANELS FOR BACKING

A. **Plywood Backing Panels**. For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated or, if not otherwise indicated, not less than 3/4 inch nominal.

2.8 CONSTRUCTION PANELS FOR UNDERLAYMENT

A. **Plywood Underlayment**. For underlayment in thickness indicated, provide plywood construction panels with fully sanded face complying with the following requirements:

1. Grade Designation. APA UNDERLAYMENT EXPOSURE 1.

2.9 AIR INFILTRATION BARRIER

A. **Polyolefin.** Woven polyolefin sheet, 0.005 inch thick, with a moisture vapor transmission rate of 70 grams/square meter/24 hours per ASTM E 96, Procedure A and a flame spread not exceeding 25 per ASTM E 84.

2.10 FASTENERS

A. **General.** Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners with a hot dip zinc coating per ASTM A 153.

B. **Nails, Wire, Brads, and Staples.** FS FF-N-105.

C. **Power Driven Fasteners.** National Evaluation Report NER-272.

D. **Wood Screws.** ANSI B18.6.1.

E. **Lag Bolts.** ANSI B18.2.1.

F. **Bolts.** Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.11 METAL FRAMING ANCHORS

A. **General.** Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports. Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this project.
2. Allowable Design Loads. Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. **Galvanized Steel Sheet.** Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock forming quality); as standard with manufacturer for type of anchor indicated.

2.12 MISCELLANEOUS MATERIALS

A. **Sill Sealer Gaskets.** Glass-fiber resilient insulation fabricated in strip form for use as a sill sealer; 1-inch nominal thickness compressible to 1/32 inch; selected

from manufacturer's standard widths to suit width of sill members indicated; in rolls of 50 feet or 100 feet in length.

B. **Adhesives for Field-Gluing Panels to Framing**. Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.

C. **Water Repellent Preservative**. National Wood Window and Door Association (NWWDA) tested and accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

2.13 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. **General**. Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. **Aboveground Items**. Pressure-treat aboveground items with waterborne preservatives to a minimum retention of 0.25 pound per cubic foot (pcf). For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

C. **Members in Contact with Ground**. Pressure-treat wood members in contact with the ground or fresh water with waterborne preservatives to a minimum retention of 0.40 pound per cubic foot (pcf).

D. **Fabrication**. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.14 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

A. **General**. Where fire-retardant-treated wood is indicated, pressure-impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated; identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Current Evaluation/Research Reports. Provide fire-retardant-treated wood for which a current model code evaluation/research report exists that is acceptable to authorities having jurisdiction and that evidences compliance of fire retardant treated wood for application indicated.

B. **Interior Type A**. For interior locations use fire-retardant chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation.

1. No reduction takes place in bending strength, stiffness, and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this project under elevated temperature and humidity conditions simulating installed conditions.
2. No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
3. No corrosion of metal fasteners results from their contact with treated wood.

C. **Exterior Type**. Use for exterior locations and where indicated.

D. **Inspection**. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. **Unusable Material**. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. **Setting Rough Carpentry**. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. **Fitting Rough Carpentry**. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. **Securement**. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. **Nailing Exposed Carpentry**. Countersink nail heads on exposed carpentry work and fill holes.

F. **Nails**. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. **General**. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. **Attachment**. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.3 WOOD FURRING

A. **Furring Installation, General**. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

1. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. **Furring**. Install furring members of size and spacing indicated, including hangers and attachment devices. Level to a tolerance of 1/8 inch in 10 feet.

3.4 WOOD FRAMING, GENERAL

A. **Framing Standard**. Comply with American Forest and Paper Association (AF&PA) "Wood Frame Construction Manual" and "Manual for Engineered Wood Construction," ASD, unless otherwise indicated.

B. **Size and Spacing**. Install framing members of size and spacing indicated.

C. **Anchorage**. Anchor and nail as shown, and to comply with the following:

1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.
2. Published requirements of manufacturer of metal framing anchors.
3. Table 2304.9.1 – "Fastening Schedule" of the Ohio Building Code (OBC).

D. **Splicing**. Do not splice structural members between supports.

E. **Fire-Stopping**. Fire-stop concealed spaces of wood-framed walls and partitions at each floor level and at the ceiling line of the top story. Where fire-stops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

3.5 STUD FRAMING

A. **General**. Use light framing dimension lumber. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install single bottom plate and double top plates using 2-inch-thick

members whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.

B. **Intersections**. Construct corners and intersections with not less than three studs. Install miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim.

1. Install continuous horizontal blocking row at midheight of single-story partitions over 8 feet high and at midpoint of multistory partitions, using 2-inch-thick members of same width as wall or partitions.

C. **Opening**. Frame openings with multiple studs and headers. Install nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For nonbearing partitions, install double jamb studs and headers not less than 4 inches deep for openings 3 feet and less in width, and not less than 6 inches deep for wider openings.
2. For load-bearing partitions, install double jamb studs for openings 6 feet and less in width, and triple jamb studs for wider openings. Install headers of depth shown, or if not shown, as recommended by NFPA "Manual for House Framing."

D. **Diagonal Bracing**. Install diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external corner, full story height, at a 45-degree angle, using either a let-in 1 x 4 or 2 x 4 blocking or metal diagonal bracing. Omit bracing where plywood sheathing is indicated.

