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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, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. 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, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

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

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

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

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

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

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

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice 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.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

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

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

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

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *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.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *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, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *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.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *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 of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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 a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

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

49. *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; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: 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 Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

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

1. does not conform to the Contract Documents;

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

3. 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 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means 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, means 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, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. 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 Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), 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;

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.

2.04 *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 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, 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 and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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 the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document 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.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

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

3.02 *Reference Standards*

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

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract 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, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer 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 part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or 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) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) 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 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

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 part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

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

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers 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 versions, or 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; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract 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 Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *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.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 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 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, 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 Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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.

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 permanent improvements are to be made 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.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, 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 any such claim, and against all 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 directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will 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 and adjacent areas 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 of 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

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

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on 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;

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

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

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 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, 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 fall within any one or more of the categories described in Paragraph 5.04.A;

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 Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a 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 otherwise;

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

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

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

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. 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 Paragraph 13.03;

b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on 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;

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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) 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 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. 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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. 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, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. 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, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. 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 failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

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

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, 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.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is 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; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the 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, risks, 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 Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, 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.
2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.

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

7.03 *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 maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. 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 will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *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, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

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

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

2) 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;

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

4) is not objectionable to Owner.

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

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

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

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

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

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

    a. will certify that the proposed substitute item will:

        1) perform adequately the functions and achieve the results called for by the general design;

        2) be similar in substance to the item specified; and

        3) be suited to the same use as the item specified.

    b. will state:

        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

        2) 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

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

    c. will identify:

        1) all variations of the proposed substitute item from the item specified; and

        2) available engineering, sales, maintenance, repair, and replacement services.

    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

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

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. 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.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

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

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed 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.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *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.

7.11 *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. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and 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 such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

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

7.13 *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.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. 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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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 at its expense (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).

E. 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.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. 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.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.15 *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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

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

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must 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 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall 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 7.16.C.

3. 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. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.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 will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

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.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

   a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

   b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

   c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *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 is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

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

1. abuse, or improper modification, 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.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

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;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 7.18.A will 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.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. 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.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

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

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) 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 any such claims, and against all 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 damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *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.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *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 (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

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.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *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.

10.02 *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 10.07. 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.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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, will 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 Contractor under Paragraph 15.06.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 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

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

1. Changes in 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;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *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, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. 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, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will 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 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *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.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

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

5. Other costs consisting of 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, 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.

1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 communication 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 that Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general 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 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

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

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

5. 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.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *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*: Contractor agrees that:

1. 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

2. 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 for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *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. Payments to Contractor for Unit Price Work will be based on actual quantities.

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. 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

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

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction 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 with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

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

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

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, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. 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. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages 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. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. 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, 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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, then 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 will 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.

14.07 *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 defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *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.

2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

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

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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 13.03, 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; 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;

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

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

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, requiring correction or replacement;

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

    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

    e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. 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; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

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 preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. 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 punch list.

15.04 *Partial Use or Occupancy*

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. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be 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 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work 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 15.03 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 6.04 regarding builder's risk or other property insurance.

15.05 *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *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, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

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

   a. all documentation called for in the Contract Documents;

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

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

d. a list of all duly pending Change Proposals and Claims; and

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

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: 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 have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;

2. correct such defective Work;

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

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

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, 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. Contractor shall pay all 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. 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.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and 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);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

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

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.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 the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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.

F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 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; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 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 16.03.

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, 7 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 are not intended to preclude Contractor from submitting a Change Proposal 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 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

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

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract 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.

18.03 *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. 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.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

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

SECTION 01 01 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

1.1 A. Construction of a parking lot for 38 buses and a parking lot for 74 employee vehicle. Work includes fence for dumpster enclosure, and installing water, sewer, and electrical services to an office trailer that will be set by owner/HCS.

B. Related Requirements Specified Elsewhere:
1. Schedule of Values and Progress Schedule: Section 01 37 00
2. Contract Closeout: Section 01 70 00
3. Cleaning: Section 01 71 00

C. Contractor's Duties:
1. Except as specifically noted, provide and pay for:
   a. Labor, materials, and equipment.
   b. Tools, construction equipment, and machinery.
   c. Other facilities and services necessary for proper execution and completion of work.
2. Pay legally required sales, consumer and use taxes.
3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
   a. Permits
   b. Government fees
   c. Licenses
4. Given required notices.
5. Comply with codes, ordinances, rules, regulation, order and other legal requirements of public authorities which bear on performance of work.
6. Promptly submit written notice to Engineers of observed variance of Contract Documents from legal requirements.
   a. Appropriate modifications to Contract Documents will adjust necessary changes.
   b. Assume responsibility for work known to be contrary to such requirements.
7. Enforce strict discipline and good order among employees. Do not employ on work:
   a. Unfit persons
   b. Persons not skilled in assigned task.

8. General Contractor's Project Manager:
   The General Contractor shall furnish a Project Manager, acceptable to the Owner, in addition to the job superintendent, who shall be responsible for the following:
   a. Direct communication, observation, responsibility and control of all sub-contractors and suppliers.
   b. To be a liaison between the Engineer and all sub-contractors and material sub-contractors and material suppliers. The Engineer and

Owner do not communicate with or control the sub-contractors and material suppliers.

c. Thoroughly review, check, coordinate and approve all shop drawings and submittals.
d. Schedule and supervise all job site progress meetings. Job site meetings with all sub-contractors who have work in progress must be scheduled at least bi-weekly and the Engineer and Owner must be notified at least two (2) days in advance.
e. Immediately report to the Engineer any discrepancy, deficiency or deviation from the drawings and specifications.
f. Gather and assemble all information required for the preparation of Field Orders or Change Orders when required.
g. Maintain records for as-built drawings and all warranty information.
h. To be available to the Engineer by phone and email at all times within one (1) day notice or call.

1.02 CONTRACTS

A. Project will be constructed under a single contract under the direction of the General Contractor.

B. The Owner reserves the right to award other contracts or subcontracts for additional work in connection with this project as required to install improvements, furnish, or equip the building.

C. There shall be complete cooperation between Contractor and sub-contractors to ensure satisfactory progress and performance of the work.

1.03 COORDINATION WITH ENGINEER/ENGINEER

A. The Engineer will be on the site at required intervals during construction and will be available upon reasonable notification by Contractor.

1.04 WORK SEQUENCE

A. Contractor shall submit with the Schedule of Values a schedule of work sequence for the major portions of work to be done. This schedule shall indicate the time work will commence and be completed on each separate portion.

1.05 CONTRACTOR'S USE OF PREMISES

A. Subcontractors shall limit their use of the premises for work and storage, to allow for:
   1. Work by other subcontractors.
   2. Ongoing use of the facility for storage purposes.

B. Coordinate use of premises under direction of the General Contractor with the Engineer.

C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.

1.06 PARTIAL OWNER OCCUPANCY

A. The Contractor shall allow the Owner to take possession of and use any completed or partially completed portion of the work, or to place and install as much of his own furniture and equipment during the progress of the work as is possible without interference before its entire completion; such possession and use of structure or work or such placing and installation of equipment, or both, shall not in any way evidence completion of the work or any part of it.

B. After the specified time of completion, it shall be understood that the Owner will not be liable for any inconvenience caused the Contractor by the Owner's occupancy.

1.07 OWNER FURNISHED PRODUCTS

A. Products furnished and paid for by the Owner under separate contract shall be incorporated into the project by the Contractor.

B. Owner's Responsibilities:
   1. Promptly inspect product, record damaged or defective items.
   2. Handle products at the site, including uncrating and storage.

C. Contractor's Responsibilities:
   1. Protect products from exposure to elements and from damage.
   2. Repair or replace items damaged by Contractor as directed by the Owner.

1.08 SCOPE OF SPECIFICATIONS

A. Use of the word "all" has generally been omitted, but coverage in all cases is intended to be complete, except where partial coverage is specifically indicated. In all such cases where the item is referred to in the singular number, it is intended that such reference shall apply to as many such items as are required to complete the work.

B. Use of the word "shall" has generally been omitted, but all requirements set forth are mandatory except where otherwise qualified.

1.09 SPECIFICATION EXPLANATION

A. For the convenience of reference and to facilitate the letting of contracts and subcontracts, these specifications are separated into titled Divisions. Such separations shall not, however, operate to make the Engineer/Engineer an arbitrator to establish limits to the contracts between the Contractor and Subcontractor.

1.10 CONDITIONS OF SURFACES

A. It shall be the responsibility of each subcontractor to carefully inspect and examine surfaces or areas prepared to receive his work, such as soil base below pavement. Should they consider such surfaces or areas not proper or satisfactory for the installation or application of their work, they shall notify the Contractor in writing, with copy to Engineer. Should they proceed before proper corrections have been made, it shall be at their own risk and any subsequent corrections that may be ordered or required shall be at their expense.

1.11 PROTECTION OF EXISTING STRUCTURES

A. The Contractor shall protect the existing structures in the area from damage caused by his work or workmen, and be responsible for any damage thus caused.

B. The Contractor shall be responsible to repair or replace to its original condition all areas disturbed by construction, including, but not limited to, trees, drives, walks, lawns, landscaping, utilities, etc.

END OF SECTION

SECTION 01 02 10 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.
   1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Material Quantity allowances.

1.3 SELECTION AND PURCHASE

Not Applicable

1.4 SUBMITTALS

Not Applicable

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 SCHEDULE OF ALLOWANCES

A. Allowance No. 1:

1. Include a lump sum General Purpose Allowance of Forty Thousand Dollars ($40,000.00) for use upon the Owner's Instructions.

2. The General Purpose Allowance shall be used only as directed for the Owner's purposes or only by Construction Change Directives that designate amounts to be charged to this allowance.

3. General Contractor's overhead and profit will not be allowed on items applied to the General Allowance. Subcontractor's overhead and profit will be allowed according to the Supplementary Conditions.

4. In the event all or part of this allowance is not directed to be utilized by the Owner, then that amount shall be credited to the Owner by Change Order at the end of the project.

5. This allowance is separate and apart from any allowances listed in other sections of the specification.

B. Allowance No. 2: Undercut Unsuitable Soil, per unit price bid, see section 01 27 00

C. Allowance No. 3: Replace undercut soil with suitable fill from onsite, per unit price bid, see section 01 27 00

D. Allowance No. 4: Replace undercut soil with suitable fill from offsite, per unit price bid, see section 01 27 00

E. Allowance No. 5: Replace undercut soil with stone from offsite, per unit price bid, see section 01 27 00

F. Allowance No. 6: Rock Excavation in trench, per unit price bid, see section 01 27 00

D. Allowance No. 7: Rock Excavation in mass grading, per unit price bid, see section 01 27 00

END OF SECTION

SECTION 01 03 50 - ADDITIONAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 APPLICATION FOR PAYMENT

A. The form for applications shall be AIA Documents G720, Application and Certification and G703 Continuation Sheet. Submit the Application for Payment to the Designer in accordance with the schedule established by Conditions of the Contract and Agreement between the Owner and Contractor.

B. The Continuation Sheets for the application shall be itemized with the line items and values of the Schedule of Values accepted by the Designer.

C. Submit the original and three copies of each Application with three copies of an updated progress schedule, visitor's log and shop drawing log to the Designer.

D. When the designer finds the Application properly completed and correct, he will transmit a certificate for payment to the Owner, with a copy to the Contractor. The Owner will pay the approved request fifteen (15) days following receipt of the request from the Designer.

1.02 CHANGE ORDER FORM AND PROCEDURES

A. Change Orders shall be submitted on AIA Document G701. A detailed breakdown of cost is required per Section 00 80 00. Signatures by all parties signing the original agreement form are required on each Change Order. No work required by a Change Order shall be accomplished prior to receiving written approval from the Owner.

B. All cost estimates provided by the General Contractor shall be accompanied by certified backup documentation from each subcontractor whose work is affected.

C. The General Contractor and Subcontractors will apply the appropriate amounts of Overhead and Profit to each Change Order in accordance with ASCE C700 General Conditions Article 11-Changes to the Contract. Note that General Contractor Overhead and Profit is not allowed on items paid with General Allowance funds.

1.03 SHOP DRAWING LOG

A. The Contractor shall maintain a Shop Drawing Log identified with Project Name and project number showing the title of each submittal, date of submittal, date returned, and status. Submit copies of this Shop Drawing Log with each pay request.

1.04 VISITOR'S LOG

A. The Contractor shall maintain a log in the field office to record visits by the Designer, his consultants and all official observers. This log shall become the official record of all job visits and shall show: Date, Time of arrival and departure, Name and who represented. The Owner will furnish a form upon request: however, the form is not required - only the information.

B. The Contractor shall submit a copy of this log with each pay request indicating Project Name, Project Number, and period covered by log.

1.05 REQUEST FOR INFORMATION (RFI)

A. The General Contractor's Project Manager or Superintendent shall initiate any questions or requests, regarding the Contract Documents or other aspect of the project to the Architect in writing by use of the RFI form following this specification section.

B. After receipt of the "RFI", the Architect shall reach a decision with regard to the request and provide a written reply on the RFI in the space provided.

C. The use of the RFI does not take the place of verbal communications between the Architect and Contractor, but will serve as a written record of these transactions.

D. All RFI's shall be emailed between the Contractor and Architect.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

REQUEST FOR INFORMATION
Bus Parking at Sequoyah High School

Date Submitted:_____

From:_____

To:_____- Hamilton Co. Dept. of Ed.

Detailed Description of Request/Question:

Response Needed by: (Date)_____ (Time)_____

Response From Engineer

Response Submitted: (Date)_____ (Time)_____

By:_____

SECTION 01 06 10 - NON-DISCRIMINATION/MINORITY HIRING

1. In determining the suitability and acceptability of proposed bidders, the Hamilton Co. Dept of Education reserves the right to consider each bidder's commitment to hire minorities and/or subcontract with minority contractors, relative to certain phases of the contracted services.

2. Except to the extent permitted by Federal Laws and Regulations for a bona fide occupational qualification, the Contractor agrees as follows:

3. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, disability, national origin, sex, or age. The Contractor will take affirmative action to ensure that applicants are employed and employees are treated during employment without regard to their race, creed, color, handicap, national origin, sex, or age. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination, rates of pay, or any other forms of compensation and selection for training.

4. The bidder/contractor agrees to comply with Title VI, as prescribed in the Civil Rights Act of 1964 (42 U.S.C. 2000(D)) and 28 CFR 42 et seq., which provides that "no person in the United States shall on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal Financial Assistance."

5. The Contractor will, in all solicitations for employees or job orders for employees placed with any employment agency, union, or other firm or agency, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, disability, national origin, sex, or age. The words "equal opportunity employer" in all advertisements shall constitute compliance with this section.

6. The Contractor will include the provisions of the foregoing paragraphs in every subcontract or purchase order for goods or services that are subject matter of this Agreement. The Owner shall have the right, at his option, to cancel the Agreement in whole or in part.

7. The Contractor will contact the Chattanooga Urban League http://ulchatt.net/ for assistance in providing minority job applicants. The Chattanooga Urban League shall be allowed to visit the jobsite to observe the minorities and to contact the Contractor if necessary to discuss the number of minorities employed.

8. The Contractor will have an affirmative action plan.

END OF SECTION 01 06 10

SECTION 01 20 00 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Designer in concert with the Contractor shall schedule and administer a preconstruction meeting, and specially called meetings throughout the progress of the Work. The Contractor is responsible for the following:
1. Prepare agenda for meetings.
2. Make physical arrangements for meetings
3. Record the minutes; include all significant proceedings and decisions.
4. Reproduce and distribute copies of minutes within three days after each meeting.
   a. To all participants in the meeting.
   b. To all parties affected by decisions made at the meeting.
   c. Email to the Designer and all participants.

B. Representatives of Contractors, Subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The Designer shall attend meetings to ascertain that work is expedited consistent with Contract Documents and the construction schedule.

1.2 PRECONSTRUCTION MEETING

A. A Preconstruction meeting shall be scheduled at the project site within 15 days after date of Notice to Proceed.

B. This meeting shall be attended by:
1. Owner’s representative
2. The Designer and his professional consultants.
3. Resident Project Representative.
4. Contractor’s Superintendent.
5. Major Subcontractors
6. Major Suppliers.
7. Others as appropriate.

C. The following is a suggested Agenda for this meeting:
1. Review requirements of DIVISION 0 and 1 of the Project Manual.
2. Projected Construction Schedules.
3. Critical work sequencing.
4. Major equipment deliveries and priorities.
5. Project Coordination.
6. Procedures and processing of:
   a. Field Decisions
   b. Submittals
   c. Payroll submittals
   d. Change Orders and itemization of cost.

e. Applications for Payment

7. Extension of time (weather data shall be based on US Weather Bureau statistics)
8. Adequacy of distribution of Contract Documents.
9. Procedures for maintaining Record Documents.
10. Use of premises.
11. Construction facilities, controls and construction aids.
12. Temporary utilities.
14. Safety and first aid procedures.
15. Security procedures.
16. Housekeeping procedures.

1.3 PROGRESS MEETINGS

A. Progress Meetings shall be scheduled at the Project Site prior to the Contractor submitting each Application for Payment or when requested by the Designer.

B. The meeting shall be attended by:
1. The Owner's representative.
2. The Designer and his professional consultants as needed.
3. Subcontractors as appropriate to the agenda.
4. Suppliers as appropriate to the agenda.
5. Others, as required.

C. The following is a suggested agenda for this meeting:
1. Review of work progress since previous meeting.
2. Application for Payment
3. Field observations, problems, conflicts.
4. Problems which impede construction schedule.
5. Review of off-site fabrication and delivery/schedules.
6. Corrective measures and procedures to regain projected schedule
7. Revisions to construction schedule.
8. Plan progress, schedule, during succeeding work period
9. Coordination of schedules.
10. Review submittal schedules: expedite as required.
11. Maintenance of quality standards
12. Other business, as required.

END OF SECTION

SECTION 01 27 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. See Division 1 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 – Excavation of unsuitable soil and provision of compacted fill:

1. Description: Provide a unit price for excavation of unsuitable soil, depose of at location determined by owner on site. Spread material and provided erosion control . This unit price will be used to determine price of material quantity actually required from that stated in the contract documents base bid. This quantity x unit

price will add to or delete from the final contract sum in accordance with General Conditions, Article 7. Section "31 20 00."

2. Unit of Measurement: cubic yards of excavation measured in loose yards.
3. **Include 3,700 loose cubic yards in the allowance bid price**.

B. Unit Price No. 2 -Replace undercut soils with suitable fill from onsite.
   1. Description: Excavation and replacement of undercut areas with suitable fill from on site.
   2. Unit of Measurement Measured compacted in -place yards.
   3. **Include 1,000 compacted yards in the allowance bid price.**

C. Unit Price No. 3 -Replace undercut soils with suitable fill from offsite
   1. Description: Excavation and replacement of undercut areas with suitable fill from contractor's site. Borrow site shall be permitted.
   2. Unit of Measurement Measured compacted in -place yards.
   3. **Include 2,700 compacted yards in the allowance bid price.**

D. Unit Price No. 4 -Replace undercut soils with stone.
   1. Description: Replacement of undercut areas with stone, as determined by owner geotechnical testing agent.
   2. Unit of Measurement Measured compacted in -place yards.
   3. **Include 1,000 compacted yards in the allowance bid price.**

E. Unit Price No. 5 – Excavation of trench rock and provision of compacted approved fill or stone:

   1. Description: Provide a unit price for excavation of trench rock, removal from site and placement of compacted approved fill or stone per cubic yard. This unit price will be used to determine price of material quantity actually required from that stated in the contract documents base bid. This quantity x unit price will add to or delete from the final contract sum in accordance with General Conditions, Article 7. Section "31 20 00."
   2. Unit of Measurement: cubic yards of excavation and compacted fill or stone.
   3. **Include 100 cubic yards in the allowance bid price in the allowance bid price.**

F. Unit Price No. 6 – Excavation of mass rock and provision of compacted approved fill or stone:

   1. Description: Provide a unit price for excavation of mas rock, removal from site and placement of compacted approved fill or stone per cubic yard. This unit price will be used to determine price of material quantity actually required from that stated in the contract documents base bid. This quantity x unit price will add to or delete from the final contract sum in accordance with General Conditions, Article 7. Section "31 20 00."
   2. Unit of Measurement: cubic yards of excavation and compacted fill or stone.
   3. **Include 30 cubic yards in the allowance bid price.**

END OF SECTION

SECTION 01 34 00 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittal of Shop Drawings, Product Data, Samples, and other miscellaneous quality-control submittals.