3.6 FLOOR JOIST FRAMING

A. **General**. Use structural framing or structural light framing dimension lumber. Install floor joists with crown edge up and support ends of each member with not less than 1 1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. To wood bearing members by toe nailing or metal framing anchors.
2. To wood supporting members with wood ledgers as shown, or if not shown, with metal joist hangers.
3. Fire-cut members built into masonry.

B. **Framed Openings**. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4 feet.

C. **Notching, Boring, Blocking**. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist or locate closer than 2 inches from top or bottom. Install solid blocking (2 inches thick by depth of joist) at ends of joists unless nailed to header or bearing member.

D. **Lapped Members.** Lap members framing from opposite sides of beams, girders or partitions not less than 4 inches or securely tie opposing members together. Install solid blocking (2 inches thick by depth of joist) over supports.

E. **Anchorage.** Anchor members paralleling masonry with 1/4" x 1-1/4" metal strap anchors spaced not more than 8 feet on center (o.c.). Extend anchors at least 4 inches into masonry, turn up 4 inches and extend over and fasten to three joists.

F. **Blocking at Jamb Studs.** Under jamb studs at openings, install solid blocking between joists.

G. **Blocking at Non-Load-Bearing Partitions.** Under non-load-bearing partitions, install double joists separated by solid blocking equal to depth of studs above.

H. **Bridging.** Install bridging of type indicated below between joists where nominal depth-to-thickness ratio exceeds 6, at intervals of 8 feet.

1. Solid wood bridging 2 inches thick by depth of joist, end nailed to joist.

3.7 RAFTER AND CEILING JOIST FRAMING

A. **Ceiling Joists.** Install ceiling joists of structural light framing or structural framing dimension lumber with crown up and to comply with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where principal ceiling joists are at right angles to rafters, frame as indicated with additional short joists from wall plate to first joist; nail to ends of rafters and to top plate and nail to long joists or anchor with framing anchors or metal straps. Install 1 x 8 or 2 x 4 stringers spaced 4 feet o.c. crosswise over principal ceiling joists.

B. **Rafters.** Use structural light framing or structural framing dimension lumber. Notch to fit exterior wall plates and toe nail or use special metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing (if any), and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, install valley rafter of size shown, or if not shown, twice the thickness of regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafter.
2. At hips, install hip rafters of size shown, or if not shown, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafters.

C. **Collar Beams.** Install collar beams (ties) as shown, or if not shown, install 1" x 6" boards between every third pair of rafters. Locate below ridge member, one third of distance to ceiling joists. Cut ends to fit slope and nail to rafters.

D. **Special Framing.** Install special framing as shown for eaves, overhangs, dormers, and similar conditions, if any.

3.8 INSTALLATION OF CONSTRUCTION PANELS

A. **General.** Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. **Fastening Methods.** Fasten panels as indicated below:

1. Subflooring. Glue and nail to framing throughout.

2. Sheathing. Nail to framing.

3. Underlayment. Nail to subflooring.

   a. Fill and sand edge joints of underlayment.

4. Plywood Backing Panels. Nail to supports.

3.9 AIR INFILTRATION BARRIER

A. **Barrier Installation**. Cover sheathing with air infiltration barrier as follows:

1. Apply air infiltration barrier to cover upstanding flashing with 4 inch overlap.

3.10 DEMONSTRATION

A. **General**. Prior to commencement of the installation and/or application of interior and/or exterior finishes, demonstrate to representatives of the Engineer/Architect (and/or Owner) that all framing and other rough carpentry members are installed at the indicated spacing, are of the indicated size and grade, and are fastened with the required anchors and fasteners, and that no members have been damaged during handling, fabrication, or installation.

1. Correct all noted deficiencies to the satisfaction of the Engineer/Architect's representative prior to commencing with finish work.
2. Demonstration and corrective measures may be phased to allow commencement of finish work according to the approved Construction Schedule.

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General**. Provide all labor, materials, tools, and equipment necessary to furnish and install building insulation in accordance with the plans and as specified herein.

B. **Work Included**. This section includes the following:

1. Insulation under slabs-on-grade.
2. Foundation wall insulation (supporting backfill).
3. Block/board cavity wall insulation.
4. Loose cavity wall insulation.
5. Safing insulation.
6. Concealed building insulation in board form.
7. Exposed building insulation in board form.
8. Building insulation in batt form.
9. Loose fill building insulation.

C. **Related Sections**. The following sections contain requirements that relate to this section:

1. Division 6 section "Rough Carpentry" for foam plastic board sheathing.

2. Division 9 sections indicated below for thermal insulation and sound attenuation insulation installed as part of metal framed wall and partition assemblies:

   a. "Lath and Plaster."
   b. "Veneer Plaster."
   c. "Gypsum Drywall."

1.3 QUALITY ASSURANCE

A. **Codes**. Perform all work in compliance with all federal, state, and local codes.

B. **Standards**. Materials and workmanship shall be in accordance with the following standards:

1. ASTM – American Society for Testing and Materials
2. FS – Federal Specifications.
3. UL – Underwriters' Laboratories, Inc.

C. **Regulatory Agencies**. Perform all work in compliance with the requirements of the following regulatory agencies:

1. OSHA - Occupational Safety and Health Administration.
2. ADA - Americans with Disabilities Act.

D. **Fire Performance Characteristics**. Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristic. ASTM E 84.
2. Fire Resistance Ratings. ASTM E 119.
3. Combustion Characteristics. ASTM E 136.