B. Shop Drawings include, but are not limited to, the following:
   1. Storm drainage and Sanitary Sewer pipe and structures.
   2. Planting Soil, Bio-retention Media, seed, plants.
   3. Asphalt, Concrete, and Roller Compacted Concrete Pavement Materials
   4. Fencing
   5. Electrical materials
   6. Schedules.
      a. Standard information prepared without specific reference to the Project is not Shop Drawings.

C. Product Data include, but are not limited to, the following:
   1. Manufacturer's product specifications.
   2. Manufacturer's installation instructions.
   3. 10. Standard product operating and maintenance manuals.

D. Samples include, but are not limited to, the following:
   1. Components used for independent inspection and testing.
   2. Field samples.

E. Quality-control submittals include, but are not limited to, the following:
   1. Design data.
   2. Certifications.
   3. Manufacturer's instructions.
   4. Manufacturer's field reports.
   5. Concrete cylinders.

F. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
   1. Permits.
   2. Applications for payment.
   3. Performance and payment bonds.
   4. Insurance certificates.

5. Listing of subcontractors.

G. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents, including copies of final Shop Drawings, at project closeout.

1.3 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Test Section of paving shall allow for verification of performance prior to completion of paving. Field samples are used to establish the standard by which the Work will be judged and if approved can remain

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal to the Engineer sufficiently in advance of scheduled performance of related construction activities to avoid delay.
1. Coordinate each submittal with other submittals and related activities that require sequential activity including:
a. Testing.
b. Purchasing.
c. Fabrication.
d. Delivery.
2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work to avoid delay in processing because of the Engineer's need to review submittals concurrently for coordination.
a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
a. Allow 2 weeks for the Engineer's initial review of each submittal. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals. The Engineer will advise the Contractor when a submittal being processed must be delayed for coordination.
b. Where necessary to provide an intermediate submittal, process the intermediate submittal in the same manner as the initial submittal.

c. Allow 2 weeks for reprocessing each submittal.
d. The Engineer will not authorize an extension of time because of the Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.
1. Indicate name of the firm or entity that prepared each submittal on the label or title block.
2. Include the following information on the label for processing and recording action taken.
a. Project name.
b. Date.
c. Name of the Engineer.
d. Name and address of the Contractor.
e. Name and address of the subcontractor.
f. Name and address of the supplier.
g. Name of the manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.
j. Similar definitive information as necessary.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Engineer and to other destinations by use of a transmittal form. The Engineer will return submittals received from sources other than the Contractor.
1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.
2. Include the Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

1.5 SHOP DRAWINGS

A. Submit newly prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
1. Include the following information on Shop Drawings:
a. Dimensions.
b. Identification of products and materials included.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
2. Submit Coordination Drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.
3. Highlight, encircle, or otherwise indicate deviations from the Contract Documents on the Shop Drawings.

4. Do not allow Shop Drawing copies that do not contain an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in construction.
5. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40.
6. Initial Submittal: Email PDF's of submittials to Engineer.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.
   1. Where Product Data includes information on several similar products, some of which are not required for use on the Project, mark copies clearly to indicate which products are applicable.
   2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.
   3. Include the following information in Product Data:
      a. Manufacturer's printed recommendations.
      b. Compliance with recognized trade association standards.
      c. Compliance with recognized testing agency standards.
      d. Application of testing agency labels and seals.
      e. Notation of dimensions verified by field measurement.
      f. Notation of coordination requirements.
   4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

B. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options by the Engineer is required.

C. Submittals: Submit PDF's of submittial to email address of Enigneer. Submit 2 additional hard copies where copies are required for maintenance manuals at project completion. The Engineer will retain one or two copies and will return the others marked with the action taken and corrections or modifications required.
   1. Unless the Engineer observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.

D. Distribution: Furnish copies of final Product Data submittal to the manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.
   1. Do not proceed with installation of materials, products, and systems until a copy of Product Data applicable to the installation is in the Installer's possession.
   2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.7 SAMPLES

A. Submit full-size, fully fabricated Samples, cured and finished in the manner specified, and physically identical with the material or product proposed for use.
   1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Engineer's sample where so indicated. Include the following information:
      a. Generic description of the Sample.
      b. Size limitations.
      c. Sample source.
      d. Product name or name of manufacturer.
      e. Compliance with recognized standards.
      f. Compliance with governing regulations.
      g. Availability.
      h. Delivery time.
   2. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
      a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented by a Sample, submit at least 3 multiple units that show approximate limits of the variations.
      b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
      c. Refer to other Specification Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be in an undamaged condition at time of use. On the transmittal form, indicate such special requests about disposition of Sample submittals.
      d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

B. Preliminary Submittals: Where Samples are specified for selection of color, pattern, texture, or similar characteristics from a manufacturer's range of standard choices, submit a single, full set of available choices for the material or product.
   1. Preliminary submittals will be reviewed and returned with the Engineer's marking indicating selection and other action taken.

C. Submittals: Except for Samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation, and other characteristics, submit 3 sets of Samples. One set will be returned marked with the action taken.
   1. Maintain sets of Samples, as returned by the Engineer, at the Project Site, available for quality-control comparisons throughout the course of construction activity.
   2. Unless the Engineer observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
   3. Sample sets may be used to obtain final acceptance of the construction associated with each set.

D. Distribution of Samples: Distribute additional sets of Samples to the subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of the Work. Show distribution on transmittal forms.

E. Field samples specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.8 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
   1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.9 ENGINEER'S ACTION

A. Except for submittals for the record or for information, where action and return of submittals is required, the Engineer will review each submittal, mark to indicate the action taken, and return.
   1. Compliance with specified characteristics is the Contractor's responsibility and not considered part of the Engineer's review and indication of action taken.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, action stamp. The Engineer will mark the stamp appropriately to indicate the action taken.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 37 00 - CONSTRUCTION SCHEDULE AND SCHEDULE OF VALUES

1.01 DESCRIPTION:

A. Related Requirements Specified Elsewhere:
   1. General Conditions Section 00 70 00 per ASCE C700
   2. Summary of Work: Section 01 01 00
   3. Contract Closeout: Section 01 70 00

B. The General Contractor shall prepare and maintain a detailed construction schedule which shall show clearly the sequence of all construction work. This schedule shall be the Contractor's working schedule and shall be used to plan, organize, and execute the work, record and report actual performance and progress, and show how the Contractor plans to complete all remaining work as of the end of each Progress Report period. The schedule shall provide sufficient detail and clarity of form and technique so that the Contractor can plan, schedule, monitor, control, and report on the progress of his work. In addition, it shall provide the Owner with a tool to monitor and follow the progress for all phases of the work. This schedule, along with the accompanying Schedule of Values, will be the basis for all pay applications, time extensions or delays, liquidated damages and early completion bonus, if applicable.

1.02 REQUIREMENTS

A. The schedule shall clearly indicate all Contract milestones and completion dates of each construction activity. In addition, it shall include activities for procurement, shop drawings, fabrication and delivery for all important material items. Owner furnished materials must be incorporated also. Each activity on the schedule shall be identified with a description of the work, and a duration, in calendar days, for the performance of the activity. Each activity will be restrained by an early start date and a late finish date. Each activity will be preceded by all other activities which must be accomplished prior to that activity. The critical path will be clearly identified on the diagram. The schedule shall be consistent with the dates specified in the Contract. Major milestones shall include, but are not limited to, the following:
   - Completion of Phase 1 Erosion Control
   - Mass Grading Completion
   - Installation of Pavement
   - Items as noted in 1.07 of this Section
   - Permanent power connection for future trailer
   - Landscaping Installation
   - Substantial Completion (C.O.)

B. The General Contractor shall involve all major subcontractors in the development and implementation of the schedule. The Contractor shall submit one digital and printed copy of the schedule rough draft within two weeks after award of the Contract. The Engineer will review and return the proposed schedule within two weeks. Within two weeks after the Engineer's approval of the rough draft, the Contractor shall submit the final schedule, which shall include the signature of the Contractor and all major subcontractors.

Failure to submit initial schedule as specified will delay approval of progress payment until required information is submitted and approved by Engineer.

1.03 SCHEDULE OF VALUES

A. In conjunction with the progress schedule, a Schedule of Values is to be submitted for approval as basis for the contractor's Application for Payment. Use Specification Table of Contents as basis of format for listing costs of work for Sections under Division 2-16. Itemize separate line items cost for work required by each Section, as well as:
   1. Performance and Payment Bonds
   2. Field supervision and layout
   3. Temporary facilities and controls.

B. Line item costs shall include overhead and profit. Make sum of total costs of all items listed in Schedule equal to total Contract Sum. Submit digital Schedule of Values on 8 ½ x 11" format.

1.04 UPDATES

A. The initial updating will take place during the first week after the approval of the Contractor's schedule. Subsequent updates shall be scheduled at the end of each month thereafter for the duration of the Project. A monthly meeting will be held with Engineer, Project Manager and Superintendent to review the schedule for:
   1. Actual start and completion dates.
   2. Cost value of work in place.
   3. Activity percent completion.
   4. Revised logic of activities.
   5. Influence of change orders.

   The Contractor shall come to the updating meeting with the above data prepared in advance.

B. The updated schedule shall be submitted along with the Contractor's Application for Payment and Schedule of Values within five calendar days after each update meeting. Any delay in submittal of this information may withhold approval of progress payment.

C. As part of the updating process, the Contractor shall prepare a written Status Report, describing the physical progress during the period, plans for the next week, actions planned to correct any lost time and discussion of any potential delays/problems that could impact the project completion date stated in the Contract. These should be submitted to the Engineer and copied to the Owner on a weekly basis. The Contractor also shall provide, in writing, a 30 day notice confirming the completion date of the Project in order for the Owner to coordinate opening activities.

1.05 REVISION/TIME EXTENSIONS

A. When change orders or delays are experienced by the Contractor, and the Contractor requests an extension of time, the Contractor shall submit a written Time Impact Analysis illustrating the influence of each change or delay in the current contract schedule completion date. Each analysis shall demonstrate the estimated time impact based on the events of delay, the date the change was given to the Contractor, the status of construction at that point in time, and the event time computation of all activities effected by the change or delay.

B. Each Time Impact Analysis shall be submitted in triplicate and with fifteen calendar days after a delay occurs. In cases where the Contractor does not submit a Time Impact Analysis for a specific change order or delay within the specified period of time, he will have waived his rights to any additional time and cost. Approval or rejection of each analysis by the Owner shall be made within fifteen calendar days after receipt, unless subsequent meetings and negotiations are necessary. In the event the Contractor does not agree with the decision of the Owner regarding the impact of a change or delay, it shall be resolved in accordance with the “Disputes” clause of the Contract.

1.06 CONSTRUCTION TIME/LIQUIDATED DAMAGES

Construction time is of the essence to this contract. The Contractor is to achieve Substantial Completion within 90 calendar days after Notice to Proceed. The Owner will assess Liquidated Damages to the Contractor of $200.00 per day for each day the project is not Substantially Complete by the above time.

END OF SECTION

SECTION 01 70 00 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operation and maintenance manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
      b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
   2. Advise the Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
   4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra stock, and similar items.
   8. Complete startup testing of systems and instruction of the Owner’s operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
   9. Complete final cleanup requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
   1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
   2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
   2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
   3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
   4. Submit consent of surety to final payment.
   5. Submit a final liquidated damages settlement statement.
   6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.
   1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   2. If necessary, reinspection will be repeated.

C. Reinspection Fees: Should the Architect perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
   1. The Owner will deduct the amount of the determined compensation from the final payment due the Contractor.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
   2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
   3. Note related change-order numbers where applicable.
   4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
   1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
   2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
   3. Note related record drawing information and Product Data.
   4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.
   1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
   2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
   3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 4-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Provide two (2) sets of each. Mark appropriate identification on front and spine of each binder. Include the following types of information:
   1. Emergency instructions.
   2. Spare parts list.
   3. Copies of warranties.
   4. Wiring diagrams.
   5. Recommended "turn-around" cycles.
   6. Inspection procedures.
   7. Shop Drawings and Product Data.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
   1. Maintenance manuals.
   2. Record documents.
   3. Spare parts and materials.
   4. Tools.
   5. Lubricants.
   6. Identification systems.
   7. Control sequences.
   8. Hazards.
   9. Cleaning.
   10. Warranties and bonds.
   11. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:
   1. Startup.
   2. Shutdown.
   3. Emergency operations.
   4. Noise and vibration adjustments.
   5. Safety procedures.
   6. Economy and efficiency adjustments.

7. Effective energy utilization.

3.3 PROJECT CLOSE-OUT PACKAGE

A. The Contractor shall submit the following Close-Out Documents to the Designer as a single package:
   1. Project Data & Warranties.
   2. Consent of Surety to release retainage and pay Contractor in full.
   3. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706).
   4. The final application for payment accompanied by a statement of accounting. The statement shall reflect all adjustments to the Contract Sum.
      a. The original Contract Sum.
      b. Additions and deductions resulting from:
         Change Orders
         Allowances
         Unit Prices
         Deductions for non-conforming work
         Deductions for Liquidated Damages
         Deductions for re-inspection payments
         Other adjustments
      c. Total Contract Sum as directed.
      d. Previous Payments
      e. Sum Remaining Due

B. When the Designer has determined that the close-out submittal is complete and correct, he will prepare a Change Order, if necessary, reflecting the approved adjustments to the contract sum which were not previously made by Change Order.

C. The Designer will submit to the Owner the Project Close-Out package and the signed final Change Order (if required) with a cover letter certifying that, to the best of his knowledge, the completion of the project is in compliance with the Contract Documents and the balance shown is due and payable.

D. Close-Out Documents shall specify that; No Owner liability shall exist for payment of equipment, material or labor which has not been properly paid for by the Contractor.

3.3 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section 01710 "Cleaning".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    2) Revise seven subparagraphs below to suit Project. Check for conflict or duplication with provisions in other Sections, particularly Divisions 15 and 16.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner’s property. Do not discharge volatile, harmful, or dangerous

materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. If the Owner does not want them, dispose of these materials as directed by the Owner.

END OF SECTION

SECTION 01 71 00 - CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Requirements Specified Elsewhere:
   1. Summary of Work: Section 01010
   2. Contract Close-Out: Section 01700
   3. Site Clearing: Section 311000

B. Work includes: The work in this section is required of each contractor unless otherwise specified:
   1. Each contractor:
      a. Maintain premises and adjacent properties free of waste, debris and rubbish caused by construction operations.
      b. At completion of work, or at such other times as directed by the Architect, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight-exposed surfaces; leave work clean and ready for occupancy.
   2. General Contractor:
      a. In addition to the work specified under “Each Contractor”, supervise and coordinate the cleaning operations of all contractors.
      b. At completion of project, leave project clean and ready for occupancy.

1.2 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with following safety and insurance standards:
   1. Occupation Safety and Health Administration (OSHA).

B. Hazards Control:
   1. Store volatile wastes in covered metal containers and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with Federal, State and local anti-pollution laws.
   1. Rubbish and waste materials shall not be burned or buried on project site.
   2. Volatile wastes such as mineral spirits, oil or paint thinner shall not be disposed of into storm or sanitary drains.
   3. Wastes shall not be disposed of into streams and waterways.

1.3 SUBMITTALS

A. Manufacturer’s recommendations for specified cleaning products.

B. Proposed cleaning products for products where manufacturer's recommendations are not specified.

PART 3 - EXECUTION

3.1 GENERAL

A. Execute cleaning to ensure that building(s), grounds and public properties are maintained and free from accumulations of waste materials and rubbish.

B. Wet down materials and rubbish to lay dust and to prevent blowing dust.

C. Twice weekly, during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish.

D. Provide on-site transportable cart containers for collection of waste, materials, debris and rubbish as required.

E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART I - GENERAL

1.01 DEFINITIONS

Whenever occurring in Division 260000 the following words shall have the meanings given below:

A. "Provide" shall mean to furnish, install and connect complete.

B. "Wiring" shall mean wire or cable, installed in conduit, cable tray, or wireways with all required boxes, fittings, connectors, and accessories completely installed.

C. "Work" shall be understood to mean the materials completely installed including the labor involved.

D. "Plans and Specifications/Contract Documents" shall be understood to mean the complete documents, including all trades, divisions, sections, addenda, etc.

E. "Review of Shop Drawings" - see Division 1.

F. "Conduit" shall mean either rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or plastic conduit (PVC).

1.02 The Contractor AGREES that upon the submittal of a bid, he will have read and studied ALL of the Contract Documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of electrical work to which end the Contractor shall provide ALL labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.03 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the electrical work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.04 Should the Contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the Architect and the Engineer BEFORE submitting a bid for work under this division. The Contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.05 The contractor shall not use any material or equipment that contains asbestos, PCB's, or any other substance which is known to endanger the public health.

1.06 SCOPE OF WORK

A. The Contractor shall refer to Architectural, Mechanical, and Structural drawings and specifications for related work.

B. The work of this division shall include the furnishing of all labor, supplies, materials, sales tax, permits, inspection fees, costs of testing, shop drawings, as built drawings, operation and maintenance manuals, and the performing of all operations including installation, cutting and chasing, trenching and backfilling, compaction, coordination with other trades on the job, etc., to the end of obtaining a complete installation of electrical work as shown on the drawings and called for in the written specifications.

C. The work to be performed under the electrical contract shall include, but not be limited to:

1. Service entrance conduit and wire.
2. Service entrance equipment including disconnects, switchboards, panelboards, etc.
3. Feeder conduit and wire.
4. Distribution, lighting, and miscellaneous panelboards.
5. Branch circuit conduit and wire.
6. Lighting Fixtures.
7. Wiring devices including receptacles, light switches, etc.
8. Telecommunications service entrance conduit, and interior conduit and outlet boxes.
9. Fire Alarm System complete, if called for on the drawings
10. Disconnects
11. Control system conduit for mechanical contract.
12. Provision of temporary power at 120/240, single phase for construction.

D. Work not included under the electrical contract:

1. All motor starters and their associated control devices, heaters, etc. will be furnished with the motors under Division 230000 of these specifications.
2. Control and interlock wiring for mechanical contract supplied systems.
3. Telecommunications head end equipment, connectors, faceplates or any cabling
4. Cable television head end equipment, connectors, faceplates or any cabling

E. The owner will not make any consideration to the contractor for any alleged misunderstanding of the amount of work to be performed. Submittal of a bid for work shall convey full agreement by the Contractor to all items and conditions specified, indicated on the drawings, and/or required by the nature of the job site.

F. The Contractor shall be responsible for ensuring that all equipment and materials are installed in a neat and workmanlike manner and are aligned, leveled and adjusted for satisfactory operation. He shall install all equipment so that all parts are easily accessible for inspection, operation, maintenance and repair. He shall insure that all equipment is solidly supported from building structures.

G. The contractor is responsible for hand marking the covers of any junction boxes with the identification of any circuits contained. Sharpie mark the exterior of the boxes except in cases where the ceilings are painted out or otherwise coated, mark the interior of the box covers in that case.

1.08 CODES, LAWS AND ORDINANCES

A. Comply with all laws, codes, ordinances, and etc., having jurisdiction over the work to be performed under the contract for this project, EXCEPT where the requirements of the drawings and/or specifications are in excess of those called for in said laws, codes, ordinances, etc.

B. Perform work in accordance with the locally adopted editions of the standards listed below; EXCEPT where federal, state and/or local codes are more stringent, in which case, follow them instead:

1.	National Fire Protection Association	NFPA
2.	Underwriters Laboratories	UL
3.	American Society of Testing Materials	ASTM
4.	National Electrical Code	NEC
5.	National Electrical Manufacturing Association	NEMA
6.	Occupational Safety & Health Act	OSHA

C. The Contractor shall be responsible for installation of the work called for in the contract documents in accordance with all codes, laws, and ordinances, which govern such work. Should he encounter anything contained within the contract documents during preparation for bid which would prohibit the successful compliance of his responsibility under this item, he shall notify the Architect prior to execution of the contract for work so that adjustments can be made to the contract.

D. The Contractor shall be responsible for obtaining all permits, inspection certificates, etc., required by local, state and/or federal authorities for this project, at his expense. Any and all additional work, expense, etc., incurred as the result of failure to request timely inspections, and or permits, shall be charged against the Contractor.

E. Approval of the Architect, Engineer, and the appropriate inspection authorities must be secured for the complete electrical installation prior to contract closeout. Upon completion of the electrical work, the Contractor will furnish the Architect with two (2) copies of all certificates of inspection, permits, etc. Final payment to the Contractor will not be made until the requirements of this paragraph have been met.

1.09 LOCAL CONDITIONS

A. Existing site utilities, underground services, structures, etc., are shown on the drawings accurately in scope only. No expressed or implied guarantee is given as to exact location of the above items. The Contractor is required to verify exact locations and subsequent effects of such on the job.

B. The Contractor shall contact the local utility companies (power, telephone, etc.) to confirm the scheme of service called for on the drawings. Should the Contractor discover the need for any change to these service schemes per the utility involved, he shall notify the Architect prior to any work being performed so that a solution can be provided. Also, if the contractor becomes aware of any aid to construction cost that will be incurred to the project for any of the utility companies to provide their services, the Contractor shall advise the Architect as soon as possible in the process so that arrangements can be made for the owner to pay these aid to construction utility fees directly to the utility. Note that this does not include any meter fees, permits, pad

preparation or leveling, primary duct bank work, or other items identified elsewhere in any of the documents which the contractor is otherwise responsible for.

C. Contractor shall verify with the Local Power Company the value of fault current in amperes which will be available at the secondary terminals of the Power Company transformer. If this value is in excess of the AIC ratings of the various panels, circuit breakers, etc., as shown on the drawings, the Contractor shall supply such equipment with AIC ratings which will accommodate the available fault current. Any increase in cost due to this item shall be included in the bid.

D. Contractors desiring to bid on work under this division are required to visit the job site before bid submittal. During said visit the Contractor shall become familiar with all site conditions which will affect his work and the cost of the work. He shall also verify exact location of the equipment of the various utility companies from whom services will be required. The Contractor shall submit a letter with his bid stating that he has complied with this requirement.

1.10 PLANS AND SPECIFICATIONS

A. While drawings are to scale, they are diagrammatic. DO NOT SCALE DRAWINGS HAVING 1/4" OR SMALLER SCALE. Equipment, conduit, outlets, etc., are not exactly positioned; therefore, the Contractor shall refer to architectural drawings for actual building dimensions, ceiling layouts, light fixture locations, work by other trades, etc.

B. Should any conflict exist between the drawings and the written specifications, the specifications shall generally govern. Contact Engineer for clarifications.

C. The drawings and written specifications for all divisions are part of the contract. Any work and material shown in the one and omitted in the other, or which may be reasonably implied by both or either, shall be fully furnished and performed by the Contractor, as required for a complete electrical system installation.

D. No deviation from the drawings and specifications shall be made without the full knowledge and consent of the Architect. Should the Contractor find, at any time during the progress of the work, that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such item promptly to the Architect for his decision and instructions.

E. The right is reserved by the Architect to move any equipment, outlet, conduit, etc.; as much as ten (10) feet at no increase in cost, provided the Contractor is notified of the change before work on the detail in question is started.

F. It shall be the responsibility of the Contractor to ensure that the equipment he provides will fit into the available space, leaving reasonable space for maintenance and servicing of the equipment. If, after the installation of any equipment, it is determined that the space requirements have not been met, the Contractor shall rearrange the work at no additional cost.

1.11 COORDINATION OF WORK

A. It is the responsibility of the Contractor to plan all work so that it proceeds with a minimum of interference with all other trades. He is to inform all parties concerned of openings in the building construction for equipment or conduit required for the electrical work. He is to coordinate the electrical work with the mechanical and plumbing installation.

B. The contractor shall review and coordinate the locations of all electrical equipment (meters, instrument transformer cabinets, panels, disconnect switches, lighting contactors, etc.) mounted on the outside walls of buildings with the drawings for the mechanical, plumbing, and architectural disciplines to avoid any conflicts in locations with sprinkler risers, plumbing risers, rain downspouts, doors, etc. Generally, meter center risers are shown on the drawings for the purposes of information only; they are not dimensioned. In addition, the locations of the meter centers on the site plans are diagrammatic only. They are not dimensioned. The contractor must coordinate these installations. If there are any questions as to locations of equipment, notify the engineer for clarification prior to installation of equipment.

C. The Contractor shall provide all required frames, sleeves, inserts, supports, anchor bolts, etc., as required for completion of the work.

D. The Contractor shall lay out and coordinate all work well enough in advance so as to avoid conflicts or interference with other work in progress. If there is any interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and at no additional cost to the Owner. Consult the Architect for instructions.

E. The contractor shall verify the location of all disconnect switches required by the project, prior to their installation. The installed location of any disconnect shall not impede the access to, or working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance due to impeded air flow, etc. This requirement applies regardless of the location shown for the disconnects on the plans. If there is any question as to disconnect location, the contractor shall ask the engineer for clarification prior to installation. If any disconnect is found to be installed in such a way that it causes any problems as mentioned above, it shall be relocated at the expense of the contractor.

F. Work lines and established heights shall be in strict accordance with architectural drawings and specifications, insofar as these drawings and specifications extend. It is the Contractor's responsibility to verify all elevations and detailed dimensions not indicated.

G. The Contractor shall coordinate all outlets, fixtures, equipment, etc., with floor, wall and ceiling patterns. Any lines which must pitch shall have right-of-way over lines whose elevations can be changed.

1.12 EQUIPMENT DATA

A. Deliver all printed tags, instructions, certified drawings, parts lists, certificates, etc., supplied with equipment items, to the Architect at completion of the project.

B. Assemble all such printed materials into a stiff-back binder identified on its face.

1.13 SHOP DRAWINGS

A. Shop drawings for switchboards, panelboards, transformers, generators, bus duct, cable tray, fire alarm systems, security systems, lighting fixtures, and other items as might be requested, shall be submitted to the Architect's Engineer for his approval, by the Contractor promptly upon receipt of the contract for work.

B. The engineer will review the shop drawings for errors in the contractor’s interpretation of the contract documents only, and to assist the contractor in compliance with the documents. Correction comments or approval made on shop drawings during the review do not relieve the contractor from compliance with requirements of the contract documents, plans, and specifications. Review or approval of the shop drawings shall not relieve the contractor from responsibility for confirming and correlating all quantities and dimensions, coordination of his work with the other trades, and performance of his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviations from plans and specifications by the contractor, nor shall it permit changes to the plans and specifications by the engineer. Changes to, or deviations from, the contract documents may only be made by a Change Order issued by the architect and executed properly.

C. The contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the engineer.

D. Equipment subject to shop drawing approval shall not be ordered until approved by the Engineer. Material ordered or installed without such approval, if rejected by the Engineer, shall be removed and replaced with approved items at the Contractor's expense.

E. In order to procure approval for such equipment, the Contractor shall submit electronic copies of shop drawings and/or brochures describing each piece of equipment. Description shall include rated capacities, dimensions, manufacturer's catalog number, performance data with operating characteristics, optional features, modifications, etc.

F. Note that if the contractor fails to submit all required shop drawings in a timely fashion which allows for resubmittal as required per comments he is solely for resulting project delays, liquidated damages, or having to provide temporary fixtures(if allowed by the architect) while awaiting the arrival of the shop drawing approved fixtures or devices for installation.

G. See individual specification sections or drawings for additional shop drawing requirements.

F. If equipment is substituted and approved in the shop drawing process; its use may affect electrical, mechanical, structural, and other systems which were designed based on the original equipment specifications. Any changes, and their cost, in any of the divisions of work affected by the substitution of equipment, shall be the sole responsibility of the contractor making the substitution.

PART II - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new and the best grade. They shall conform to all standards and requirements governing the work. Any and all equipment and materials damaged during installation or shipment shall be immediately replaced at NO cost to the Owner.

B. Reference shall be made to drawing schedules and details and/or specifications for manufacturer, model, catalog number, size, capacity, performance, installation, etc., of equipment and material. Such information is used to denote design, workmanship, and quality desired.

C. The Contractor shall offer his bid for work based on the electrical equipment (including light fixtures) which is described in these specifications and described in the respective schedules on the drawings. Pre-bid approvals for substitute equipment will not be given.

D. PRODUCT SELECTION PROCEDURES:

Product selection shall be governed by the Contract Documents, and not by previous project experience which the Contractor or his suppliers may possess. Procedures governing product selection include the following:

1. PROPRIETARY SPECIFICATION REQUIREMENTS: See drawings for cases in which no substitutions shall be permitted.

2. NON-PROPRIETARY SPECIFICATONS: When the specification lists products or manufacturers that are available for incorporation into the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product which complies with the contract requirements. Such products are still subject to the shop drawings submittal process.

E. In the submission of substitute equipment and materials, the Contractor shall note the following: (1) capacities are absolute minimum and must be equaled, (2) physical size limitations for space allotted, (3) structural properties, (4) noise levels, (5) interchangeability, (6) compatibility with other materials, (7) similar items shall be same manufacturer and style wherever possible.

F. All materials and equipment, for which a UL or NEMA standard is established, shall be so approved and labeled or stamped.

G. NEMA standards shall be taken as minimum requirements for electrical equipment.

H. Electrical equipment shall operate properly under a 10 percent plus or minus voltage variation.

I. Adhesives are not acceptable as mounting, supporting or assembling media.

PART III - EXECUTION

3.01 All materials required for the project shall be ordered by the Contractor in a timely manner which allows the material to be received at the job site for installation in agreement with the job schedule, so that work of the other divisions is not held up in any way.

3.02 All materials and equipment received at the job site by the Contractor shall be stored and protected from damage while they wait to be installed.

3.03 All work shall be carried out in a neat and orderly manner by experienced electricians, under the constant supervision of a competent electrician, trained and licensed in this field, who shall represent the Contractor at all times in connection with the work.

3.04 Materials or work installed, rejected by the Architect's Engineer upon inspection shall be completely removed by the Contractor, and the work redone in a manner acceptable to the Engineer by the Contractor at no charge.

3.05 When rejected work is removed, should other material, equipment, etc., be damaged in the process, the Contractor shall make all necessary repairs, so that the damaged equipment is equal in quality, strength and appearance to its original state.

3.06 SPACE REQUIREMENTS

A. The Contractor is fully responsible for determining in advance of purchase that all equipment and materials proposed for installation will fit into the space indicated while allowing sufficient clearance about the equipment and materials to allow proper maintenance and servicing of all components requiring such, including equipment and materials of other divisions located in the vicinity. Shop drawing approval does not alleviate the contractor of this responsibility.

B. Clearances in front of panelboards, switchboards, motor starters, busway taps, and other electrical equipment requiring servicing while energized, shall be provided in accordance with the NEC, table 110-16a, as required by the code text. Shop drawing approval does not alleviate the contractor of this responsibility.

3.07 FIRESTOPPING

A. Firestop all penetrations of building fire rated surfaces made by this division.

B. Each penetration shall be protected by a firestop system with a rating equal to or greater than the original assembly in which the penetration occurs.

C. All firestop material shall be installed in accordance with manufacturer’s standard details and the UL Building Materials Directory for each type of fire rated assembly penetrated.

D. Telecommunications sleeves shall be firestopped with materials that will permit re-entry and use of the sleeves.

3.08 WIRING ELECTRICALLY OPERATED EQUIPMENT

A. The Contractor shall provide all conduit, conductors, wiring, etc., required to connect

power to all electrically operated equipment installed on the project, whether provided by this division or other divisions, or by the owner.

B. The Contractor shall install, support, and electrically connect motor starters, disconnects, etc., and shall complete all power wiring circuits so that each is left in satisfactory condition.

C. All control equipment associated with any equipment furnished under any other division, or by the owner, shall be furnished by that provider.

D. This division shall provide all conduit required for control wiring as needed for Division 230000. Refer to that division and its associated drawings for specifics.

E. This division is responsible for the provision of, and fire alarm system wiring of, duct smoke detectors for all HVAC equipment requiring them. If there is a fire alarm system provided for the project, the detectors shall be tied to that system. If there is no fire alarm system, the Contractor shall provide remote visual and audible alarm indicators and remote test stations per the requirements of NFPA 72 or 90A, latest edition.

3.09 RECORD AND AS-BUILT DOCUMENTS

A. The Contractor shall maintain at the job site a complete set of Contract Documents. These documents shall be kept current with all changes, substitutions, etc., to the original documents as reflected by the actual work being installed.

B. At closeout, the Contractor shall provide the Owner with one complete set of as-built reproducible drawings. These documents shall show installed locations, sizes, etc., of all work and material as required by the contract documents and actually installed on the project. If for some reason CAD or Rivet versions of the as builts are required at project conclusion by the owner or architect, the contractor is responsible for making these changes or paying the engineer to make the changes per the firms standard hourly rates.

C. For each piece of equipment installed or provided, the Contractor shall provide the number of OEM hardcopies or electronic files as required by the architect to include:

1. Manufacturer’s printed catalog pages
2. Manufacturer’s operating and maintenance instructions
3. Manufacturer’s wiring and connection diagrams, etc.,
4. Motor interlock and control diagrams showing operating instructions for, and normal positions of, each motor and controller
5. Warranty information

All of this information shall be provided in bound 8-1/2” by 11” hardback booklets, or electronic if allowed by the architect.

3.10 CLEANING

A. The Contractor shall insure that all interior and exterior surfaces of panelboards, transformers, switchboards, motor starters, cabinets, etc., are cleaned so as to be free

of dust, dirt, grease, plaster, debris, etc. Lighting fixtures shall be cleaned according to manufacturer's recommendations. Interior of can lights to be wiped clean of fingerprints.

B. Any electrical equipment having sustained damage to any factory painted surfaces shall have that damage repaired and restored to original factory condition.

C. Any and all ferrous metal surfaces exposed on the electrical system shall be painted.

3.11 TEMPORARY LIGHTING AND POWER

A. As soon as is possible, the Contractor shall install temporary electrical wiring and lighting for the project in accordance with NEC Article 305.

B. Wiring shall consist of non-metallic sheathed cable with ground wire.

3.12 EXCAVATION, SHORING, AND BACKFILL

A. The Contractor shall perform all necessary excavation required for installation of his work. Each utility shall be installed in a separate trench.

B. Excavation shall be below that required for general construction and final grade. It is expected that the Contractor shall process normally difficulties encountered in excavation related to rocks, debris, etc. However, should the Contractor encounter "solid" rock impediments to his excavation, he shall contact the Architect for directions.

C. Any and all trenching shall be performed strictly in accordance with OSHA, and other authorities having jurisdiction, rules and regulations regarding "cave in" safety shoring. All shoring material used shall be completely removed prior to backfilling the trench.

D. The Contractor shall not backfill trenches until the conduit banks have been inspected by the proper authorities.

E. Backfill shall be done simultaneously on both sides of the equipment, raceways, etc. Backfill shall be clean soil, free of rocks, cinders, wood, debris, etc.

F. Backfill shall be installed in 12-inch layers. It shall be compacted to 85% per ASTM D-1557 in areas under sidewalks and grass; and to 95% under any paved areas.

G. Should concrete encasement of raceways be required, the sides and floor of the trench shall be used as formwork for the concrete. This shall not apply unless the excavation is clean, free of debris, and of the proper size.

3.13 CUTTING AND PATCHING

A. The Contractor shall be responsible for the location and size of all openings required for his work.

B. The Contractor shall not cut into structural members or architectural finish surfaces without expressed written approval of the Architect.

C. Any patching of surfaces required by the Contractor's work shall be made so that they are equal in quality and appearance to the original surface.

3.14 FLASHING

A. Raceways which pass through walls or roof surfaces to the outside shall be flashed in accordance with architectural standards and with the requirements of the roofing manufacturer.

B. Any raceways penetrating the roof shall maintain a clearance of 18 inches minimum from all parapets.

C. Whenever raceways pass through floor structures which contain a water proofing membrane, the Contractor shall provide a watertight floor sleeve for each raceway. The lowest floor shall be exempt.

3.15 MOISTURE - DAMP PROTECTION

A. Whenever any electrical component such as panels, raceways, etc., will be in contact with surfaces which may become damp or wet, that component shall be mounted on standoff devices so that it is a minimum of ¼" away from the surface.

3.16 GUARANTEE AND WARRANTY

A. The Contractor and the General Contractor shall, and hereby does, guarantee that all work executed, and all electrical equipment installed, under this division will be free of all defects in materials, manufacture, and workmanship for a period of one (1) year from the date of final acceptance of the building. The above parties agree that they will, at their expense, repair and/or replace all such defective work and equipment, and any and all other work damaged thereby, which becomes defective during the term of this guarantee.

END OF SECTION

SECTION 26 05 02 – TESTING FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 SUMMARY

A. The entire electrical system shall be tested to insure proper operation and safety for building occupants and operating personnel.

B. Testing shall insure conformity to code requirements and conformity to contract documents.

1.02 REGULATORY REQUIREMENTS

A. Testing shall be in conformance local codes, utility company requirements, and standard industry practices.

B. Testing shall accomplish the requirements of the NEC, Article 110.

PART II – PRODUCTS

2.01 Testing shall be performed with instruments and materials required and approved for the purpose.

PART III - EXECUTION

3.01 Perform appropriate tests on the entire electrical system before it is energized. Testing shall be performed to insure that it is free of unintended grounds, short circuits, and open circuits.

3.02 Provide safeguards to protect all personnel involved in the testing as well as for protection of equipment being tested.

3.03 Testing shall be performed in a timely manner. Reports of results shall be filed with the Architect in written form.

3.04 Testing shall include the following:

1. Prior to connections to equipment, all service entrance conductors and feeder conductors shall be tested for unintended grounds and for insulation integrity with a megohm meter. Any conductor found to be defective in the testing shall be replaced.

2. Ground fault protection systems on service entrance equipment shall be tested according to the NEC, Article 230-95.

3. The grounding system network shall be tested to insure a resistance value of not more than ten (10) ohms to ground. Should the system test results be higher than 10 ohms, additional ground rods shall be driven, or alterations made to the system, to produce the 10-ohm or less value required.

4. Full load currents of each feeder shall be measured to test for phase load balance. If the phases are not load balanced, circuit rearrangement shall be made to achieve

balanced load conditions.

5. The proper operation of all alarm and control systems installed under this division shall be verified by system operational testing.

6. All circuits having parallel conductors shall be tested for proper phasing using hot phasing or other compatible techniques.

3.05 The Contractor shall provide additional testing as deemed necessary by the Architect to insure that all equipment functions properly and meets the requirements of the specifications and drawings.

END OF SECTION

SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART I - GENERAL

1.01 SUMMARY

A. This section includes building wires and cables, metal clad cable, connectors, and terminations for systems rated below 600 volts.

1.02 RELATED DOCUMENTS

A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.

B. Section 260553 – Identification for Electrical Systems

1.03 REGULATORY REQUIRMENTS

A. All products required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.

B. All products furnished under this section, as installed, shall meet all requirements of the NEC.

1.04 WIRE AND CABLE

A. All wire and cable routing shown on the drawings is approximate. Field verify dimensions and routing lengths of all conductors and cables required prior to installation.

B. All wire and cable furnished on this project shall be copper and drawings reflect conductor sizes, conduit sizes, etc. based on copper conductors.

1.05 SUBMITTAL FOR INFORMATION:

A. Provide written data for aluminum conductor substitution to the engineer indicating the voltage drop and ampacity calculations for the aluminum conductor substitute to match the copper conductor involved.

PART II - PRODUCTS

2.01 CONDUCTORS

A. Specified gauge sizes refer to American Wire Gauge, copper conductors.

B. All wire and cable shall be of soft drawn, annealed, copper having a conductivity of not less than 98% of that of pure copper; each wire continuous without weld, splice, or joint throughout its length; uniform in cross section and free from flaws, scales and other imperfections.

C. Sizes specified are AWG through No. 4/0 and circular mils above No. 4/0. Conductor No. 10 and smaller shall be solid; No. 8 and larger stranded. Note that the manufacturers recommendations for certain pieces of equipment may require stranded wire in smaller sizes than noted above; always follow manufacturers recommendations.

D. Conductors No. 4 and smaller shall be Type "THHN/THWN"; larger conductors shall be type "THW". Other types allowed with approval of the engineer.