E. **Single-Source Responsibility for Insulation Products**. Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

1.4 SUBMITTALS

A. **General**. Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

1. Product data for each type of insulation product specified.
2. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values (aged values for plastic foam insulations), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.
3. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of plastic foam insulations with building code in effect for project.

1.5 JOB CONDITIONS

A. **Coordination - Interfacing**. Coordinate with all other trades to prevent delays, errors, and omissions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **General**. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry

location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. **Plastics**. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 SPECIAL WARRANTY

Not used.

1.8 DEFINITIONS

A. **Thermal Resistivity**. Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees Fahrenheit (° F.) between the two exposed faces required to cause one British thermal unit (Btu) to flow through 1 square foot per hour at mean temperatures indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Available Manufacturers**. Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:

B. **Manufacturers**. Subject to compliance with requirements, provide insulation products of one of the following:

1. Extruded Polystyrene Board Insulation.

   a. Amoco Foam Products Co.
   b. DiversiFoam Products.
   c. Dow. The Dow Chemical Company.
   d. UC Industries, Inc.

2. Molded Polystyrene Board Insulation.

   a. AFM Corporation.
   b. DiversiFoam Products.
   c. Grace Construction Products Div., W.R. Grace & Co.

d. Manufacturers with a third party certification program satisfying mandatory requirements for foam plastics of model building codes.

3. Phenolic Board Insulation.

a. Manville. Building Insulation Div., Manville Sales Corp.

4. Polyisocyanurate Board Insulation.

a. Celotex. Building Products Div., The Celotex Corporation.

5. Cellular Glass Block Insulation.

a. Pittsburgh Corning Corp.

6. Manufacturers of Glass Fiber Insulation.

a. CertainTeed Corp.
b. Knauf Fiber Glass GmbH.
c. Manville. Building Insulations Div., Manville Sales Corp.
d. Owens/Corning Fiberglas Corp.

7. Manufacturers of Semirefractory Fiber Insulation.

a. Cafco Industries Ltd.
b. Fibrex Inc.
c. USG. Thermafiber Div., USG Interiors, Inc.

8. Manufacturer of Loose Granular Perlite Insulation.

a. Producer Members of Perlite Institute Inc.

2.2 INSULATING MATERIALS

A. **General.** Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units. Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. **Extruded Polystyrene Board Insulation**. Rigid, cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5 year aged r-values of 5.4 and 5 at 40 and 75° F. (4.4 and 23.9 degrees Celsius [° C.]), respectively; and as follows:

1. Type IV, 1.6 pounds per cubic foot (pcf) minimum density, unless otherwise indicated.
2. Type V, 3.0 pcf minimum density where indicated.
3. Type VI, 1.8 pcf minimum density.

4. Type VII, 2.2 pcf minimum density.
5. Type X, 1.35 pcf minimum density.
6. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 75 and 450, respectively.

C. **Fabric-Faced Extruded Polystyrene Board Insulation**. Rigid, cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; fabricated with tongue and groove edges and with one side having a matrix of vertical and horizontal drainage channels faced with manufacturer's standard spunbonded filtration fabric; with 5 year aged r-value of 4.4 at 75° F. (23.9° C.).

1. Type IV, 1.6 pcf minimum density.
2. Type VI, 1.8 pcf minimum density.
3. Type VII, 2.2 pcf minimum density.

D. **Molded Polystyrene Board Insulation**. Rigid, cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with ASTM C 578 for type indicated; and as follows:

1. Type I, 0.9 pcf minimum density, aged r-values of 4.0 and 3.6 at 40 and 75° F. (4.4 and 23.9° C.), respectively.
2. Type II, 1.35 pcf minimum density, aged r-values of 4.4 and 4.0 at 40 and 75° F. (4.4 and 23.9° C.), respectively.
3. Type VIII, 1.15 pcf minimum density, aged r-values of 4.2 and 3.8 at 40 and 75° F. (4.4 and 23.9° C.), respectively.
4. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 75 and 450, respectively.

E. **Phenolic Board Insulation**. Rigid, cellular thermal insulation with thermoset phenolic based closed cell foam core and two ply foil kraft liner facing laminated to both sides, in board form complying with ASTM C 1126 for Type II, Grade 1; with r-value of 8.33 at 75° F. (23.9° C.).

1. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 25 and 35, respectively.

F. **Polyisocyanurate Board Insulation**. Rigid, cellular thermal insulation with glass fiber reinforced polyisocyanurate closed cell foam core and aluminum foil facing laminated to both sides; complying with FS HH-I-1972/1, Class 2; aged r-values of 8 and 7.2 at 40 and 75° F. (4.4 and 23.9° C.), respectively; and as follows:

1. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 20 and 200, respectively.

G. **Cellular Glass Block Insulation**. Rigid cellular glass thermal insulation with closed cell structure, passing ASTM E 136 for testing of combustion characteristics, in flat or tapered block form complying with ASTM C 552 for

Type I; with r-values of 3.03 and 2.86 at 50 and 75° F. (10 and 23.9° C.), respectively.