E. All conductors shall be of the same name brand and shall be in the original wrapping.

2.02 BRANCH CIRCUIT CONDUCTORS

A. Minimum wire size for lighting and power circuits shall be #12. #10 shall be used where the run to the first outlet exceeds 75' for 120V circuit and 150' for 277V circuit.

B. Branch circuit wiring shall be rated for 75 degrees C minimum. Note that 90 degree wire can be used for derating but not to increase the overall ampacity of a circuit, since connections at most manufacturers equipment is rated for 75 degree C max, as a limiting factor.

C. All installations to be based on wire in conduit except for cases where the use of MC cable or NM cable is specifically noted as being allowed on the drawings in certain applications or instances. In these cases, follow the appropriate NEC section for installation guidelines or obtain the approval of the local AHJ in regards to any specifics he has for that area as relates to MC or NM cable installation.

2.04 SPLICES & TERMINATIONS

A. Splices for #10 AWG and smaller wire used on Branch circuits and fixtures shall be of the "Live Spring" pressure type, Ideal Co. wing nut and/or wire nut type connectors or approved equal. Splices shall be rated 600 volts or 1000 volts when enclosed in a fixture or sign.

B. Solderless, mechanical type lugs shall be used for terminal connections for copper conductors of #8 AWG or larger.

PART III - EXECUTION

3.01 WIRE AND CABLE

A. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with "Live Spring" pressure type connectors, by "IDEAL CO." or approved equal. Tape shall be "Scotch" No. 33 for indoor and NO. 88 for outdoor or approved equal. Where connection is made to any material, copper terminal lugs shall be bolted or compression fitted to the conductors. Where multiple

connections are made to the same terminal, individual lugs for each conductor shall be used.

B. Wire shall not be drawn into a conduit until all work on the conduit system, which might cause damage to the wiring, is complete.

C. Where two or more circuits run to a single outlet box, tag each circuit with linen tags as a guide to the fixture hanger in making fixture connections.

D. All stranded conductors shall be furnished with copper connecting lugs drilled or reamed the full diameter of the bare conductors.

E. Mains and feeders shall be run their entire length in continuous pieces without joints or splices. If the runs are too long for a single conductor piece, then joint and/or splices installed per these specifications shall be used.

F. All splices, taps, terminations, etc. in the conductors shall be kept where they are fully accessible for inspection and maintenance.

G. All wiring in cabinets, boxes, gutters, etc., shall be neatly tied and held in place by nylon cable ties and mounting brackets.

H. At each fixture outlet a loop or end or wire not less than 8" long shall be left for connection to fixtures.

I. The number of crosses hatches, where indicated, designates the number of conductors to be installed when the number exceeds minimum of two (2). Where crosshatches are not indicated, the number of conductors shall be as determined by switching, homeruns, etc. This does not apply to conduit provided for telephone or other special systems.

J. Branch circuits shall contain the necessary number of conductors to afford the switch control indicated.

K. Splices, etc. in signal and/or communication conductors shall be made with crimp-on or soldered connections, which are properly insulated.

L. The Contractor shall not permit conductor bends to a radius less than 10 diameters or thickness on circuits of 600 volts or less.

M. Conductors, when installed, shall not have dents, cuts, and scars, pressure indentation, abraded areas, etc. The Contractor will be responsible for replacement of conductors so damaged, at his expense.

N. Lubricants used to ease conductor-pulling operations shall be specifically manufactured for that purpose. TALC only shall be used on isolated branch circuit wiring.

O. An UL approved non-oxidation compound or grease is to be applied at all Alluminum terminations of panel feeders, secondary service conductors, and primary (high voltage) service conductors prior to connection.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 SUMMARY

A. This section includes the electrical grounding of all electrical systems and equipment provided on this project.

1.02 RELATED DOCUMENTS

A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.

B. Specification section 260519 – Low Voltage Electric Power Conductors and Cables

1.03 REGULATORY REQUIREMENTS

A. All components, equipment, fittings, accessories, etc. required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.

B. All components, equipment, fittings, accessories, etc. required and furnished under this section shall comply with the NEC, particularly Article 250.

1.04 GROUNDING SYSTEM

A. Components of the grounding system shall include (but not limited to):
   1. Building water supply pipe
   2. Building structural steel
   3. Driven ground rod(s)

PART II - PRODUCTS

2.01 MANUFACTURERS

A. All grounding equipment shall be manufactured by ERICO International Corporation or equal.

B. Grounding conductor manufacturers shall be per Section 260519 of these specifications.

2.02 CONDUCTORS

A. All grounding conductors shall be copper. Conductors smaller than No. 8 AWG shall be solid; all other conductors shall be stranded. Ground conductors shall be bare or have type THHN insulation, green in color.

B. Aluminum grounding conductors shall not be used.

2.03 GROUND RODS

A. Ground rods shall be copper clad, sectional, solid steel, 8-ft. long, ¾ in. diameter.

B. Rods shall be threaded on both ends.

C. All couplings shall be bronze and made by the rod manufacturer.

2.04 CONNECTIONS

A. Grounding connections made to ground rods, building re-steel, counterpoise systems, etc. shall be made via exothermic welding means.

B. Grounding connections to pipes shall be made with bolted pressure type or compression type clamps manufactured for grounding purposes.

C. Grounding connections to boxes, fixtures, etc. shall be made at the factory provided grounding terminal.

PART III - EXECUTION

3.01 SERVICE GROUND

A. Provide driven ground rods in 3 separate locations arranged in a triangle, separated from each other by a minimum of 10 ft. Set rods so that top of final rod driven is 2 inches below grade at each of the 3 locations. The number of rods are allowed to be reduced if ground test provided to the engineer demonstrate a resistance of 25 ohms or less.

B. Connect ground rods together with grounding conductor via exothermic welding process or compression type installed with the use of a high pressure crimping tool. Provide connection to main service entrance disconnect ground bus connection point and to system neutral at this location with grounding conductor.

C. Provide grounding conductor from main service entrance disconnect ground bus to main building water service piping. Provide grounding conductor shuts around all valves and water meter in water service piping. Shunts shall be braided type.

3.02 BUILDING CONNECTIONS

A. Provide grounding conductors from main service entrance disconnect ground bus connection point to building foundation reinforcement steel and to building frame steel.

B. Provide bonding connections to all above ground sections of gas piping upstream from the equipment shutoff valve that the pipe feeds.

3.03 COMMUNICATIONS SYSTEMS

A. Provide a #4 AWG grounding conductor from the grounding electrode system to the communications system (fire alarm, security, telephone, data, cable television, etc.) utility service cabinet.

B. Provide connection to service and/or central equipment locations on a ¼" by 2" by 12" grounding bus.

3.04 EQUIPMENT CONNECTIONS

A. Provide grounds to all equipment requiring them, including, but not limited to:

1. Electric service
2. Secondary of transformers (except the isolating type).
3. Conduit and enclosures.
4. All neutral conductors.
5. Panelboards, switchboards, etc.
6. Ground terminals on receptacles, appliances, equipment, etc.

B. Make all connections with galvanically compatible materials.

B. Clean all connections points so that new bare metal surfaces are involved in connections.

C. Tighten all bolts, screws, etc. on grounding connections to torque ratings of manufacturer, or per UL 486A if there are no manufacturer's instructions on torque settings.

D. Seal all grounding connections of dissimilar metals with inert product intended for this purpose to exclude moisture infiltration into connection joints.

E. Provide grounding connection for all step down transformer neutrals to nearest building steel member.

3.05 Route all grounding conductors via shortest physical path possible without obstructing access to other systems or placing the conductors in locations where they will be subjected to any type of damage.

3.06 All bonding conductors (straps, jumpers, etc.) shall be installed so that their connections are isolated from equipment vibrations, etc.

3.07 In all raceway systems provide an equipment grounding conductor in addition to the circuit neutral inside the raceway with the phase conductors. Equipment grounding conductor shall be "Green" in color.

END OF SECTION

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. The General and Supplementary Conditions, and General Requirements Division, apply to the work specified in this Section.

1.02 LOCATION OF OUTLETS

A. Unless specifically indicated, all outlets are located diagrammatically on the drawings. Reference shall be made to the architectural and mechanical plans for the exact location of all outlets.

B. Outlets shall be located so that they will be symmetrical with architectural details and power outlets shall be so located as to properly serve the equipment.

1.03 JUNCTION BOXES AND PULL BOXES

A. Furnish and install junction and pull boxes as required to facilitate installation of the various conduit systems and as required by the NEC.

B. The contractor is responsible for hand marking the covers of any junction boxes with the identification of any circuits contained. Sharpie mark the exterior of the boxes except in cases where the ceilings are painted out or otherwise coated, mark the interior of the box covers in that case.

C. The contractor is responsible for providing blank covers for any boxes which he installs which are not utilized at the time of turnover to the owner. This includes boxes which were originally intended for use by others with low voltage systems but that don’t get utilized for whatever reason. Note that stainless blank cover plates are required in cases where that is the coverplate material used for other devices on the project.

PART II - PRODUCTS

2.01 SECONDARY SERVICE CONDUIT

A. Secondary service duct shall be galvanized rigid steel conduit, IMC or schedule 40 PVC.

2.02 TELECOMUNICATIONS SERVICE ENTRANCE DUCT

A. Telephone service duct shall be schedule 40 PVC conduit. Where penetrations through slabs occur, use long sweep rigid steel conduit elbows.

2.03 FEEDERS & BRANCH CIRCUITS

A. Rigid conduit or IMC shall be used for all feeders and sub-feeders and branch circuits,

where exposed to possible physical damage. EMT shall be permitted in protected areas.

2.04 RIGID CONDUIT

A. All rigid conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, threads included, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.

B. Fittings for all rigid conduits shall be steel or malleable iron as manufactured by Thomas and Betts or equal. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED.

2.05 ELECTRIC METALLIC TUBING (EMT)

A. EMT conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.

B. Fittings for all EMT conduit shall be compression type, made of steel, with case hardened locknuts, and nylon insulated throats; or steel setscrew fillings with case hardened locknuts, and nylon insulated throats. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED. Fittings shall be manufactured by Thomas and Betts or equal.

2.06 RIGID NONMETALLIC CONDUIT (PVC)

A. All PVC conduit shall be produced by the same manufacturer, be schedule 40, and manufactured as Electrical Conduit with the manufacturer's trade mark or stamp on each length of conduit.

B. All PVC conduit fittings and cement shall be secured from the conduit manufacturer.

C. All PVC conduit shall meet the following standards:

1. Rated for 90 degrees centigrade.
2. Shall have a tensile strength of 7,000 psi @ 73 degrees F.
3. Shall have a flexural strength of 11,000 psi.
4. Shall have a compressive strength of 8,600 psi.

D. PVC not allowed above grade except for use with ground wires(only).

2.07 FLEXIBLE CONDUIT

A. Flexible Steel Conduit (No Cover) shall be constructed of reduced wall galvanized steel, and shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp.

B. PVC Extruded Cover Flexible Conduit shall be used in all outdoor applications. It shall be UL listed for outdoor use.

C. Connectors and fittings for flexible conduit shall be steel type with nylon insulated throats. Connectors shall “bite” into the conduit under pressure of the connector bolt. All connectors and fittings shall be manufactured by Thomas and Betts or equal.

2.08 BELOW GRADE CONDUIT AND CABLE SEAL

A. Seals for either conduit or cable below grade shall form a reliable lasting seal between building and the outside and shall be able to withstand pressures to a minimum head of 50 feet of water. The below grade seals shall be as manufactured by O.Z./Gedney and sized for the particular application.

2.09 THREADED JOINT COMPOUND

A. Threaded joint compound shall be a corrosive inhibiting compound that is electrically conductive under pipe joint pressure. The compound shall be Thomas and Betts "KOPR-HIELD" or approved equal.

2.10 CONDUIT IDENTIFICATION TAPE

A. Conduit identification tape for use in marking underground conduit runs shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words “CAUTION – ELECTRIC LINE BURIED BELOW” imprinted along its entire length with a contrasting color permanent ink. The tape shall be “Terra Tape” as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.11 PULL BOXES

A. All pull boxes shall be constructed of code gauge galvanized steel of the dimensions required by Article 370 of the NEC, according to the number, size, and position of conduits entering the box.

B. Pull boxes installed in vertical runs of conductors shall be provided with Red Seal type VVC or approved equal cable supports as required by Table 300-19 of the NEC.

C. Pull boxes for horizontal runs of feeder conductors which contain more than one feeder shall be provided with reinforced flange and removable 12 gauge 1-1/2” by 1-1/2” galvanized channel for support of conductors. Wood supports shall not be used.

D. Pull boxes installed in finished spaces shall be flush mounted and shall be provided with trim, hinged door, and flush latch with lock to match trims for flush mounted panelboards.

E. Where exterior pull boxes are required in the ground, provide drive over rated covers in appropriate areas.

2.12 OUTLET BOXES

A. All outlet boxes shall be constructed of code gauge galvanized steel.

B. Outlet boxes specified herein are minimum size boxes. Larger boxes of the same type shall be provided if required by the NEC in consideration of the number and size of conductors installed.

C. Outlet boxes for surface mounted and pendant mounted lighting fixtures shall be four inch octagon boxes, 1-1/2 inches deep. Fixtures studs shall be provided for support of fixtures if required.

D. Outlet boxes for flush mounted lighting fixtures shall be four inch square boxes, 1-1/2 inches deep with blank cover.

E. Outlet boxes for switches, receptacles, and wall mounted junction boxes shall be four inch square boxes, 1-1/2 inches deep. Where only one conduit enters box, 3-1/2 inch deep single gang switch boxes may be used. Outlet boxes for GFCI receptacles shall be 2-3/4 inches deep.

F. Outlet boxes recessed in concrete lock walls and partitions shall be designed especially for installation in concrete block and tile walls and partitions. Single gang or multi-gang square cornered masonry boxes shall be used for one or more devices at the termination of a conduit run. Conventional four inch octagonal or 4-11/16 inch square boxes fitted with square tile covers of proper depth for concrete block shall be used where two or more conduits enter a box.

G. Where specialty equipment such as fire alarm components, security components, etc., are installed provide outlet boxes suitable in size for these devices.

H. Outlet boxes to be used in exposed conduit run shall be cast ferrous alloy type. Outlet boxes for vapor-tight lighting fixtures shall be cast corrosion resistant type.

2.13 FLOOR BOXES

A. Floor outlet boxes shall be adjustable, sheet steel, designed for use in concrete slabs, and water tight if noted on drawings.

B. Boxes for use in a floor to be carpeted shall be supplied with an adjustable brass carpet flange.

C. Provide shallow boxes where required due to slab thickness.

D. Watertight boxes or boxes on grade shall be cast metal and adjustable. Provide rubber gasket and bronze disk.

E. Covers for all floor boxes shall be supplied in accordance with the use of the box.

PART III - EXECUTION

3.01 INSTALLATION

A. Unless otherwise specifically noted on the drawings, ALL CONDUCTORS installed on this project shall be installed in conduit as specified herein.

B. Any conduit installed on this project shall be no smaller than ¾", except as otherwise noted on the drawings. Where desirable for ease of installation, larger sizes than those called out on the drawings may be used. The contractor is responsible for resolution of any conflicts arising from the use of larger sizes.

C. Conduit shall be continuous from outlet to outlet, from outlet to panelboard cabinet, junction box, and/or pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each raceway system will be electrically continuous from the service entrance to all outlets. All conduit from panelboard cabinets and junction boxes shall terminate in approved outlet boxes or conduit fittings. Conduit connection to any box, which has no threaded hub for its reception, shall be installed with two locknuts.

D. In general, the conduit installation shall follow the layout shown. However, this layout is diagrammatic only; and where changes are necessary due to structural conditions, other apparatus, or other causes, such changes shall be made without any additional cost to the Owner. Offsets in conduit are not indicated, and must be provided as required.

E. Junction boxes and pull boxes shall be provided and installed as required to facilitate the systems shown on the drawings. "AX" expansion fittings shall be installed in all conduit runs wherever they cross building expansion joints.

F. At couplings, conduit ends shall be threaded so they meet in the coupling. Right and left couplings shall not be used; conduit couplings of the Erickson type or approved equal shall be used at locations requiring such joints.

G. Connections in conduit installed in outdoor or indoor locations where exposed to continuous or intermittent moisture, shall provide a liquid-tight seal. The sealing hub fittings shall be of steel or malleable iron, with recessed sealing "0" ring and a nylon insulated throat, Thomas and Betts Series 370. All conduit and cable, telephone or otherwise, which extend from the interior to the exterior below grade shall be sealed with a fitting designed for that particular use so as to be watertight.

H. No bends will be permitted with a radius less than size (6) times the diameter of the conduit nor more than 90 degrees.

I. All conduits shall be concealed in the wall, in or below floors or above ceilings unless otherwise directed or indicated. Concealed conduit shall be supported from the building construction at intervals not exceeding 8'-0". Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of the lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures.

J. Where conduit is expressly shown to be run exposed, the conduit shall be supported at intervals not exceeding 8'-0" with straps and wood screws for wood construction, machine screws for metal construction, and expansion bolts for masonry construction. Exposed conduit in finished spaces that pass through walls or ceilings shall be provided with chrome plated escutcheons. Run exposed conduit, where permitted by this specification, parallel or at right angles to the building with approved galvanized iron clamps or hangers. Devices attached to masonry or slabs shall be secured with inserts and bolts or lead expansion sleeves. Provided a support at each outlet box, at each conduit elbow, and at each junction

box. Wooden plugs inserted in drilled holes are not acceptable as support bases.

K. Where two (2) or more conduits are run parallel and adjacent, they shall be installed on gang hangers.

L. Where connections are made to motors more than 2'-0" away from walls or columns, a vertical conduit, minimum size 3/4", securely attached to floor and ceiling shall be installed and the wiring carried into and out of this conduit by means of condulets and flexible conduit.

M. Conduit embedded in concrete, which is in contact with the earth, and conduit installed outside the building below grade shall be rigid steel conduit, IMC or PVC.

N. Conduit shall be located 6" minimum from surfaces with temperature ranges above 140 degree F.

O. Conduit shall not be installed in any manner, which will result in the accumulation of condensation in the pipe.

P. In masonry construction, wooden plugs inserted in drilled holes are NOT acceptable as bases for supports for conduit. The Contractor shall use approved types of galvanized wall brackets, beam clamps, strap hangers, or pipe straps secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws or bolts and nuts in metal surfaces, and wood screws in wood surfaces.

Q. Conduit runs left for future use shall be checked for unblocked passage by the use of a ball mandrel. Contractor shall leave a non-mildewing polyolefin pull line in each such conduit. The line shall have an average tensile strength of 200 lbs. for 1" or smaller conduit and 500-lbs. for conduit larger than 1". Pull lines shall be based on the standard set by Ideal Co. product #31-343 for 200-lb. line and 32-244 for 500-lb. line.

3.02 CONDUIT PROTECTION

A. Conduit shall not be installed in any manner that will result in the accumulation of water inside the pipe.

B. Conduit shall be located a minimum of 6 inches away from any surfaces which will reach surface temperatures of 140°F. or above.

C. All conduit installed in the ground outside of the building shall be buried a minimum of 36 inches below finished grade, but in no case shall it be buried more than 48 inches deep without the written consent of the Engineer.

D. Conduit run inside the building below floor slabs shall be included within the concrete pour of the slab, located between the reinforcing steel vertically.

E. For all conduit installed in the ground outside of the building, provide identifying marker tape over the entire length of the conduit run. Place tape below finished grade between 12 inches and 18 inches absolute.

F. All conduit shall be secured in place and protected to prevent damage to work during

construction. The ends of all conduit and conduit fittings shall be plugged to avoid filling with dirt, plaster, gypsum, etc. Plugs shall be Thomas and Betts series 1470.

G. All conduit shall be blown out and swabbed clear of water and trash prior to the installation of any conductors in the conduit.

3.03 GROUNDING AND TERMINATIONS

A. Connections to all panelboards, cabinets, pull boxes, etc., shall be installed with a grounding wedge lug between the bushings and the box; or with locknuts designed to "bite" into the metal of the box.

B. To insure continuity of electrical ground and to improve conductivity, use Kopr-Shiel compound, series CP-8 as manufactured by Thomas and Betts on all rigid conduit threaded joints.

C. In ALL conduit runs, rigid or otherwise provide a green colored insulated grounding conductor inside the conduit with the phase conductors.

3.04 PENETRATIONS

A. Where any electrical item such as conduit, cable, telephone cable, busway, etc., penetrates a wall, floor, or ceiling, the original integrity for the respective wall, floor, or ceiling shall be restored. The opening around the item making the penetration shall be sealed airtight. If the surface penetrated is fire rated, the sealant shall have a fire rating equal to the original surface. In no case shall the penetration result in a lessening of the fire rating of the surface penetrated.

B. Any openings in surfaces left for future routing of electrical work shall be left sealed as noted in Item A above.

C. Provide sleeves for conduit, cables, busway, etc., accurately before concrete floors are poured; or set boxes in the forms so as to leave openings in the floors so the required sleeves can be subsequently located.

D. Sleeves shall be rigid conduit with bushings installed on each end. Sleeves shall extend 6 inches beyond the surface they penetrate.

3.05 FLEXIBLE CONDUIT

A. Non-covered flexible steel conduit shall be used in making short connections from outlet boxes to recessed lighting fixtures. Such conduit runs shall be no longer than 72-inches.

B. Flexible conduit runs to other equipment shall be kept as short as possible, but shall have a minimum length of 12 inches.

C. Flexible conduit connections to dry type transformers, rotating or vibrating machinery, kitchen equipment, or any other equipment, which may result in the conduit being exposed to moisture, shall be PVC covered.

3.06 PVC CONDUIT

A. PVC conduit shall not be used above grade under any circumstances.

B. All PVC conduit joints of any type shall be solvent welded in accordance with the manufacturer's recommendations.

3.07 PULL BOXES

A. Pull boxes shall be provided where indicated on the drawings and/or where required to facilitate the installation of all required conductors or as required by NEC.

B. Pull boxes shall be installed exposed only in unfinished spaces. They shall be accessible.

C. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder.

D. Conductors shall not be spliced inside pull boxes except with the approval in writing of the Architect. Where splices are permitted they shall be made with splicing sleeves attached to the conductors with hydraulic crimping tools or with tap blocks. Split bolt connectors shall not be permitted.

3.08 OUTLET LOCATIONS

A. Furnish and install outlet, junction, and pull boxes as required to facilitate the installation of the electrical systems as required.

B. All outlet, junction, and pull boxes shall be accessible with covers designed for quick removal. Where boxes are located above non-accessible ceilings, in walls, etc., in finished areas, the removable cover shall be flush with the finished surface. Cover finish and the exact location of the boxes shall be approved by the Architect **.**

C. The drawings are intended to show the locations of outlets, devices, fixtures and arrangement and control of circuits only. Exact locations shall be determined by actual measurement at the building and/or reference to the architectural drawings.

D. The location of any outlet may be moved ten feet with the prior approval of the Architect and before it is installed without any additional expense to the Owner.

E. Contractor shall check the location of all wall outlets including light fixtures, receptacles and switches, to verify that the outlets will clear any wall fixture, shelving, work tables, sinks or similar equipment that will be installed.

F. Outlets occurring in architectural features shall be accurately centered in same. Install wall switch outlets on the STRIKE SIDE of doors with cover plate clearing door trim.

G. Outlet boxes in non fire rated partitions shall NOT be set back to back. Boxes set side by side facing separate rooms or spaces, shall be connected together by offset nipple; after conductors are pulled, the nipples shall be tightly packed with mineral wool to prevent sound transmission.

H. Outlet boxes in fire-rated partitions shown to be mounted on the opposite side of the

partition at the same height, shall be separated horizontally by a minimum of 24 inches.

I. The mounting height of all wall outlets is indicated on the architectural or electrical drawings. The height is from the finished floor to the center line of the device or outlet. The Contractor may with the Architect's approval vary the mounting heights to correspond to masonry joints.

J. Were outlets are shown as being adjacent and different mounting heights are indicated for each, they shall be mounted one directly over the other at the heights specified.

3.09 OUTLET BOXES

A. All outlet boxes shall be flush mounted within the wall regardless of wall construction, unless they are specifically shown as being used with exposed conduit. Cuts for outlet boxes in masonry walls shall be made so that the cover plate will completely cover the cut. The edge of all boxes shall be flush with the surface in which they are installed.

B. The devices that are to be installed in the boxes shall be screwed tight before cover plates are installed. Plates shall not be used as a means for tightening the devices or holding them in place.

C. Provide extension rings for all boxes when required by wall finish.

D. Junction boxes shall be provided with blank covers. Covers on ceiling outlets shall be round, and shall be painted to match ceilings. Covers on wall junction boxes shall be of size and finish as used on switch and receptacle outlets.

E. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted ONE DIRECTLY over the other, on the center line of the group or on the center line of the room or wall.

F. The mount height of all wall outlets is indicated on the architectural or electrical plans. The mounting height is from finished floor to the centerline of the device or outlet. The Contractor may, with the Architect's approval on the job, slightly vary the mounting height of wall outlet so that the outlet box, top or bottom, will occur at a masonry joint.

G. Outlet boxes shall be provided with 3/8" fixture stud to support light fixture. Outlet boxes shall be firmly anchored to structural member of the building, using wood screws for wood construction, bolts for steel construction, and expansion bolts secured in place with cement mortar for masonry construction. Ceiling outlet flush in furred acoustical tile ceiling construction for surface or pendant mounted lighting fixtures shall be in 4" square or octagonal pressed steel boxes supported from stud and rod, bars or hangers supported from the building structure independent of the ceiling construction. For outlet boxes located between steel studs, provide Caddy No. BHA; and adjacent to studs, provide Caddy No. MSC.

H. Where drawings indicate ganged installation of switches controlling 277 volt lighting circuits of opposite phase, switches shall be separated by one full gang width, or separated with a permanently installed barrier between phase and/or different voltages.

I. Outlet boxes shall not be used as support for lighting fixtures

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART I - GENERAL

1.01 SECTION INCLUDES

A. This section includes equipment marking, wire and cable marking, and conduit marking.

1.02 RELATED SECTIONS

A. All conditions and requirements of Division 01 shall apply to the work specified in this section.

B. Section 099100 - Painting

1.03 REGULATORY REQUIREMENTS

A. Furnish products that are manufactured and rated for labeling and marking electrical equipment.

PART II - PRODUCTS

2.01 EQUIPMENT NAMEPLATES

A. Nameplates shall be engraved three layer laminated plastic. In all cases, inner layer shall be white in color.

B. Nameplates shall be provided on all electrical enclosures and/or cabinets.

C. Engraved letters shall be 3/8 inches high.

D. Nameplate outer layer color shall be:

1. 480/277 volt equipment – Red

2. 208/120 volt equipment – Black

3. 240/120 volt equipment – Blue

2.02 WIRE AND CABLE MARKERS

A. Markers shall be colored plastic tape for service entrance and feeder conductors and PVC sleeve type markers for branch circuit conductors.

B. PVC sleeve type markers shall be equal to Thomas & Betts E-Z-Code, white with black writing.

C. Service entrance and feeder conductor marking shall consist of phase identification follows:

208Y/120 Volt System	480y/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

D. Branch circuit conductor marking shall consist of the source panel name and the branch circuit number as listed in the panel schedules on the drawings.

2.03 CONDUIT MARKERS

A. Conduit and raceway labeling shall be stenciled painted letters of height of 2 conduit diameters, or 2 inches, which ever is smaller. Voltage and function shall be stated in label.

B. Label paint shall be enamel meeting requirements of Section 099100 – Painting. Color per voltage system:

1. 480/277 volt raceway – Red

2. 208/120 volt raceway – Black

3. 240/120 volt raceway – Blue

2.04 UNDERGROUND RACEWAY MARKERS

A. Raceway route markers shall be 4” by 4” by 18” long concrete stakes.

B. Raceway route warning tape shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words “CAUTION – ELECTRIC LINE BURIED BELOW” imprinted along its entire length with a contrasting color permanent ink. The tape shall be “Terra Tape” as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.05 PANELBOARD CIRCUIT DIRECTORIES

A. Circuit directory cards shall be white heavy cardboard manufactured for the purpose, with machine written black ink circuit number legends.

B. Circuit identification shall be in agreement with the actual connections installed and clearly labeled as to the areas served by that circuit.

2.06 SWITCHBOARD AND DOORLESS PANELBOARD CIRCUIT BREAKER MARKERS

A. Circuit breakers markers shall be as per paragraph 2.01 above.

B. Circuit identification shall be in agreement with the actual connections as guided by the panel schedules on the drawings.

PART III - EXECUTION

3.01 Clean and remove grease, etc. from all equipment surfaces that will receive nameplates.

3.02 Provide labels for all electrical panels, switchboards, disconnects, cabinets, feeder and service raceways, motors, and major pieces of electrical equipment installed under this division

3.03 Provide panelboards that have doors with a directory card of all circuits in the panel.

3.04 Provide circuit breakers in switchboards and in panelboards that do not have doors with labels stating the circuit number and what the breaker is supplying.

3.05 Label all feeder conduits and all single equipment branch circuit conduits in excess of 6 ft. in length with painted labels located at 20 ft. on center along the entire length of the conduit run.

3.06 Mark all underground conduit runs installed outside the building with stakes set with tops flush in the ground directly over the source, end, and bends locations in the conduit run.

3.07 Provide marker tape over the entire length of all underground conduit runs installed outside the building. Tape shall be installed at a depth between 12 and 18 inches below the surface of the ground directly over the conduit.

3.08 Mark all service entrance phase conductors and the neutrals with colored plastic tape to identify phase assignments on each end of the conductor and in all pull and/or junction boxes.

3.09 Branch circuit conductors shall be color-coded via insulation color as follows:

208Y/120 Volt System	480y/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART I - GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards

1.02 RELATED SECTIONS

A. Overcurrent Protective Devices

1.03 REFERENCES

The panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).

A. ANSI 61

B. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts)

C. ANSI/NEMA PB 1, Panelboards

D. ANSI/NFPA 70, National Electrical Code

E. ASTM - American Society of Testing Materials

F. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards

G. CSA C22.2 No. 5.1, Molded Case Circuit Breakers

H. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service

I. Federal Specification W-P 115, Rev. C, Panel, Power Distribution

J. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches

K. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

L. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures

M. UL 50, Enclosures for Electrical Equipment

N. UL 67, Panelboards

O. UL 943, Ground-Fault Circuit-Interrupters

1.04 DEFINITIONS

A. Overcurrent Protective Device -- a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.05 SYSTEM DESCRIPTION

A. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or applicable UL series rating for proper main and branch device combinations.

B. Panelboards shall have a maximum of 42 protective devices per panel, including sub-feeders and excluding main overcurrent protective devices. For more than 42 devices, 2 or more panelboards are required.

C. With 2 or more panelboards, sub-feed lug or thru-feed lugs shall be used in all but 1 section of each panelboard. Lugs shall have same capacity as incoming mains. Cable inter-connections shall be field installed.

D. Protective devices shall be molded case circuit breakers.

1.06 SUBMITTALS

A. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:

1. Product Data on specified product;

2. Shop Drawings on specified product;

3. Certified trip curves for each specified product;

1.07 PROJECT RECORD DOCUMENTS

A. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

1.08 OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.09 QUALIFICATIONS

A. Manufacturer shall have specialized in the manufacture and assembly of lighting and appliance panelboards for 25 years.

B. Lighting and appliance panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.

B. Deliver each lighting panelboard in individual shipping cases for ease of handling. Each panelboard shall be wrapped for protection.
C. Inspect and report concealed damage to carrier within specified time.
D. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)
E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

1.11 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

A. Follow (standards) service conditions before, during and after panelboard installation.

B. Lighting and appliance panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus [30] and plus [40] degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

1.12 SEQUENCING AND SCHEDULING

1.13 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

1.14 MAINTENANCE SERVICE

A. Furnish complete service and maintenance of lighting and appliance panelboards for 1 year from date of substantial completion.

B. Include parts and labor.

1.15 EXTRA MATERIALS

A. Provide spares as indicated in drawings.

1.16 FIELD MEASUREMENTS

A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART II - PRODUCTS

2.02 EQUIPMENT

A. Furnish Lighting Panelboards, as indicated in drawings.

2.03 COMPONENTS

Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

A. RATINGS

1. Lighting and appliance panelboards shall be rated as indicated in drawings.

2. Maximum current ratings for mains, sub-feeds and branches, respectively, shall be specified in drawings.

B. ENCLOSURE

1. Boxes shall be a nominal 20 inches wide and 5.75 inches deep with wire bending space per National Electric Code. Electrical Contractor to Coordinate with Architect to insure that any walls which have recessed panels are located and a minimum of 6” deep prior to work.

2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.

3. All door locks shall be metallic corbin latch bolt type or equivalent. All door locks shall be keyed for a single key.

4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door.

5. All panelboard series ratings shall be prominently displayed on dead front shield.

6. Interiors shall permit top or bottom incoming cables.

C. BUS BARS

1. Bus bars shall be phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies. Note that certain building

owners require the use of copper bussing in lieu of aluminum. Verify prior to bid and submit RFI to engineer if this appears to be an concern.

2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.

3. Terminations shall be UL tested and listed and suitable for UL copper wire.

4. Provide [1] continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.

5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.

6. Lugs shall be rated for 75 degree C terminations.

7. Main lugs for copper conductors shall be bolted lugs. Lugs for aluminum conductors shall be compression lugs.

8. Lug bodies shall bolt in place.

D. CIRCUIT BREAKERS

1. Molded case circuit breakers shall be bolt-on devices for 120/240V panels and shall be bolt-on for 277/480V panels.

2. All circuit breakers shall have thermal and magnetic trip elements in each pole.

3. Multi-pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.

4. Circuit breakers shall not be restricted to any mounting location due to physical size.

5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for 2 such twin mounted devices shall not exceed 180 amperes.

6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.

7. Branch breaker panelboard connections shall be copper to copper.

8. All panelboard terminations shall be rated as indicated in drawings.

9. All breakers shall have an over center mechanism and be quick make and quick break.

10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.

11. Breaker handle and faceplate shall indicate rated ampacity.

12. Circuit breaker escutcheon shall have standard ON/OFF markings.

13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.

14. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.

E. Contactors shall be electronically held.

2.04 ACCESSORIES

A. Contactor control relays

B. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

C. Provide Transient Voltage Surge Suppression system as specified in the TVSS section and on prints.

2.06 FINISH

A. Boxes shall be corrosion resistant, zinc finish galvanneal.

B. Fronts shall be powder finish painted ANSI 61 gray.

PART III - EXECUTION

3.01 EXAMINATION

A. Verify that panelboards are ready to install as shipped.

B. Verify field measurements are as shown on Drawings.

C. Verify that required utilities are available, in proper location and ready for use.

D. Beginning of installation means installer accepts conditions.

3.02 LOCATION

3.03 INSTALLATION

Additional provisions and editing may be required for this part.

A. Install per manufacturer's instructions.

B. Install required safety labels.

3.04 FIELD QUALITY CONTROL

A. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.

B. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench>. Minimum acceptable values are specified in manufacturer's instructions.

C. Test each key interlock system for proper functioning.

3.05 ADJUSTING

A. Adjust all circuit breakers, access doors, operating handles for free operation as described in manufacturer's instructions.

3.06 CLEANING

A. Clean interiors of panels to remove construction debris, dirt, shipping materials.

B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 26 43 13 - TRANSIENT VOLTAGE SUPPRESSION FOR LOW VOLTAGE ELECTRICAL POWER SYSTEMS

PART I - GENERAL

1.01 SECTION INCLUDES

This section describes the materials and installation requirements for transient voltage surge suppressors (TVSS), including integrated TVSS in switchboards, distribution and branch panelboards and motor control centers for the protection of all AC electrical circuits.

1.02 STANDARDS

Most Recent Editions of:

A. ANSI/IEEE C62.41, C62.45 & C62.48

B. National Electric Code

C. Underwriters Laboratories: UL1449 & UL1283

PART II – PRODUCT

2.01 TRANSIENT VOLTAGE SURGE SUPPRESSORS

A. Surge Suppressor

1. TVSS shall be Listed in accordance with UL 1283 and 1449 Second Edition.

2. TVSS shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. (This is Article 285.6 of the 2002 NEC and is the Engineer's requirement, regardless of whether or not the Authority Having Jurisdiction adopts the 2002 Code.)

3. Integral TVSS shall be installed by, UL Listed by and shipped from the electrical distribution equipment manufacturer's factory. Field or aftermarket conversions are disallowed.

4. TVSS shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G in WYE systems, and L-L, L-G in DELTA systems.

5. TVSS shall be modular in design. Each module shall be fused with a surge rated fuse and incorporate a thermal cutout device. (Note: thermal cutouts protect against sustained overvoltages.)

6. At Service Entrance, a UL approved disconnect switch shall be provided as a means of disconnect if a 60A breaker is not available.

7. TVSS shall meet or exceed the following criteria:

   a. Maximum surge current capability (single pulse rated) per phase or per mode as indicated on the drawings.

   b. UL 1449 Listed and Recognized Component Suppression Voltage Ratings shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
208Y/120	400V	400V	400V

8. TVSS shall have a minimum EMI/RFI filtering of -50dB at 100kHz.

9. TVSS shall be provided with 1 set of NO/NC dry contacts.

10. Service entrance TVSS shall be provided with a surge counter.

11. TVSS shall have a five-year warranty. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

12. If not shown on the drawings, surge suppression is to be provided on all service entrance gear but not at downstream panelboards. In all cases the drawings shall over ride this spec section in cases where TVSS is indicated on the drawings.

13. If not indicated on the drawings, surge suppression is to be located integral to the equipment and provided by the gear manufacturer internally mounted. Drawings shall override if TVSS is noted there.

2.02 MANUFACTURERS

Approved Vendors: as noted on drawings.

END OF SECTION

SECTION 26 50 00

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

A. The General Conditions and Supplementary Conditions and General Requirements (Division 1), apply to the work specified in this Section.

B. All lighting fixtures together with required mounting hardware, lamps, and fixture supports shall be provided under this Section.

1.02 WORK INCLUDED

A. Provide and install fixtures as shown on the drawings and in the schedules complete with all associated hardware, completely wired, controlled, and securely attached to building structure.

B. Coordinate installation and connection of all lighting fixtures with the installation of the ceiling and with the work of all other trades. Provide a total system that is complete and finished in appearance.

C. If any fixture type is shown on the plans but is not described in the Lighting Fixture Schedule, request a clarification from the Architect prior to bid. Provide a suitable fixture as directed. The absence of the description of a fixture, which is shown on the plans, does not relieve the contractor from the responsibility of supplying a fixture.

D. Verify fixture numbers before placing an order. Furnish all fixtures with proper frames, fittings, and devices as required for installation in the ceiling systems being installed.

E. All fixtures of the same type are to be supplied from the same manufacturer, identical in finish and appearance.

1.03 QUALITY ASSURANCE

A. All fixtures supplied for this project shall be new, of good quality, and be approved by, and bear the label of, the applicable regulatory agency. All fixtures shall bear the UL label.

B. All blemished, damaged, or unsatisfactory fixtures shall be replaced in a satisfactory manner as directed by the Architect.

C. All fixtures shall meet all applicable local codes and regulations.

D. The lighting designated for this project is based on design using the fixtures scheduled by manufacturer and catalog number. Alternate equals are generally accepted unless otherwise noted on the drawings. Equality shall be the sole determination of the Engineer. Note that the contractor is responsible for turning in shop drawings for review in a timely fashion which allows for review, rejection and resubmittal as needed. Delivery and lead times for fixtures are a contractor issue, with the contractor paying any liquidated damages for the project related to delayed fixture delivery due to rejected submittals, or if allowed by the architect providing temporary fixtures at his cost while waiting on delivery of the approved fixtures.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver lighting fixtures individually wrapped in factory-fabricated containers, unless noted otherwise.

B. Any fixtures damaged are not to be installed. Return damaged fixtures to manufacturer, and replace them for installation.

C. Fixtures shall be stored in clean, dry spaces, in their original shipping containers until ready for installation. They are to be protected while stored to prevent damage from all causes.

1.05 SUBMITTALS

A. Refer to the appropriate sections in Division 1 for submittal format, and provide additionally as follows:

1. Submit standard drawings or cut sheets for each fixture type noted in the Lighting Fixture Schedule.
2. Drawings shall indicate name of project, fixture type, complete details of fixture, including manufacturer's name and complete catalog number including all aspects of fixture intended to be provided.