H. **Unfaced, Flexible Glass Fiber Board Insulation**. Thermal insulation produced by combining glass fibers with thermosetting resin binders to comply with ASTM C 553, Class B-4, and ASTM C 612, Class 1; with nominal density of not less than 1.5 nor more than 1.65 pcf, r-value of 4.13 at 75° F. (23.9° C.), and maximum flame spread and smoke developed values of 25 and 50, respectively.

I. **Foil-Faced, Flexible Glass Fiber Board Insulation**. Thermal insulation produced by combining glass fibers with thermosetting resin binders to comply with ASTM C 553, Class B-4, and ASTM C 612, Class 1; with nominal density of 1.5 pcf and r-value of 4.13 at 75° F. (23.9° C.); foil scrim kraft vapor retarder facing on one side with maximum flame spread and smoke developed values of 25 and 50, respectively.

J. **Unfaced Glass Fiber Board Insulation**. Thermal insulation produced by combining glass fibers with thermosetting resin binders to comply with ASTM C 612 for Class indicated; and as follows:

1. Low Density Semirigid Board. Class 1, nominal density of 2.25 pcf, r-value of 4.3 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 1 and 2, nominal density of 3.0 pcf, r-value of 4.3 at 75° F. (23.9° C.).
3. Rigid Board. Class 1 and 2, nominal density of 6.0 pcf, r-value of 4.3 at 75° F. (23.9° C.).

K. **Foil-Faced Glass Fiber Board Insulation**. Thermal insulation produced by combining glass fibers with thermosetting resin binders to comply with ASTM C 612 for Class indicated; foil scrim kraft or foil scrim polyethylene vapor retarder facing on one side with maximum flame spread and smoke developed values of 25 and 50, respectively; and as follows:

1. Low Density Semirigid Board. Class 1, nominal density of 2.25 pcf, r-value of 4.3 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 1 and 2, nominal density of 3.0 pcf, r-value of 4.3 at 75° F. (23.9° C.).
3. Rigid Board. Class 1 and 2, nominal density of 6.0 pcf, r-value of 4.3 at 75° F. (23.9° C.).

L. **Glass-Mat-Faced Glass Fiber Board Insulation**. Thermal insulation produced by combining glass fibers with thermosetting resin binders to comply with ASTM C 612 for Class indicated; black glass fiber mat facing on one side with maximum flame spread and smoke developed values of 25 and 50, respectively; and as follows:

1. Low Density Semirigid Board. Class 1, nominal density of 2.25 pcf, r-value of 4.3 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 1 and 2, nominal density of 3.0 pcf, r-value of 4.3 at 75° F. (23.9° C.).

3. Rigid Board. Class 1 and 2, nominal density of 6.0 pcf, r-value of 4.55 at 75° F. (23.9° C.).

M. **Unfaced Semirefractory Fiber Board Insulation**. Thermal insulation produced by combining semirefractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for class indicated; passing ASTM E 136 for combustion characteristics; and as follows:

1. Low Density Semirigid Board. Class 1 and 2, nominal density of 4.0 pcf, r-value of 4.0 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 3, nominal density of 6.0 pcf, r-value of 4.16 at 75° F. (23.9° C.).
3. Rigid Board. Class 4, nominal density of 8.0 pcf, r-value of 4.35 at 75° F. (23.9° C.).
4. Fiber Color. Regular color, unless otherwise indicated.
5. Fiber Color. Darkened, where indicated.

N. **Foil-Faced Semirefractory Fiber Board Insulation**. Thermal insulation produced by combining semirefractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for Class indicated; passing ASTM E 136 for combustion characteristics of unfaced board; foil scrim kraft or foil scrim polyethylene vapor retarder facing on one side with maximum flame spread and smoke developed values of 25 and 10, respectively; and as follows:

1. Low Density Semirigid Board. Class 1 and 2, nominal density of 4.0 pcf, r-value of 4.0 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 3, nominal density of 6.0 pcf, r-value of 4.16 at 75° F. (23.9° C.).
3. Rigid Board. Class 4, nominal density of 8.0 pcf, r-value of 4.35 at 75° F. (23.9° C.).

O. **Glass-Mat-Faced Semirefractory Fiber Board Insulation**. Thermal insulation produced by combining semirefractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for Class indicated; passing ASTM E 136 for combustion characteristics of unfaced board; faced on one side with black glass fiber mat; with maximum flame spread and smoke developed values of 10 and 5, respectively; and as follows:

1. Low Density Semirigid Board. Class 1 and 2, nominal density of 4.0 pcf, r-value of 4.0 at 75° F. (23.9° C.).
2. Medium Density Semirigid Board. Class 3, nominal density of 6.0 pcf, r-value of 4.16 at 75° F. (23.9° C.).
3. Rigid Board. Class 4, nominal density of 8.0 pcf, r-value of 4.35 at 75° F. (23.9° C.).
4. Fiber Color. Darkened.

P. **Glass-Mat-Faced and Foil-Faced Semirefractory Fiber Board Insulation**. Thermal insulation produced by combining semirefractory mineral fibers manufactured from slag with thermosetting resin binders to comply with ASTM C 612 for Class indicated; passing ASTM E 136 for combustion characteristics of

unfaced board; foil scrim polyethylene vapor retarder facing on one side and black glass fiber mat on other side; with maximum flame spread and smoke developed values of 10 and 5, respectively; and as follows:

1. Low-Density Semirigid Board. Class 1 and 2, nominal density of 4.0 pcf, r-value of 4.0 at 75° F. (23.9° C.).
2. Medium-Density Semirigid Board. Class 3, nominal density of 6.0 pcf, r-value of 4.16 at 75° F. (23.9° C.).
3. Rigid Board. Class 4, nominal density of 8.0 pcf, r-value of 4.35 at 75° F. (23.9° C.).
4. Fiber Color. Darkened.