PART 2 - PRODUCTS

2.01 INTERIOR LUMINAIRES AND ACCESSORIES

A. All LED light engines (combination of diodes, driver, heat sink, housing and optics), whether screw-in or hardwired, shall meet all of the following:
1. The rated driver input wattage and total number of LEDs shall be published by the manufacturer for each fixture unit.
2. The LED fixture manufacturer shall have been in business and producing LED fixtures for a minimum of 10 years.
3. All LED fixtures shall be dimmable either by CAT 5 communications, or 0 to 10 volt controls.
4. All LED fixtures shall be DLC listed.
5. All LED fixtures shall be Energy Star listed.
6. All LED fixtures shall be UL listed

B. Housings shall be formed of cold rolled steel. Housings shall be painted after fabrication.

C. LED units shall be manufactured for 50 to 100 thousand hours of operation. LEDs shall exhibit 99% lumen maintenance at 60,000 hours of operation.

D. All drivers and internal components of all fixtures shall be accessible from the floor side of the installed fixture.

2.02 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly.

B. Exterior LED fixtures shall be manufactured and rated for outdoor installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fixtures complete and ready to operate.

B. Provide all required mounting hardware and accessories for the ceiling construction encountered. Fixture catalog numbers shown in the fixture schedule do not necessarily denote specific mounting accessories

C. Luminaire Pole Bases: Size and constructed as indicated on Drawings. Project anchor bolts 2" minimum above base. Install poles on bases plumb; provide double nuts for adjustment. Grout around pole base.

D. Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.

3.02 REPLACEMENT

A. Replace failed fixture components as required up to complete fixture for any fixture that is not operating properly at building construction completion prior to turn over to owner.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires. The interior of all recessed can lights to be wiped

clean of fingerprints prior to the final engineering punch list.

B. For parking lot light poles, touch up luminaire and pole finishes as directed by the engineer in the punch list.

END OF SECTION

SECTION 31 10 00 – SITE CLEARING

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Protecting existing trees to remain.
2. Removing existing trees, shrubs, groundcovers, plants, and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place or removing site utilities.
7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:

1. Division 31 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
2. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and planting.

1.03 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.04 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.05 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings according to Division 1 Section "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on adjoining properties and on Owner’s property.

2. Restore damaged improvements to their original condition, as acceptable to property owners.

C. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

E. Notify utility locator service for area where Project is located before site clearing.

F. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

1.08 EXISTING SERVICES

A. General: Indicated locations are approximate; determine exact locations before commencing Work.

B. Arrange and pay for disconnecting, removing capping and plugging utility services. Notify affected utility companies in advance, minimum forty-eight hours, and obtain written approval before starting work.

C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART II – PRODUCTS

2.01 SOIL MATERIALS

Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART III – EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

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

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY SEDIMENT AND EROSION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.

2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with wet burlap to prevent roots from drying out.

2. Temporary support and protect roots from damage until they are permanently relocated and covered with soil

3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Backfill with soil as soon as possible.

C. Maintain fenced area free of weeds and trash.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.04 UTILITIES

A. Contractor shall arrange for disconnecting and sealing utilities that serve existing structures before site clearing and demolishing begins.

1. Coordinate schedule with Owner.

2. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange to shut off indicated utilities with utility companies. Pay any required fees.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.

4. Use only hand methods for grubbing within drip line of remaining trees.

5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).

2. Do not stockpile topsoil within drip line of remaining trees.

3. Dispose of excess topsoil as specified for waste material disposal.

4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.07 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.08 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

B. Burning on Owner’s Property: Burning may be permitted only at designated areas and times as directed by the Owner and by local and state issuing authorities. A burn permit as well as any other associated permit(s) must be obtained by the contractor by the local issuing authority. The contractor shall comply with all local codes. Provide full time monitoring personal for burning materials until fires are extinguished.

END OF SECTION

SECTION 31 20 00 – EARTHWORK

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for slabs-on-grade.
   4. Subbase course for concrete walks and pavements.
   5. Base course for asphalt paving.
   6. Subsurface drainage backfill for walls and trenches.
   7. Excavating and backfilling trenches within building lines.
   8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
   2. Division 21, 22, 23 and 26 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.03 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

L. Rock Excavation

1) Sound, solid rock in its original position in ledges, bedded deposits, or masses of such hardness and texture that, in the opinion of the Engineer, cannot be loosened or broken down and removed by use of heavy construction equipment such as power shovels, bulldozers, heavy-duty rooters, etc., without drilling and blasting, or with an air-hammer shall be classified as rock excavation.
2) Boulders, stones, or pieces of masonry that are one-half cubic yard or larger in volume shall be considered rock excavation.
3) Hard pan, small boulders less than one-half cubic yard in volume, chert, clay, soft shale, soft and disintegrated rock, and similar material shall not be considered as rock even though the Contractor elects to excavate same by drilling and blasting, or with an air hammer.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.

2. Separation fabric.

B. Photographs of existing adjacent structures and site improvements
.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Geotechnical Testing Agency Qualifications: The Geotechnical testing agency will be hired by the owner. The Contractor shall coordinate testing requirements with the specification.

1.06 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

2. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

3. Test borings and other exploratory operations may be performed by the Contractor, at Contractor's option. However, no change in Contract Sum will be authorized for such additional exploration.

PART II - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Imported fill soils should consist of low to moderately plastic clay or silt with a plastic index of less than thirty (PI<30) and a standard Proctor maximum dry density greater than 90 pounds per cubic feet. The imported fill should contain no rock fragments larger than 4 inches in any dimension, and should be free from organic matter and other deleterious matter. The on-site soils may be used as engineered fill as approved acceptable by the Owner's Geotechnical testing agency. Existing fill soils will require evaluation by the Owner's Geotechnical testing agency to determine if they can be used as structural fill.

C. Unsatisfactory Soils: The Geotechnical testing agency observation will determine unsatisfactory soils.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Communicaiton, Alarm or Singal Lines, Cables or Conduit.
   4. Blue: Potable Water systems.
   5. Green: Sewer and Drain systems.
   6. Purple: Reclaimed Water, Irrigation and Slurry Lines, Fire Protection or other Non-potable Water lines.

PART III - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

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

D. Strip all topsoil, vegetation, and any debris from the construction area and either waste it from the site or use as topsoil or fill in areas to be landscaped. The stripped area should extend at least 10 feet beyond exterior foundation excavations and at least 5 feet beyond the outside edge of paved areas.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 STABILITY OF EXCAVATIONS

A. Comply with all Federal, State and local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

3.05 EXCAVATION, GENERAL

3.05 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

B. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

C. Determination of Pay Quantities
   a. The volumes of unsuitable excavation for which payment will be allowed shall be expressed in cubic yards as computed from cut measurements.

D. Payment

1. Payment for undercutting performed under these Specifications shall be made for the quantities determined in the manner specified above at the applicable contract unit price per cubic yard as listed in the Bid Schedule.

2. These amounts, so paid, shall cover the cost of furnishing all labor, materials, tools, plant, and other expense in connection with or incidental to rock excavation.

3.06 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.07 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.08 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
1. Clearance: 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipe Line Inches	Depth of Excavation Below Bottom of Pipe, Inches Sewer Pipe	Water Pipe
4 to 12 incl.	6	6
15 to 33 incl.	8	8
36 and over	12	12

The space below grade for pipe sewers shall then be backfilled with 3/8 inch crushed rock or gravel or other approved material and tamped to the proper grade. Where pipe sewers are constructed on concrete cradles rock shall be excavated to the bottom of the cradle as shown on the Plans.

F. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.09 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. Have foundation excavation tested to determine if required bearing pressure is available as shown on structural foundation plans.

C. If Engineer or Soils Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

D. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

F. Avoid overcompaction and smearing of subgrade below infiltrations areas such as pervious pavement and bio-retention. Rake or rip subgrade as necessary to remove any smearing of subgrade.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

B. Where width of trench exceeds industry standard width, provide stronger pipe or special installation procedures, as required by the Engineer at no cost to the Owner.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
2. Removing concrete formwork.
3. Removing trash and debris.

4. Removing temporary shoring and bracing and sheeting.
5. Installing permanent or temporary horizontal bracing on horizontally supported walls

3.13 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. In areas where trench is under paved areas, backfill remainder of trench with Bedding or Engineered fills to subgrade.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.

D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of satisfactory soil or subbase material, free of particles larger than 1 inch, to 12 inches over pipe or conduit.

F. Where sewers, water lines, etc. are to be installed within the street right-of-way, they shall be backfilled full depth with stone per local code. The trenches under the building and at least 5 feet beyond the building limits shall be backfilled with low plasticity and low permeability soils per the geotechnical reports. If sewer is located in fill and backfill is six feet or over from the top of pipe to finished subgrade, backfill in accordance with paragraph above.

1. Carefully compact material under pipe haunch and backfill evenly on both sides and along pipe or conduit to avoid damage or displacement of system.

G. Fill voids with approved backfill materials as shoring and bracing and sheeting is removed.

H. Place and compact final backfill of satisfactory soil material to final subgrade.

I. Coordinate backfilling with utilities testing.

J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills. Areas receiving fill shall be proof rolled in the presence of a Geotechnical Engineer prior to fill placement. Areas identified as unacceptable by the Geotechnical Engineer shall be excavated (undercut) and backfilled prior to fill placement.

1. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. When subgrade or existing ground to receive fill has density less than required for fill, break up surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.

C. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use subbase or base material, or satisfactory soil material.

3. Under steps and ramps, use engineered fill.

3. Under building slabs, use drainage fill over subgrade and engineered fill to bring to subgrade.

5. Under footings and foundations, use engineered fill.

D. Compact rock in accordance with the Geotechnical Engineer's recommendations

3.15 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

K. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs and steps, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.

2. Under pavements, scarify and recompact top 24 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.

3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent standard Proctor compaction.

4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent standard Proctor compaction.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch.

2. Walks: Plus or minus 1/2 inch.

3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.19 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.

2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.

3. Shape subbase and base to required crown elevations and cross-slope grades.

4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.

5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.20 DRAINAGE COURSE

A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
   1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

   2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.

   3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 FIELD QUALITY CONTROL

A. Testing Agency: The owner will engage a Geotechnical engineering firm to perform field quality assurance testing.

B. Have testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on visual comparison of each subgrade with related test strata when acceptable to the Geotechnical Engineer.

3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 31 50 00 – EXCAVATION SUPPORT AND PROTECTION

PART I - GENERAL

A. Performance Requirements: Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.

1. System design and calculations must be acceptable to authorities having jurisdiction.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.

PART II - PRODUCTS (Not Applicable)

PART III - EXECUTION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

C. Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

F. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures as determined by a registered soils engineer. Remove in stages to avoid disturbing underlying soils and damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.

END OF SECTION

SECTION 32 11 00 – SUB-GRADE AND BASE COURSE PREPARATION

PART I – GENERAL

1.01 WORK INCLUDED

A. Sub-grade preparation.

B. Crushed stone or crushed gravel compacted base course.

1.02 RELATED WORK

A. Section 32 13 13 – Portland Cement Concrete Paving

B. Section 32 12 16 – Hot Mix Asphalt Paving

1.03 REFERENCES

A. Where Tennessee Department of Transportation Specifications for road and Bridge construction are referred to, the applicable requirements of that Section shall be considered a part of these specifications and all materials and construction methods prescribed therein shall be as binding as if herein specified. The Sections referred to are from Tennessee, current edition with latest supplements.

PART II – PRODUCTS

2.01 MATERIALS

A. Base Courses: Comply with Tennessee Department of Transportation specifications, Section 303, Class A.

PART III – EXECUTION

3.01 SUB-GRADE PREPARATION

A. Grade sub-grade to lines and grades indicated. Preparation of sub-grade shall be in compliance with Tennessee D.O.T. Specifications sections referenced herein.

3.02 BASE COURSE

A. Construct crushed stone or crushed gravel base course to thickness indicated on drawings and in compliance with Tennessee D.O.T. Specifications, Section 303, Class A.

B. All areas to receive paving shall be graded to the indicated sub-grade elevation and proof-rolled as outlined below.

C. All areas (sub-grade) to receive compacted fill, pavements or slabs on grade shall be proof-rolled in the presence of the Owner's Representative or Testing

Agency to detect any soft areas that may exist. A four-wheeled, pneumatic-tired roller of not less than 25 tons, or its equivalent, shall be used for this operation. At least four passes shall be made, two in each of two directions at right angles. Any soft areas thus disclosed shall be stabilized or undercut and replaced with properly compacted material as approved by the Owner's Representative or Testing Agency.

D. Proof-rolling should be conducted only on soils in their approximate natural moisture condition. Proof-rolling should not be undertaken after rains while soils are still in a high moisture condition (well above the natural moisture content) or on soils which are desiccated by prolonged drying.

END OF SECTION

SECTION 32 12 16 – HOT MIX ASPHALT PAVING

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Hot-mix asphalt paving.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt overlays.
   4. Pavement-marking paint.
   5. Wheel Stops

B. Related Sections include the following:
   1. Section 32 13 73 – Pavement Joint Sealants
   2. Section 31 20 00 – Earthwork
   3. Section 32 11 00 – Subgrade and Base Course Preparation

1.03 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
   1. Standard Specification: As indicated.

1.04 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
   1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
   1. Slurry Coat: Comply with weather limitations of ASTM D 3910.
   2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART II - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel complying with ASTM D 692.

C. Fine Aggregate: Sharp-edged natural sands or sand prepared from stone, gravel, or combinations thereof complying with ASTM D 1073.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.02 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Under-sealing Asphalt: ASTM D 3141, pumping consistency.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wetable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: Non-woven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
   1. Color: As indicated.

F. Wheel Stops: Pre-cast, air-entrained concrete, 2500-psi minimum compressive strength, approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for anchoring to substrate.
   1. Dowels: Galvanized steel, diameter 3/4 inch, minimum length 10 inches.

2.04 MIXES

A. Provide mixes compiling with typical specifications of Tennessee Department of Transportation.
Surface Course: Surface course shall conform to Tennessee Department of Transportation standard specifications, Section 411, Asphalt Concrete Surface (Hot Mix) with aggregates meeting requirements of subsection 903.11, Grading E used as surface for traffic lanes (50-55% crushed limestone and 45-50% natural sand, sand slag, or sand manufactured from gravel.

B. Asphalt Binder Course: Binder course shall conform to TDOT Standard Specification Sections 3307-B, 307-BM, or 307-C.

C. The base shall be a dense graded mineral aggregate base, compacted to 95 percent of the Standard Proctor maximum dry density. The base shall meet the requirements

conforming to all Tennessee Department of Transportation specification 303, class A. The base shall be placed in a way that prevents segregation.

PART III - EXECUTION

3.01 EXAMINATION

A. Verify that sub-grade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll sub-base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.02 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
   1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.03 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Re-compact new sub-grade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
   3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot under-sealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
   1. Allow tack coat to cure undisturbed before paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.04 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive paving.
   1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.

   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared sub-grade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

3.05 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

   1. Place Binder.
   2. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   3. Spread mix at minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
   5. Regulate paving machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide, except where fill-in edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.06 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat.
   2. Offset longitudinal joints in successive courses a minimum of 6 inches.
   3. Offset transverse joints in successive courses a minimum of 24 inches.
   4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.07 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
   2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping while surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

E. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.08 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.09 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal. /sq. yd. to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with fine sand.

B. Slurry Seals: Apply slurry coats in a uniform thickness according to ASTM D 3910 and allow curing.
   1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturers recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb./gal.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
   1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
   2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
      a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION

SECTION 32 13 13 – PORTLAND CEMENT CONCRETE PAVING

PART I – GENERAL

1.01 WORK INCLUDED

A. Concrete sidewalks, roads, aprons, door pads, curbs and gutters.

B. Reinforcement.

C. Surface finish.

D. Curing.

E. Roller Compacted Concrete Pavement

1.02 RELATED WORK

A. Section 32 11 00 - Sub-grade and Base Course Preparation

B. Section 32 13 73 - Pavement Joint Sealants

C. Section 31 20 00 – Earthwork

D. Division 3 Section “Cast-in-Place Concrete”

1.03 REFERENCES

A. Portland Cement Association’s Guide Specification for Construction of Roller-Compacted Concrete Pavements (attached)

B. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.

C. ACI 211.2 - Recommended practice for Selecting Proportions for Structural Lightweight Concrete.

D. ACI 301 - Specifications for Structural Concrete for Buildings.

E. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

F. ACI 305R - Hot Weather Concreting.

G. ACI 306R - Cold Weather Concreting.

H. ACI 315 - Details and Detailing of Concrete Reinforcement.

I. ACI 318 - Building Code Requirements for Reinforced Concrete.

J. ACI 347 - Recommended Practice for Concrete Formwork, Concrete Reinforcing Steel Institute, Manual of Standard Practice.

K. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

L. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

M. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

N. ASTM C31 - Standard Method of Making and Curing Concrete Test Specimens in the Field.

O. ASTM C33 - Standard Specification for Concrete Aggregates.

P. ASTM C39 - Standard Test Method of Compressive Strength of Cylindrical Concrete Specimens.

Q. ASTM C78 - Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).

R. ASTM C94 - Ready Mixed Concrete.

S. ASTM C143 - Slump of Portland Cement Concrete.

T. ASTM C150 - Portland Cement.

U. ASTM C172 - Sampling Fresh Concrete.

V. ASTM C173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.

W. ASTM C192 - Making and Curing Concrete Test Specimens in the Laboratory.

X. ASTM C231 - Air Content Of Freshly Mixed Concrete by the Pressure Method.

Y. ASTM C260 - Air-Entraining Admixtures for Concrete.

Z. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

AA. ASTM C494 - Chemical Admixtures for Concrete.

BB. ASTM C1116- Standard Specification for Fiber-Reinforced

CC. ASTM D1751- Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

DD. ASTM D1752- Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

EE. Tennessee Department of Transportation – Standard Specifications for Road and Bridge Construction.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. Submit laboratory test reports for concrete materials and mix design test as specified.

D. Provide material certificates in lieu of materials laboratory test reports when permitted by Owner's Representative. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item meets specified requirements.

E. Use of Synthetic Fibers shall be approved by the owner or architect.

1.05 TESTS

A. As the work progresses, sample concrete in accordance with ASTM C172.

B. Make slump tests according to ASTM C143, one slump test for each set of test cylinders.

C. Test air content of concrete made with normal-weight aggregates having low water absorption according to either ASTM C231 or ASTM C173. For lightweight aggregates or aggregates with high absorptions, use latter test method.

D. Make compression test specimens and cure according to ASTM C31. Each test shall consist of one set of laboratory cured cylinders. A set shall consist of four cylinders. Minimum number of tests shall be one for 100 cubic yards of concrete for each class. Make at least one test per day of each class of concrete used that day.

E. Cure specimens under laboratory conditions. Specimens cured under job conditions may be required when, in Owner's Representative's opinion, there is a possibility of the surrounding air temperature falling below 40°F, or rising above 90°F.

F. Test cylinders according to ASTM C39.

G. Test laboratory cured cylinders one at seven days, two at 28 days, and one at 56 days, if required.

H. Strength level of concrete will be considered satisfactory if averages of any three consecutive strength test results of laboratory cured cylinders equal or exceed specified strength f'c, and no individual strength test result falls below specified strength f'c by more than 500 psi.

I. Make reports on cylinder tests to Owner's Representative and show dates placed and tested, name of job, proportions of cement and aggregate, quantity of water, slump, air content, admixtures, location of concrete in the project, type of concrete, compressive strength in pounds per square inch and atmospheric and concrete temperature at time of sampling.

J. In cases where strength of laboratory cured cylinders shown by tests for any portion of paving falls below required compressive strengths specified, Owner's Representative shall have the right to order change in mix or in cement content for remaining portion of the paving.

K. Make and cure flexural test beam specimens according to ASTM C78. Each test shall consist of one set of laboratory cured beams. A set shall consist of two beams. Minimum number of tests shall be one for each 100 cubic yards of concrete placed, at least one per day. Cure specimens under laboratory conditions.

L. Test beams according to ASTM C78, simple beam with third-point loading. Test beams shall have six inch by six inch cross-section.

M. Test beams at 14 days.

N. Flexural strength level of concrete shall be considered satisfactory as long as averages of any three consecutive test results of laboratory cured beams equal or exceed specified strength, and no individual strength test result falls below specified strength by more than 100 psi.

O. Concrete cylinder and flexural tests shall be made by an independent testing laboratory selected by Owner. Cost of initial tests shall be paid for by Owner. Subsequent tests required as a result of improper strength shall be paid for by Contractor.

PART II – MATERIALS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type I, gray color.

B. Fine and Coarse Aggregates: ASTM C33. Provide aggregates from single source for exposed concrete.

1. For grading tests of fine and coarse aggregates, use square mesh wire cloth complying with ASTM E11.

2. Fine Aggregate:

    a. Provide washed natural sand of strong, hard durable particles.
    b. Grade from coarse to fine within following limits:

Sieve Size	Percentage by Weight Passing Sieve Minimum	Maximum
3/8”	100	---
No. 4	95	100
No. 8	65	95
No. 16	45	75
No. 30	30	50
No. 50	10	22
No. 100	2	8

3. Coarse Aggregate:

    a. Provide coarse aggregate consisting of clean, hard, fine-grained, sound crushed rock or washed gravel, or combination of both.
    b. Any piece having length in excess of five times average thickness shall be considered flat or elongated.
    c. The maximum size coarse aggregate shall 1½ " with the minimum size being 1 inch.
    d. Water: Clean, not detrimental to concrete, and conforming to ACI 318, Article 3.4.

    e. Form Materials.

        1. Conform to ACI 301.

C. Reinforcement

1. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars.

2. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

3. Tie Wire: Annealed steel, minimum 16 gauge size.

4. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

5. Synthetic fiber reinforcement: manufactured in ISO 9001:2000 certified facility.
6. Minimum 10-year satisfactory performance history of specified synthetic fiber reinforcement.

D. Accessories

1. Curing Compound: FS TT-C-800, Type 1, 30% solids; ASTM C309, Kurey DR, manufactured by Euclid Chemical Company and L&M Cure Resin by L&M Construction Materials, or approved equal.

2. Expansion Joint Filler: Non-extruding, non-bituminous, resilient type complying with AASHTO M153 and ASTM D1752.

3. Joint Sealant for Pavements Unless Noted Otherwise on Drawings: Urethane complying with ASTM D1850 and ASTM C290 such as "Urexpan NR-200" by Pecora Corp., "VULKEM-245" by Mameco International, "THC-900" by Tremco or approved equal.

F. Admixtures

1. Air Entrainment: Conform to ASTM C260.

2. Water Reducing Admixture: Conform to ASTM C494, Type A, containing not more than 1% chloride ions.

3. High Range Water Reducing Admixture (Super Plasticizer): Conform to ASTM C494, Type F or G, containing not more than 1% chloride ions.

4. Non-Chloride Accelerator Admixture: Conform to ASTM C494, Type C or E. Provide long-term test data proving non-corrosive effect on reinforcing steel.

G. Concrete Mix Design

1. Design concrete for flexural strength of 650 pounds per square inch at 14 days, compressive strength of (f'c) of 4,000 pounds per square inch at 28 days unless otherwise directed on plans.

2. Concrete shall contain no calcium chloride nor shall admixtures contain more than 1 % chloride ions or air entraining cement, unless approved by Owner's Representative.

3. Concrete shall be air entrained and conform to air content limits of Table 1 below.

Table 1 – Air Content for Air-Entrained Concrete	
Maximum Size Coarse Aggregate Inches	Air Content Percent by Volume
1 1 ½"	5.5±1 5.0±1

4. Concrete shall have a slump of 3", plus or minus ½".

5. Methods of measuring concrete materials shall be such that proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to ASTM C94.

6. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.

7. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

H. Roller Compacted Concrete shall be per the materials in paragraph 4 of PCA guide specification.

PART III – EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade ready to support paving and imposed loads.

B. Verify correct gradients and elevations of base.

C. Beginning installation implies acceptance of existing conditions.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Owner's Representative minimum 24 hours before start of concreting operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

A. Where noted on drawings, reinforce concrete paving with welded steel wire fabric.

B. Provide chairs, supports, spacers, bolsters and other devices to keep reinforcement at proper elevations and in place.

C. Interrupt reinforcement at control, contraction and expansion joints.

D. Synthetic Fiber Reinforcement if used shall be added to concrete mixture in accordance with manufacturer's instructions.

3.05 FORMED JOINTS

A. Place joints as shown on plans to correct elevation and profile.

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Hot Weather Placement: ACI 305R

C. Cold Weather Placement: ACI 306R

D. Ensure reinforcements, inserts, embedded parts, formed joints and are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Place concrete to pattern indicated. Saw cut contraction joints at an optimum time after finishing. Saw joints in accordance with details on plans.

G. Chamfer exposed corners of concrete using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth lines and tight edge strips.

H. Place Roller Compacted Concrete per paragraph 6.5 of PCA's quide specification.

3.07 FINISHING

A. Road and Apron Paving: Light broom.

B. Sidewalk Paving: Light broom and trowel joint edges.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 FIELD QUALITY CONTROL

A. Field testing will be performed by an independent testing company as selected by the Owner.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 13 73 – PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within portland cement concrete pavement.

2. Joints between portland cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Division 32 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.

1.03 SUBMITTALS

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

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.

3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.02 COLD-APPLIED JOINT SEALANTS

A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

B. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

1. Type SL Silicone Sealant for Concrete and Asphalt:

    a. 890-SL; Dow Corning Corp.
    b. Roadsaver Silicone SL; Crafco, Inc.
    c. Sika-1C SL; Sika Corp.
    d. Or Equivalent

2. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:

    a. SOF-SEAL; W.R. Meadows, Inc.
    b. Roadsaver Silicone; Crafco, Inc.
    c. 888; Dow Corning Corp.
    d. Or Equivalent

2.03 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.04 PRIMERS

A. Primers: Product 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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. 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.

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

3.02 PREPARATION

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

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless 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. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.

2. Do not stretch, twist, puncture, or tear backer materials.

3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.

2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 32 31 13 - PVC COATED CHAIN LINK FENCES, POSTS AND GATES

PART 1 - GENERAL

1.01 SCOPE

A. Summary*:* The work covered by this section includes furnishing all labor, materials, and equipment required to install Class 2b Fused and Adhered, Poly Vinyl Chloride (PVC) Coated, Steel Chain Link Fence, including all excavation, concrete, and accessories, as shown on the Drawings or specified herein.

B. General*:* Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.

C. Delivery, Storage and Handling*:* Deliver material to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

1.02 SUBMITTALS

A. Shop Drawings: Include complete details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details. Actual samples and certificates of compliance may be requested.

B. Product Data*:* Provide manufacturer's catalog cuts with printed specifications. Manufacturer shall provide certification of compliance with material specifications. Actual samples of the material may be requested.

1.03 STANDARDS

A. ASTM B 6 Slab Zinc

B. ASTM F567 Installation of Chain Link Fence

C. ASTM F668 Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric, Class 2b

D. Federal Specification RR-F-191K/1D Fencing, Wire and Post Metal (Chain-Link Fence Fabric), Type IV

E. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Type IV, Class A

F. ASTM F1043 Strength and Protective Coating on Metal Industrial Chain Link Fence Framework Group I-A and Group I-C Heavy Industrial

G. ASTM F934 Standard Colors for Polymer-Coated Chain Link Fence Materials

H. Federal Specification RR-F-191K/3D Fencing, Wire and Post Metal (Chain-Link Fence Posts, Topsails and Braces), Class 1, Grade A or B

I. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Grades 1 and 2

PART 2 - PRODUCTS

2.01 FENCE FABRIC

A. The base metal of the chain link fence fabric shall be composed of commercial quality, medium-carbon galvanized (zinc coated) steel wire. The vinyl coating shall be thermally bonded to a thermoset-bonding layer over a galvanized steel wire. Vinyl coating thickness, coating weight, and wire tensile strength conform to Federal specification RR-F-191K/1D, ASTM F668, Class 2b and (AASHTO) M-181, Type IV, Class A, as shown in Table 1. The wire is PVC coated before weaving, is free and flexible at all joints, and is knuckled at both

selvages.

Table 1-PVC Coated Steel Wire Characteristics

Zinc Coated Core Wire Size			PVC Coated Finished Wire Size	PVC Coated Wire Allowable Variance		Core Wire Zinc Coating Weight, Min		PVC Coating Thickness		Breaking Strength, minimum		Tensile Strength, min	
ga	inch	mm	ga	Inch	mm	oz/ft^2	g/m^2	Inch	mm	lbf	N	ksi	MPa
9	0.148	3.76	8	+- 0.005	+-0.13	0.30	92	0.006 to 0.010	0.15 to 0.25	1,290	5,740	75	515

B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali. The vinyl coating is thermally bonded to a thermoset-bonding layer over a galvanized steel wire. The wire is PVC coated before weaving and is free and flexible at all joints.

C. Color: Shall Conform to ASTM F934, Black

2.02 FENCE POSTS AND RAILS

A. The base metal of the posts and rails shall be commercial steel conforming to ASTM F1043 Group I-A and I-C, Heavy Industrial Fence, and also conform to Federal specification RR-F-191, Class 1, Grades A and B and ASSHTO M181 Grades 1 and 2. The thickness of the PVC coating shall be a minimum 0.010 to 0.015 in.

B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali.

2.03 FITTINGS

A. Fittings and other accessories shall be zinc-coated (galvanized) pressed steel, cast steel or malleable iron, as specified and are coated with matching PVC by the same process as post and rails. PVC coating thickness shall be a minimum 0.006 mils. Painted fittings are not acceptable.

B. Color: Shall Conform to ASTM F934, Black

2.04 FENCE MATERIALS

A. Fabric

Fused and Adhered Poly(Vinyl Chloride)-PVC Coated Steel Chain Link Fence Fabric

1. 9 gauge zinc coated core wire with 8 gauge PVC coated finished wire size
2. 2-inch mesh
3. Knuckled at both selvages unless otherwise specified.

B. Posts: Steel pipe, ASTM F1043, capped

1. Line post: 2-3/8 inch O.D.
2. Corner, end, angle, and pull posts: 2-7/8 inch O.D., Schedule 40
3. Gate posts, 3 and 12 feet wide: 4 inch O.D. Schedule 40

4. Backstop posts: 6.625 inch O.D. min, Schedule 40

C. Top rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.

D. Bottom rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.

E. Fittings: pressed steel, cast steel or heavy malleable iron.

2.05 GATE

A. Vehicle Type: 12 foot minimum, double swing

B. Pedestrian Type: 3 foot minimum, single swing

C. Frames

1. 2 inch O.D. pipe

2. Material: Galvanized steel.

3. Construction: Welded corners or assembled with corner fittings and 3/8-inch steel truss rods.

4. Provide horizontal 1 1/4 inch brace rail and 3/8-inch truss rod for gates 5 feet wide or greater.

5. Provide vertical 1 1/4 inch brace rail for gates 6 feet wide or wider, spacing not to exceed 5-foot centers.

D. Hinges

1. Standard type.

2. Size to accommodate gate frame and post.

E. Latches

1. Industrial gate latch with drop rod or center stop.

2. See plan for latches at playgrounds

F. Keepers

1. Mechanical keeper for each gate leaf.

2. Secure free end of gate when in full open position.

2.06 CONCRETE

A. Posts shall be placed in masonry wall as shown on the details. Concrete shall be a min. 3000 psi.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that final grading in fence location is complete without irregularities, which would interfere with fence installation.

B. Measure and lay out complete fence line.

C. Locate line posts at equal distance spacing, not exceeding 10-foot centers.

D. Use corner posts at positions where fence changes direction more than 10 degrees.

E. Contractor to grout entire length of masonry wall to the top of last block after installation of fence posts, fabric, and net poles.

3.02 INSTALLATION

A. Install Fence, Fence Posts and Gates in accordance with ASTM practice 567.

B. Coordinate installation of fence posts, with Retaining Wall installer.

3.03 ADJUST AND CLEAN

A. Adjust brace rails for rigid installation.

B. Tighten hardware, fasteners and accessories.

C. Level and smooth all disturbed areas.

END OF SECTION

SECTION 32 91 00 - PLANTING SOIL

PART 1 - GENERAL

1.01 SUMMARY

A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Bio-Retention Soil, Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.

B. The scope of work in this section includes, but is not limited to, the following:

1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
2. Harvest and stockpile existing site soils suitable for Planting Soil.
3. Modify existing stockpiled site soil.
    a. Modify existing site soil in place for use as Planting Soil.
    b. Install existing or modified existing soil for use as Planting Soil.
4. Locate, purchase, deliver and install subsurface Drain Lines.
5. Fine grade Planting Soil.
6. Install Compost into Planting Soil.
7. Cleanup and disposal of all excess and surplus material.

1.02 CONTRACT DOCUMENTS

A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.03 RELATED DOCUMENTS AND REFERENCES

A. Related Documents:

1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
2. Related Specification Section
    a. Section 31 10 00– Site Clearing
    b. Section 31 20 00 -Earthwork
    c. Section 32 92 00– Turf and Grasses
    d. Section 32 93 00 – Exterior Plants

B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.

1. ASTM: American Society of Testing Materials cited section numbers.
2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
3. US Composting Council www.compostingcouncil.org and

http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf.

4. Methods of Soil Analysis, as published by the Soil Science Society of America (http://www.soils.org/).

5. Up by Roots: healthy soils and trees in the built environment. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.04 VERIFICATION

A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.05 PERMITS AND REGULATIONS

A. The Contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor shall promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.

B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.

C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner's Representative shall determine which shall govern.

1.06 PROTECTION OF WORK, PROPERTY AND PERSON

A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to the Contractor's actions.

1.07 CHANGES IN WORK

A. The Owner's Representative may order changes in the work, and the contract sum adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

B. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.08 CORRECTION OF WORK

A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands but not more than 180 (one hundred and eighty) days after notification.

1.09 DEFINITIONS

A. Acceptable drainage: Drainage rate is sufficient for the plants to be grown. Not too fast and not too slow. Typical rates for installed Planting Soil are between 1 - 5 inches per hour. Turf soils are often higher, but drainage rates above 2 - 3 inches per hour will dry out very fast. In natural undisturbed soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers, but could become unstable in high wind events.

B. Amendment: material added to Topsoil to produce Planting Soil Mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.

C. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.

D. Bioretention Soil: A soil mix design to allow stormwater infiltration and filtration, while supporting plant growth.

E. Compacted soil: soil where the density of the soil is greater that the threshold for root limiting, and further defined in this specification.

F. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.

G. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).

H. End of Warranty Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation (if applicable) work run concurrent with each other, and further defined in this specification.

I. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.

J. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.

K. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes other suitable devices, and further defined in this specification, and further defined in this specification.

L. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.

M. Graded soil: Soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this specification.

N. Installed soil: Planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this specification.

O. Minor disturbance: Minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.

P. Owner's Representative: The person or entity, appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner's Representative may appoint other persons to review and approve any aspects of the work.

Q. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.

R. Planting Soil: Topsoil, or Planting Soil Mixes which are imported or existing at the site, or made from components that exist at the site, or are imported to the site; and further defined in this specification.

S. Poor drainage: Soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable preferable to either to plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage

T. Scarify: Loosening and roughening the surface of soil and subsoil prior to adding additional soil on top, and further defined in this specification.

U. Soil Fracturing: Deep loosening the soil to the depths specified by using a backhoe, and further defined in this specification.

V. Soil Horizons: as defined in the USDA National Soil Survey Handbook http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.

W. Soil Ripping: Loosening the soil by dragging a ripping shank or chisel thru the soil to the depths and spacing specified, and further defined in this specification.

X. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.

Y. Soil trenching: Cutting narrow trenches thru the soil at the depths and spacing specified to loosen the soil profile, and further defined in this specification.

Z. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.

AA. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation (if applicable) where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project, and further defined in this specification.

BB. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.

CC. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.10 SUBMITTALS

A. See the contract General Conditions for policy and procedures related to submittals.

B. Submit all product submittals eight weeks prior to the start of the soil work.

C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:

1. Submit manufacturer's or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.

a. For each Compost product submit the following analysis by a recognized laboratory:

1.) pH

2.) Salt concentration (electrical conductivity)

3.) Moisture content %, wet weight basis

4.) Particle size % passing a selected mesh size, dry weight basis

5.) Stability carbon dioxide evolution rate mg CO2-C per g OM per day

6.) Solvita maturity test

7.) Physical contaminants (inerts) %, dry weight basis

8.) US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)

b. For Coarse Sand product submit the following analysis by a recognized

laboratory:

1.) pH

2.) Particle size distribution (percent passing the following sieve sizes):

3/8 inch (9.5 mm)

No 4 (4.75 mm)

No 8 (2.36 mm)

No 16(1.18 mm)

No 30 (.60 mm)

No 50 (.30 mm)

No 100 (.15 mm)

No 200 (.075 mm)

D. Samples: Submit samples of each product and material, where required by Part 2 of the specification, to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.

1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.

2. Samples of all Topsoil, Coarse Sand, Compost and Planting Soil shall be submitted at the same time as the particle size and physical analysis of that material.

E. Soil testing for Imported and Existing Topsoil, existing site soil to be modified as Planting Soil and Planting Soil Mixes.

1. Topsoil, existing site soil and Planting Soil Mix testing: Submit soil test analysis report for each sample of Topsoil, existing site soil and Planting Soil from an approved soil-testing laboratory and where indicated in Part 2 of the specification as follows:

a. Submit Topsoil, Planting Soil, Compost, and Coarse Sand for testing at least 8 weeks before scheduled installation of Planting Soil Mixes. Submit Planting Soil Mix test no more than 2 weeks after the approval of the Topsoil, Compost and Coarse Sand. Do not submit to the testing laboratory, Planting Soil Mixes, for testing until all Topsoil, Compost and Coarse Sand have been approved.

b. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Owner's Representative.

c. All soil testing will be at the expense of the Contractor.

2. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.

3. Provide the following other soil properties:

a. pH and buffer pH.

b. Percent organic content by oven dried weight.

c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.

d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milli Ohm per cm.

e. Cation Exchange Capacity (CEC).

1.11 OBSERVATION OF THE WORK

A. The Owner’s Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.

1. The Owner’s Representative may utilize the Contractor’s penetrometer and moisture meter at any time to check soil compaction and moisture.

B. The Owner’s Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner’s Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner’s Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. EXISTING SOIL CONDITIONS REVIEW: Prior to the start of any soil modification that will utilize or modify the existing soil.

2. EXCAVATION REVIEW: Observe each area of excavation prior to the installation of any Planting Soil.

3. DRAIN LINE INSTALLATION REVIEW: Upon completion of the installation of drain lines and prior to the installation of any Planting Soil

4. COMPLETION of SOIL MODIFICATIONS REVIEW: Upon completion of all soil modification and installation of planting soil.

5. COMPLETION OF FINE GRADING AND SURFACE SOIL MODIFICATIONS REVIEW: Upon completion of all surface soil modifications and fine grading but prior to the installation of shrubs, ground covers, or lawns.

1.12 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction meeting with the Owner’s Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.13 QUALITY ASSURANCE

A. Installer Qualifications: The installer shall be a firm having at least 5 years of experience of a scope similar to that required for the work, including the preparation, mixing and installation of soil mixes to support planting. The installer of the work in Section: Planting, shall be the same firm installing the work in this section.

1. The bidders list for work under this section shall be approved by the Owner’s Representative.

2. Installer Field Supervision: When any Planting Soil work is in progress, installer shall maintain, on site, an experienced full-time supervisor who can communicate in English with the Owner’s Representative.

3. Installer’s field supervisor shall have a minimum of five years experience as a field supervisor installing soil, shall be trained and proficient in the use of field surveying equipment to establish grades and can communicate in English with the Owner’s Representative.

4. The installer’s crew shall be experienced in the installation of Planting Soil, plantings, and irrigation (where applicable) and interpretation of planting plans, soil installation plans, and irrigation plans (where applicable).

5. Submit references of past projects and employee training certifications that support that the Contractors meet all of the above installer qualifications and applicable licenses.

B. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.

C. All delivered and installed Planting Soil shall conform to the approved submittals sample color, texture and approved test analysis.

1. The Owner's Representative may request samples of the delivered or installed soil be tested for analysis to confirm the Planting Soil conforms to the approved material.

2. All testing shall be performed by the same soil lab that performed the original Planting Soil testing.

3. Testing results shall be within 10% plus or minus of the values measured in the approved Planting Soil Mixes.

4. Any Planting Soil that fails to meet the above criteria, if requested by the Owner's Representative, shall be removed and new soil installed.