Q. **Unfaced Mineral Fiber Blanket/Batt Insulation**. Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type. Fibers manufactured from glass or slag.
2. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 25 and 50, respectively.

R. **Faced Mineral Fiber Blanket/Batt Insulation**. Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor retarder membrane facing with flame spread of 25 or less); foil scrim kraft or foil scrim polyethylene vapor retarder membrane on one face, and as follows:

1. Mineral Fiber Type. Fibers manufactured from glass or slag.
2. Surface Burning Characteristics. Maximum flame spread and smoke developed values of 25 and 50, respectively.
3. Flanged Units. Provide blankets/batts fabricated with facing incorporating 4-inch-wide flanges along their edges for attachment to framing members.

S. **Perlite Loose Fill Insulation**. Expanded perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or IV (surface treated for water repellency and limited moisture absorption), r-values of 3.3 - 2.8 for densities of 4.1 - 7.4 pcf at 75° F. (23.9° C.).

T. **Glass Fiber Loose Fill Insulation**. Glass fibers processed to comply with ASTM C 764 for Type (method of application) indicated below; maximum flame spread and smoke developed values of 5 and 5, respectively, and as follows:

1. Type 1 for pneumatic application.
2. Type 2 for poured application.

2.3 SAFING INSULATION AND ACCESSORIES

A. **Semirefractory Fiber Board Safing Insulation**. Semirigid boards designed for use as a fire stop at openings between edge of slab and exterior wall panels, produced by combining semirefractory mineral fiber manufactured from slag

with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 pcf; passing ASTM E 136 for combustion characteristics; r-value of 4.0 at 75° F. (23.9° C.).

B. **Caulking Compound**. Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.

C. **Safing Clips**. Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

2.4 RADIANT BARRIERS

A. **Radiant Barrier Coating**. Silver colored, not thickness dependent, low emissivity coating, formulated for adherence to substrates indicated.

B. **Foil Kraft Laminate**. Two layers of 0.0035 inch thick aluminum foil laminated to an inner layer of 100 pound basic weight kraft paper, with maximum flame spread and smoke developed ratings of 20 and 10, respectively, in sheets of the following width covering 500 square feet (sf):

1. Sheet Width. 24 inches.

C. **Foil Scrim Polyethylene Laminate**. Two layers of aluminum foil laminated with scrim reinforcing on polyethylene with an overall thickness of 7.5 mils, with maximum flame spread and smoke developed ratings of 5 and 10, in sheets 48 inches wide up to 375 feet long.

D. **Available Products**. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

E. **Products**. Subject to compliance with requirements, provide one of the following:

1. Radiant Barrier Coating.

   a. LO/MIT-1, Solar Energy Corp.

2. Foil Kraft Laminate.

   a. RX-2 Reflective Aluminum Foil Insulation, R-Fax Technologies, Inc.

3. Foil Scrim Polyethylene Laminate.

   a. Foil-Ray DS Radiant Barrier, Energy Savers Imports, Inc.

2.5 VAPOR RETARDERS

A. **Polyethylene Vapor Retarder**. ASTM D 4397, 6.0 mils thick, with a maximum permeance rating of 0.13 perms.

B. **Reinforced Polyethylene Vapor Retarder**. Multiple layers of polyethylene film reinforced with inner layers of nylon cord reinforcing and laminated together with a rubber adhesive to produce the following product in roll form:

1. Number of Layers. Two outer layers of polyethylene film and one inner layer of nylon reinforcing, with an overall thickness of 6.0 to 8.0 mils.
2. Number of Layers. Three layers of polyethylene film and two layers of nylon cord reinforcing, with an overall thickness of 10.0 to 12.0 mils.

C. **Foil Polyester Film Vapor Retarder**. Two layers of 0.5-mil-thick polyester film laminated to an inner layer of 1.0-mil-thick aluminum foil, with maximum flame spread and smoke developed ratings of 15 and 5, respectively.

D. **Tape for Vapor Retarder**. Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

E. **Available Products**. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

F. **Products**. Subject to compliance with requirements, provide one of the following:

1. Reinforced Polyethylene Vapor Retarder.

   a. Griffolyn T-65, Griffolyn Div., Reef Industries, Inc.
   b. Griffolyn T-85, Griffolyn Div., Reef Industries, Inc.

2. Foil Polyester Film Vapor Retarder.

   a. Alumiseal Zero Perm, Alumiseal Corp.

2.6 AUXILIARY INSULATING MATERIALS

A. **Adhesive for Bonding Insulation**. Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates.

B. **Adhesively Attached Pin Anchors**. Perforated plate, 2 inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:

1. Plate. Zinc-plated steel, 0.106 inch thick.

2. Pin. Copper-coated low carbon steel, fully annealed, 0.106 inch in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.

3. Self-Locking Washer. Mild steel, 0.016 inch thick, size as required to hold insulation securely.

a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.

C. **Asphalt Coating for Cellular Glass Block Insulation**. Cutback asphalt or asphalt emulsion of type recommended by cellular glass block insulation manufacturer.

1. Available Products. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

2. Products. Subject to compliance with requirements, provide one of the following:

a. PITTCOTE 300 Coating, Pittsburgh Corning Corp.
b. Karnak 100, Karnak Corp.

D. **Protection Board**. Premolded, semirigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, standard sizes.

E. **Eave Ventilation Troughs**. Preformed rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Verification of Conditions**. Examine substrates and conditions with installer present, for compliance with requirements of the sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. **Cleaning**. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

B. **Poured-in-Place Insulation**. Close off openings in cavities receiving poured-in-place insulation to prevent the escape of insulation. Provide bronze or stainless steel screen (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION

A. **General**. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. **Continuity of Insulation**. Extend insulation full thickness as 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.

C. **Layers**. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER SLAB INSULATION

A. **Vertical Surfaces**. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of insulation.

B. **Protection Board**. Protect below grade insulation on vertical surfaces (from damage during backfilling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

C. **Top Surface Protection**. Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

3.5 INSTALLATION OF CAVITY WALL AND MASONRY CELL INSULATION

A. **Plastic Insulation**. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" on center (o.c.) both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Supplement adhesive attachment of insulation by securing boards with two piece wall ties designed for this purpose and specified under Division 4 "Unit Masonry."

B. **Cellular Glass Insulation**. On units of cellular glass insulation, apply insulation with closely fitting joints using method indicated below:

1. Gob Method. Install four gobs of adhesive per unit and apply firmly against inside wythe of masonry or other construction as shown. Apply gobs at each corner; spread gobs to form pads 4 inches in diameter by 1/4 inch thick.
2. Serrated Trowel Method. Apply adhesive to entire surface of each cellular glass insulation unit with a serrated trowel complying with insulation manufacturer's specifications.
3. Coat edges of insulation units with a full bed of adhesive to seal joints between insulation and between insulation and adjoining construction.
4. Coat exterior face (cold face) of installed cellular glass block insulation course with asphalt coating recommended by insulation manufacturer for this purpose.

C. **Granular Insulation**. Pour granular insulation into cavities indicated to receive insulation, taking care to fill void spaces completely. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close ports after

confirming complete coverage. Limit fall of insulation to one story in height, but not to exceed 20 feet.

3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. **General**. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. **Treatment of Joints and Voids**. Seal joints between closed cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. **Vapor Retarder**. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. **Foil-Faced Units**. Set reflective, foil-faced units accurately with not less than 0.75-inch air space in front of foil as indicated.

E. **Loose-Fill Insulation**. Place glass-fiber loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not excessively compact.

F. **Voids and Cavities**. Stuff glass fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.7 INSTALLATION OF SAFING INSULATION

A. **General**. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation but not further apart then 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with caulking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

3.8 INSTALLATION OF RADIANT BARRIERS

A. **General**. Install radiant barriers in locations indicated to comply with radiant barrier insulation manufacturer's recommendations.

3.9 INSTALLATION OF VAPOR RETARDERS

A. **General**. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose fiber insulation.

B. **Joints**. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches o.c.

C. **Joints**. Seal overlapping joints in vapor retarders with adhesives or tape per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer. Locate all joints over framing members or other solid substrates.

D. **Attachment**. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

E. **Penetrations**. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape of type recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.

F. **Repair**. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.10 PROTECTION

A. **General**. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.11 DEMONSTRATION

A. **Correct all noted deficiencies** to the satisfaction of the Engineer/Architect's representative prior to commencing with placement of concrete slabs, backfill, sheathing, interior and/or exterior finishes and other systems.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **General**. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1, and all related specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

A. **General**. Provide all labor, materials, tools, and equipment necessary to furnish and apply joint sealants in accordance with the plans and as specified herein.

B. **Work Included**. This section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

    a. Control and expansion joints in cast-in-place concrete.
    b. Joints between architectural precast concrete units.
    c. Control and expansion joints in unit masonry.
    d. Joints of stonework set without mortar.
    e. Joints of stonework set with mortar including copings and cornices.
    f. Joints between different materials listed above.
    g. Perimeter joints between materials listed above and frames of doors and windows.
    h. Control and expansion joints in ceiling and overhead surfaces.
    i. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

    a. Control and expansion joints in brick pavers.
    b. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    c. Joints between architectural precast concrete paving units.
    d. Joints in stone paving units, including steps.
    e. Tile control and expansion joints.
    f. Joints between different materials listed above.
    g. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.

c. Joints between tops of nonload bearing unit masonry walls and underside of cast-in-place concrete slabs and beams.
d. Tile control and expansion joints.
e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
f. Joints on underside of precast beams and planks.
g. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
h. Perimeter joints of toilet fixtures.
i. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

a. Control and expansion joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated.

C. **Related Sections**. The following sections contain requirements that relate to this section:

1. Division 7 section "Exterior Insulation and Finish Systems - Class PB" for sealing system joints.
2. Division 7 section "Exterior Insulation and Finish Systems - Class PM" for sealing system joints.
3. Division 7 section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
4. Division 7 section "Firestopping" for through penetration firestopping systems.
5. Division 7 section "Paving Joint Sealants" for sealing joints in portland cement concrete for pavements, walkways, and curbing.
6. Division 8 "Glass and Glazing" for sealants used in glazing.
7. Division 8 section "Structural Sealant Glazed Curtain Walls" for structural and other glazing sealants.
8. Division 9 section "Veneer Plaster" for sealing concealed perimeter joints of veneer plaster partitions to reduce sound transmission.
9. Division 9 section "Gypsum Drywall" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.
10. Division 9 section "Acoustical Panels" for sealing edge moldings at perimeter of acoustical ceilings.
11. Division 9 section "Tile" for sealing tile joints.
12. Division 9 section "Chemical Resistant Brick Flooring" for sealing flooring joints.

1.3 QUALITY ASSURANCE

A. **Codes**. Perform all work in compliance with all federal, state, and local codes.

B. **Standards**. Materials and workmanship shall be in accordance with the following standards:

1. AAMA – American Architectural Manufacturers Association.
2. ASTM – American Society for Testing and Materials.
3. FS – Federal Specifications.

C. **Regulatory Agencies**. Perform all work in compliance with the requirements of the following regulatory agencies:

1. ADA – Americans with Disabilities Act.
2. OSHA – Occupational Safety and Health Administration.

D. **Installer Qualifications**. Engage an experienced installer who has completed joint sealant applications similar in material, design, and extent to that indicated for project that have resulted in construction with a record of successful in service performance.

E. **Testing Laboratory Qualifications**. To qualify for acceptance, an independent testing laboratory must demonstrate to Engineer/Architect's satisfaction, based on evaluation of laboratory submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the work.

F. **Single-Source Responsibility for Joint Sealant Materials**. Obtain joint sealant materials from a single manufacturer for each different product required.

G. **Preconstruction Compatibility and Adhesion Testing**. Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

   a. Perform tests under normal environmental conditions that will exist during actual installation.

2. Submit not less than nine pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.

4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

5. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to Engineer/Architect and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

H. **Product Testing**. Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Engineer/Architect.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
2. Include test results performed on joint sealants after they have cured for 1 year.

I. **Preconstruction Field Testing**. Prior to installation of joint sealants, field test their adhesion to joint substrates as follows:

1. Locate test joints where indicated or, if not indicated, as directed by Engineer/Architect.

2. Conduct field tests for each application indicated below:

   a. Each type of elastomeric sealant and joint substrate indicated.
   b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Engineer/Architect 1 week in advance of the dates and times when field test will be performed.

4. Test Method. Test joint sealants by hand pull method described below:

   a. Install joint sealants in 5-foot joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed work. Allow sealants to cure fully before testing.
   b. Make knife cuts horizontally from one side of joint to the other followed by two vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2-inch cuts. Place a mark 1 inch from top of 2-inch piece.
   c. Use fingers to grasp 2-inch piece of sealant just above 1-inch mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

5. Report whether or not sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

6. Evaluation of Field Test Results. Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

J. **Field-Constructed Mock-Ups**. Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:

1. Joints in field constructed mock-ups of assemblies specified in other sections that are indicated to receive elastomeric joint sealants specified in this section.

K. **Preinstallation Conference**. Conduct conference at project site to comply with requirements of the Division 1 section covering this activity.

1.4 SUBMITTALS

A. **General**. Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

1. Product data from manufacturers for each joint sealant product required.

a. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds (VOC).

2. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

3. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Engineer/Architects and Owners, plus other information specified.

4. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

5. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

6. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

7. Preinstallation conference meeting minutes.

1.5 JOB CONDITIONS

A. **Coordination - Interfacing**. Coordinate with all other trades to prevent delays, errors, and omissions.

B. **Environmental Conditions**. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 degrees Fahrenheit (° F.) (4.4 degrees Celsius [° C.]).
3. When joint substrates are wet.

C. **Joint Width Conditions**. Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

D. **Joint Substrate Conditions**. Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Delivery**. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. **Storage and Handling**. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 SPECIAL WARRANTY

Not used.

1.8 SYSTEM PERFORMANCE REQUIREMENTS

A. **General**. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. **Interior Applications**. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.9 SEQUENCING AND SCHEDULING

A. **General**. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. **Compatibility**. Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. **Colors**. Provide color of exposed joint sealants to comply with the following:

1. Provide custom colors to match Engineer/Architect's samples.
2. Match colors indicated by reference to manufacturer's standard designations.
3. Provide selections made by Engineer/Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. **Elastomeric Sealant Standard**. Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability. Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. **Available Products**. Subject to compliance with requirements, elastomeric sealants that may be incorporated in the work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

C. **Products**. Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 SOLVENT RELEASE CURING JOINT SEALANTS

A. **Acrylic Sealant**. Manufacturer's standard one part, nonsag, solvent release curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following

percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for project without failing cohesively:

1. 12-1/2 percent movement in both extension and compression for a total of 25 percent.

B. **Butyl Sealant**. Manufacturer's standard one part, nonsag, solvent release curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack free time of 24 hours or less.

C. **Pigmented Narrow Joint Sealant**. Manufacturer's standard, solvent release curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

D. **Available Products**. Subject to compliance with requirements, solvent release curing joint sealants that may be incorporated in the work include, but are not limited to, the following:

E. **Products**. Subject to compliance with requirements, provide one of the following:

1. Acrylic Sealant.

   a. 60+Unicrylic, Pecora Corp.
   b. PTI 738, Protective Treatments, Inc.
   c. PTI 767, Protective Treatments, Inc.
   d. Mono, Tremco, Inc.

2. Butyl Sealant.

   a. BC-158, Pecora Corp.
   b. PTI 757, Protective Treatments, Inc.
   c. Sonneborn Multipurpose Sealant, Sonneborn Building Products Div., ChemRex, Inc.
   d. Tremco Butyl Sealant, Tremco, Inc.

3. Pigmented Narrow Joint Sealant.

   a. PTI 200, Protective Treatments, Inc.

2.4 LATEX JOINT SEALANTS

A. **General**. Provide manufacturer's standard one part, nonsag, mildew resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. **Acrylic Emulsion Sealant**. Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. **Silicone Emulsion Sealant**. Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

D. **Available Products**. Subject to compliance with requirements, latex joint sealants that may be incorporated in the work include, but are not limited to, the following:

E. **Products**. Subject to compliance with requirements, provide one of the following:

1. Acrylic Emulsion Sealant.

   a. AC-20, Pecora Corp.
   b. Sonolac, Sonneborn Building Products Div., ChemRex, Inc.
   c. Tremco Acrylic Latex 834, Tremco, Inc.

2. Silicone Emulsion Sealant.

   a. Trade Mate Paintable Glazing Sealant, Dow Corning Corp.

2.5 ACOUSTICAL JOINT SEALANTS

A. **Acoustical Sealant**. Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.

B. **Acoustical Sealant for Concealed Joints**. Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. **Available Products**. Subject to compliance with requirements, acoustical joint sealants that may be incorporated in the work include, but are not limited to, the following:

D. **Products**. Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant.

   a. SHEETROCK Acoustical Sealant, United States Gypsum Co.
   b. AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.

2. Acoustical Sealant for Concealed Joints.

   a. BA-98, Pecora Corp.
   b. Tremco Acoustical Sealant, Tremco, Inc.

2.6 TAPE SEALANTS

A. **Tape Sealant**. Manufacturer's standard, solvent free, butyl based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

B. **Available Products**. Subject to compliance with requirements, tape sealants that may be incorporated in the work include, but are not limited to, the following:

C. **Products**. Subject to compliance with requirements, provide one of the following:

1. Extru-Seal Tape, Pecora Corp.
2. Shim-Seal Tape, Pecora Corp.
3. PTI 606, Protective Treatments, Inc.
4. Tremco 440 Tape, Tremco, Inc.
5. MBT-35, Tremco, Inc.

2.7 PREFORMED FOAM SEALANTS

A. **Preformed Foam Sealants**. Manufacturer's standard preformed, precompressed, impregnated open cell foam sealant manufactured from high density urethane foam impregnated with a nondrying, water repellent agent; factory produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties. Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.

2. Impregnating Agent. Manufacturer's standard.

3. Impregnating Agent. Latex modified asphalt.

4. Impregnating Agent. Chemically stabilized acrylic.

5. Impregnating Agent. Neoprene rubber suspended in water based emulsion.

6. Density. Manufacturer's standard.

7. Density. 8 to 9 pounds per cubic foot (pcf).

8. Density. 8 to 10 pcf.

9. Density. 9 to 10 pcf.

10. Density. 14 to 16 pcf.

11. Backing. None.

12. Backing. Pressure sensitive adhesive factory-applied to one side with protective wrapping.

13. Available Products. Subject to compliance with requirements, preformed foam sealants that may be incorporated in the work include, but are not limited to, the following:

14. Products. Subject to compliance with requirements, provide one of the following:

    a. Emseal, Emseal Corp.
    b. Emseal Greyflex, Emseal Corp.
    c. Wil-Seal 150, Wil-Seal Construction Foams Div., Illbruck.
    d. Wil-Seal 250, Wil-Seal Construction Foams Div., Illbruck.

2.8 JOINT SEALANT BACKING

A. **General**. Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. **Plastic Foam Joint Fillers**. Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open cell polyurethane foam.
2. Closed cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
3. Proprietary, reticulated, closed cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 pounds per square inch (psi) per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
4. Any material indicated above.

C. **Elastomeric Tubing Joint Fillers**. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26° F. (-32° C.). Provide products

with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. **Bond Breaker Tape**. Polyethylene tape or other plastic tape as 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.

2.9 MISCELLANEOUS MATERIALS

A. **Primer**. Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. **Cleaners for Nonporous Surfaces**. Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. **Masking Tape**. Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **General**. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. **Surface Cleaning of Joints**. Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. **Joint Priming**. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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 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 OF JOINT SEALANTS

A. **General**. Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. **Sealant Installation Standard**. Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. **Acoustical Sealant Application Standard**. Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. **Installation of Sealant Backings**. Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. **Installation of Sealants**. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant

movement capability. Install sealants at the same time sealant backings are installed.

F. **Tooling of Nonsag Sealants**. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

   a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. **Installation of Preformed Foam Sealants**. Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. **General**. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. **General**. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 that and installations with repaired areas are indistinguishable from original work.

3.6 DEMONSTRATION

A. **General**. Prior to final acceptance, demonstrate that the in-place joint sealants are equal to the quality and appearance of the accepted mock-ups.

END OF SECTION