D. Soil compaction testing: following installation or modification of soil, test soil compaction with a penetrometer.

1. Maintain at the site at all times a soil cone penetrometer with pressure dial and a soil moisture meter to check soil compaction and soil moisture.

a. Penetrometer shall be AgraTronix Soil Compaction Meter distributed by Ben Meadows, www.benmeadows.com or approved equal.

b. Moisture meter shall be "general digital soil moisture meter" distributed by Ben Meadows, www.benmeadows.com or approved equal.

2. Prior to testing the soil with the penetrometer check the soil moisture and penetrometer readings in the mockup soils. Penetrometer readings are impacted by soil moisture and excessively wet or dry soils will read significantly lower or higher than soils at optimum moisture.

3. The penetrometer readings shall be within 20% plus or minus of the readings in the approved mockup when at similar moisture levels.

1.14 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner's Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner's Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner's Representative of such conditions, they shall remain responsible for plant material under the warranty clause of the specifications.

2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1.15 SOIL COMPACTION – GENERAL REQUIREMENTS

A. Except where more stringent requirements are defined in this specification. The following parameters shall define the general description of the threshold points of soil compaction in existing, modified or installed soil and subsoil.

B. The following are threshold levels of compaction as determined by each method.

1. Acceptable Compaction: Good rooting anticipated, but increasing settlement expected as compaction is reduced and/or in soil with a high organic matter content.

a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.

b. Standard Proctor Method – 75-85%; soil below 75% is unstable and will settle excessively.

c. Penetration Resistance Method – about 75-250 psi, below 75 psi soil becomes increasingly unstable and will settle excessively.

2. Root limiting Compaction: Root growth is limited with fewer, shorter and slower growing roots.

a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.

b. Standard Proctor Method – above approximately 85%.

c. Penetration Resistance Method – about 300 psi.

3. Excessive Compaction: Roots not likely to grow but can penetrate soil when soil is above field capacity.

a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.

b. Standard Proctor Method – Above 90%.

c. Penetration Resistance Method – Approximately above 400 psi

1.16 DELIVERY, STORAGE, AND HANDLING

A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.

B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.

C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.

D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.

E. Bulk material: Coordinate delivery and storage with Owner's Representative and confine materials to neat piles in areas acceptable to Owner's Representative.

1.17 EXCAVATING AND GRADING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Notification of the Tennessee One-Call, 811, is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the Tennessee One-Call service.

PART 2 - PRODUCTS

2.01 IMPORTED TOPSOIL

A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:

1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.
2. pH value shall be between 5.5 and 7.0.
3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
4. Soluble salt level: Less than 2 mmho/cm.
5. Soil chemistry suitable for growing the plants specified.

B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.

C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 2 inches in diameter throughout the stockpile after harvesting.

D. Stockpiled Existing Topsoil at the site meeting the above criteria may be acceptable.

E. Provide a two gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.02 COMPOST

A. Compost: Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure based material designed to produce Compost high in fungal material.

1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for “Compost as a Landscape Backfill Mix Component”.

   http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

2. Compost shall comply with the following parameters:
   a. pH: 5.5 - 8.0.
   b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
   c. Moisture content %, wet weight basis: 30 – 60.
   d. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
   e. Stability carbon dioxide evolution rate: mg CO_2-C/ g OM/ day < 2.
   f. Solvita maturity test: > 6.
   g. Physical contaminants (inerts), %, dry weight basis: <1%.

h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels.

i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.03 COARSE SAND

A. Clean, washed, sand, free of toxic materials

1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.

2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.

3. pH shall be lower than 7.0.

4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm	2-5

B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.04 LIME

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

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

2. Provide lime in form of dolomitic limestone.

B. Provide manufacturer's literature and material certification that the product meets the requirements.

2.05 EXISTING SOIL (Acceptable for planting with minimum modifications)

A. General definition of existing soil: Surface soil in the areas designated on the soils plan as existing soil, that is not altered, compacted to root limiting density, graded or contaminated before or during the construction process and considered acceptable for planting and long term health of the plants specified either as it exists or with only minor modification.

1. The Owner's Representative shall verify that the soil in the designated areas is suitable at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for use as Planting Soil to the point where the soil is no longer suitable to support the plants specified, the Owner's Representative may require modification of the damaged soil up to and including removal and replacement with soil of equal quality to the soil that existed prior to construction. Examples of damage include further compaction, contamination, grading, creation of hardpan or drainage problems, and loss of the O, and or A horizon.

a. Do not begin work on additional modifications until changes to the contract price are approved by Owner's Representative.

B. Protect existing soil from compaction, contamination, and degradation during the construction process.

C. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not increase compaction of soil to root limiting levels.

D. Modifications:

1. When results of soil tests recommend chemical adjustments, till surface soil to six inches or greater after chemical adjustments have been are applied.

2. Remove existing turf thatch, ground cover plants and weeds.

3. Provide pre-emergent weed control if indicated.

4. Make chemical adjustment as recommended by the soil test.

2.06 PLANTING SOIL MIXES

A. General definition: Mixes of Existing Soil or Imported Topsoil, Coarse Sand, and or Compost to make a new soil that meets the project goals for the indicated planting area. These may be mixed off site or onsite, and will vary in Mix components and proportions as indicated.

B. Planting Mix - moderately slow draining soil for trees and shrub beds

1. A Mix of Imported Topsoil, Coarse Sand and Compost. The approximate Mix ratio shall be:

Mix component	% by moist volume
Imported Topsoil unscreened	45-50%
Coarse sand	40-45%
Compost	10%

2. Final tested organic matter between 2.75 and 4% (by dry weight).

3. Mix the Coarse Sand and Compost together first and then add to the Topsoil. Mix with a loader bucket to loosely incorporate the Topsoil into the Coarse Sand/Compost Mix. DO NOT OVER MIX! Do not mix with a soil blending machine. Do not screen the soil. Clumps of Soil, Compost and Coarse Sand will be permitted in the overall Mix.

4. At the time of final grading, add fertilizer if required to the Planting Soil at rates recommended by the testing results for the plants to be grown.

5. Provide a two gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time.

2.07 Bio-Retention SOIL MIXES

A. Blend bioretention soil in appropriate weather conditions only.

1. A Mix of Coarse Sand, Soil Fines and Organic Material. The approximate Mix ratio shall be:

Mix component	% by moist volume
Coarse Sand	80-85%
Soil Fines	8-15%
Organic Material	3-10%

B. Bio-retention Media must meet the following criteria.

1. P Index Range = 10-30 (7 to 21 mg/kg of P)

2. Infiltration rate of greater than 1 inches per hour

2.08 LIGHT DUTY DRAIN PIPE

A. Drain pipe shall be 4 inch diameter, perforated, HDPE, single wall corrugated exterior pipe. ASTM F405. All fittings, elbows, unions, T's and screw caps shall be the same material and from the same manufacturer as the pipe. All joints shall be gasketed bell and spigot. Example source ADS Single Wall Pipe by Advance Drainage Systems or approved equal. Submit manufacturer's product literature for approval by the Owner's Representative.

1. When pipe has perforations on all quadrants, drape a 12 inch wide 4 mil plastic sheet over the length of the pipe to force water to the bottom of the pipe.

B. Clean out: Clean out risers shall be 4 inch diameter Schedule 40 PVC solid pipe compatible with the bottom fitting and clean out screw cap. Elbow fitting at the bottom of the cleanout riser. When the cleanout is in the middle of a pipe run the fitting shall be a sanitary T fitting. Screw cap FITTING shall be PVC Schedule 40.

PART 3 - EXECUTION

3.01 SITE EXAMINATION

A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.

1. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.

2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.

3. Confirm that no adverse drainage conditions are present.

4. Confirm that no conditions are present which are detrimental to plant growth.

5. Confirm that utility work has been completed per the drawings.

6. Confirm that irrigation work, which is shown to be installed below prepared soil levels, has been completed.

B. If unsatisfactory conditions are encountered, notify the Owner’s Representative immediately to determine corrective action before proceeding.

3.02 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner’s Representative of any conflicts encountered.

3.03 GRADE AND ELEVATION CONTROL

A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.04 SITE PREPARATION

A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting

1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

B. Remove all construction debris and material including any construction materials from the subgrade.

C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.

D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.

E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.

2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.05 SOIL MOISTURE

A. Volumetric soil moisture level, in both the Planting Soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

B. The Contractor shall confirm the soil moisture levels with a moisture meter (Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent). If moisture is found to be too low, the planting holes shall be filled with water and allowed to drain before starting any planting operations. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.06 PLANTING SOIL AND PLANTING SOIL MIX INSTALLATION

A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.

B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.

C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.

1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the backhoe or loader bucket, tiller or other suitable device.
2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.

D. Install the Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the

soil surface to roughen the surface.

E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

F. Where possible place large trees first and fill Planting Soil around the root ball.

G. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the over mixing and soil ped breakdown cause by this type of equipment.

H. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph “Compaction Reduction” (section 3.9) in the event that soil becomes over compacted.

I. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.07 COMPACTION REQUIREMENTS FOR INSTALLED OR MODIFIED PLANTING SOIL

A. Compact installed Planting Soil to the compaction rates indicated and using the methods approved for the soil mockup. Compact each soil lift as the soil is installed.

B. Existing soil that is modified by tilling, ripping or fracturing shall have a density to the depth of the modification, after completion of the loosening, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the midpoint between wilting point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.

C. Installed Planting Soil Mix and re-spread existing soil shall have a soil density through the required depth of the installed layers of soil, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the midpoint between wilt point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.

D. Planting Soil compaction shall be tested at each lift using a penetrometer calibrated to the mockup soil and its moisture level. The same penetrometer and moisture meter used for the testing of the mockup shall be used to test installed soil throughout the work.

E. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.

F. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the Planting Soil mockup.

G. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.

1. Light weight equipment such as trenching machines or motorized wheelbarrows is permitted to pass over finished soil work.

2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.08 OVER COMPACTION REDUCTION

A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mock up shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.

B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6

inches or greater below finished grade.

3.09 INSTALLATION OF CHEMICAL ADDITIVES

A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.

B. Types, application rates and methods of application shall be approved by the Owner's Representative prior to any applications.

3.10 FINE GRADING

A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.

B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.

C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.

D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.

E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.

F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and groundcover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.11 INSTALLATION OF COMPOST TILL LAYER

A. After Planting Soil Mixes are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread 3 – 4 inches of Compost over the beds and roto till into the top 4 - 6 inches of the Planting Soil. This step will raise grades slightly above the grades required in paragraph "Fine Grading". This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down. Additional settlement as defined in paragraph "Planting Soil and Planting Soil Mix installation" must still be accounted for in the setting of final grades.

3.12 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner's Representative seals are to remain on the trees and removed at the end of the warranty period.

1. Make all repairs to grades, ruts, and damage to the work or other work at the site.

2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.13 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.

B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner's Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.

1. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.

2. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.14 BIORETENTION SOIL INSTALLATION

A. Do not begin installation until entire contributing drainage area is stabilized with pavement or landscaping.

B. Prepare as-built survey and time stamped photos of bio-retention subgrade, when required by authority having jurisdiction.

C. Excavators or other equipment shall work from the sides. Do not drive equipment into bioretention areas.

D. Install drainage layers, geotextile and under drain, if needed as indicated in the drawings.

E. Install median in 12" lifts. Saturate media with water slowly. Allow media to drain overnight and add additional media as needed to compensate for settlement.

F. Continually protection bio retention areas with erosion control measure to prevent sedimentation.

G. Replace any bioretention soil that becomes clogged during construction.

3.15 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.

1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.

2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings or turf.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner's Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.16 SUBSTANTIAL COMPLETION ACCEPTANCE

A. Upon written notice from the Contractor, the Owner's Representative shall review the work and make a determination if the work is substantially complete.

B. The date of substantial completion of the planting soil shall be the date when the Owner's Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

3.17 FINAL ACCEPTANCE / SOIL SETTLEMENT

A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.

1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.

B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

END OF SECTION

SECTION 32 92 00 -TURFS AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Lawns.
2. Topsoil and soil amendments.
3. Fertilizers and mulches.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 31 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 31 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.
3. Division 32 Section "Exterior Plants" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

D. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.

1. Analysis of existing surface soil.
2. Analysis of imported topsoil.

E. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and

name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.06 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.08 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days after date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches.

1. Water lawn at the minimum rate of 1 inch per week.

D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

E. Post-fertilization: Apply fertilizer to lawn after first mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft.of lawn area.

PART 2 - PRODUCTS

2.01 GRASS MATERIALS

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on drawings.

2.02 TOPSOIL

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

growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

2. Topsoil Quantity: Provide topsoil to a minimum depth of 4" in all lawn and landscaped areas.

2.03 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.

1. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

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

D. Perlite: Horticultural perlite, soil amendment grade.

E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.

F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

1. When site treated, mix with at least 0.15 lb of ammonium nitrate or 0.25 lb of ammonium sulfate per cu. ft. of loose sawdust or ground bark.

G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

H. Herbicides: EPA registered and approved, of type recommended by manufacturer.

I. Water: Potable.

2.04 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.05 MULCHES

A. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

B. Non-asphalt Emulsion Tackifier: Nontoxic and free of plant growth- or germination-inhibitors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

C. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.

2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.03 LAWN PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inches in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.

2. Till surface soil to a depth of at least 6 inches. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.

3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.04 SEEDING NEW LAWNS

A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

B. Sow seed at the following rates:

1. Seeding Rate: 3 to 4 lb. per 1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

E. Hydroseeding is an acceptable alternative, at Contractor's option.

3.05 RECONDITIONING LAWNS

A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.

B. Remove vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

C. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.

D. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches.

E. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Provide new planting soil as required to fill low spots and meet new finish grades.

F. Apply seed as required for new lawns.

G. Water newly planted areas and keep moist until new grass is established.

3.06 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.07 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.08 SEED MIXTURES SCHEDULE

A. Sun and Partial Shade: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

	Min. Pct.	Min. Pct.	Max. Pct.

Proportion	Name	Germ.	Pure Sd.	Weed Sd.
50 %	Kentucky 31	80%	85%	0.5%
30 %	Chewings red fescue	85%	98%	0.5%
10 %	Perennial rye grass	90%	98%	0.5%
10 %	Redtop	85%	92%	1%

END OF SECTION

SECTION 32 93 00 - EXTERIOR PLANTS

PART 1 - GENERAL

1.01 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A 300	Tree Care Operations – Trees, Shrubs and Other Woody Plant Maintenance.
ANSI Z133.1	Arboricultural Operations – Safety Requirements for Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush
ANSI Z60.1	Nursery Stock

ASTM INTERNATIONAL (ASTM)

ASTM A 580/A 580M	Standard Specification for Stainless Steel Wire
ASTM C 602	Agricultural Liming Materials
ASTM D 1972	Standard Practice for Generic Marking of Plastic Products
ASTM D 2729	Poly (Vinyl Chloride) (PVC Sewer Pipe and Fittings
ASTM D 3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 4427	Peat Samples by Laboratory Testing
ASTM D 4972	pH of Soils
ASTM D 5203	Polyethylene Plastics Molding and Extrusion Materials from Recycled Post-Consumer (HDPE) Sources
ASTM D 5268	Topsoil Used for Landscaping Purposes
ASTM D 5852	Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
ASTM D 6629	(2001; R 2007) Selection of Methods for Estimating Soil Loss by Erosion
ASTM F 405	Corrugated Polyethylene (PE) Tubing and Fittings

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	Principles and Criteria for Forest Stewardship

L.H. BAILEY HORTORIUM (LHBH)

LHBH	Hortus Third

U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED	Leadership in Energy and Environmental Design ™ Green Building Rating System for New Construction (LEED – NC)

1.02 RELATED REQUIREMENTS

A. Section 31 00 00 EARTHWORK

B. Section 32 91 00 PLANTING SOIL

C. Section 32 92 00 TURFS AND GRASSES

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Division 01 Section SUBMITTAL PROCEDURES:

1. SD-01 Preconstruction Submittals
Time Restrictions and Planting Conditions

Indicate anticipated dates and locations for each type of planting.

2. SD-03 Product Data

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Peat
Composted Derivatives
Rotted Manure
Organic Mulch Materials

Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.
Mulch; G,
Ground Stakes

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Fertilizer
Hose
Weed control fabric; G,

Staking Material
Ground Stakes

Submit documentation certifying products are from salvaged/recovered lumber sources and indicating percentage of salvaged/recovered content per unit of product.

Metal anchors
Antidesiccants
Erosion control materials
Photographs; G,

3. SD-04 Samples

Mulch; G,
Submit one pint of mulch

4. SD-06 Test Reports

Topsoil composition tests; Soil Test of proposed area; Soil Test location map

Percolation Test; Percolation Test of proposed area.

5. SD-07 Certificates

Nursery certifications

Indicate names of plants in accordance with the LHBH, including type

quality, and size.

6. SD-10 Operation and Maintenance Data

   Plastic Identification

   When not labeled, identify types in Operation and Maintenance Manual.

1.04 QUALITY ASSURANCE

A. Topsoil Composition Tests: Commercial test from an independent testing laboratory including basic soil groups (moisture and saturation percentages, Nitrogen-Phosphorus-Potassium (N-P-K) ratio, pH (ASTM D 4972), soil salinity), Secondary nutrient groups (calcium, magnesium, sodium, Sodium Absorption Ratio (SAR), micronutrients (zinc, manganese, iron, copper), toxic soil elements (boron, chloride, sulfate), cation exchange and base saturation percentages, and soil amendment and fertilizer recommendations with quantities for plant material being transplanted. Soil required for each test shall include a maximum depth of 18 inches of approximately 1 quart volume for each test. Areas sampled should not be larger than 1 acre and should contain at least 6-8 cores for each sample area and be thoroughly mixed. Problem areas should be sampled separately and compared with samples take from adjacent non-problem areas. The location of the sample areas should be noted and marked on a parcel or planting map for future reference.

B. Nursery Certifications: Indicate on nursery letterhead the name of plants in accordance with the LHBH, including botanical common names, quality, and size, Inspection certificate, Mycorrhizal fungi inoculum for plant material treated.

C. State Landscape Contractor's License: Construction company shall hold a landscape contractors license in the state where the work is performed and have a minimum of five years landscape construction experience. Submit copy of license and three references for similar work completed in the last five years.

D. Plant Material Photographs: Contractor shall submit nursery photographs, for government approval prior to ordering, for each tree larger than 24-inch box/or 2-inch caliper size.

E. Percolation Test: Immediately following rough grading operation, identify a typical location for one of the largest trees and or shrubs and excavate a pit per the project details. Fill the pit with water to a depth of 12 inches. The length of time required for the water to percolate into the soil, leaving the pit empty, shall be measured by the project Landscape Architect and verified by the Contracting Officer. Within six hours of the time the water has drained from the pit, the Contractor, with the Contracting Officer and project Landscape Architect present, shall again fill the pit with water to a depth of 12 inches. If the water does not completely percolate into the soil within 9 hours, a determination shall be made whether a drainage system or a soil penetrant will be required for each tree and or shrub being transplanted.

F. Erosion Assessment: Assess potential effects of soil management practices on soil loss in accordance with ASTM D 6629. Assess erodibility of soil with dominant soil structure less than 2.8 to 3.1 inches in accordance with ASTM D 5852.

G. Pre-Installation Meeting: Convene a pre-installation meeting a minimum of one week prior to commencing work of this section. Require attendance of parties directly affecting work on this section. Review conditions of operations, procedures and coordination with related work. Agenda shall include the following:

   1. Tour, inspect, and discuss conditions of planting materials.
   2. Review planting schedule and maintenance.
   3. Review required inspections.
   4. Review environmental procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Branched Plant Delivery: Deliver with branches tied and exposed branches covered with

material which allows air circulation. Prevent damage to branches, trunks, root systems, and root balls and desiccation of leaves.

B. Soil Amendment Delivery: Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer, gypsum, sulfur, iron, and lime may be furnished in bulk with a certificate indicating the above information. Store in dry locations away from contaminates.

C. Plant Labels: Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct botanical and common plant name and variety as applicable and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels shall be legible for a minimum of 60 days after delivery to the planting site.

D. Plant Storage and Protection: Store and protect plants not planted on the day of arrival at the site as follows:

1. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.

2. Heel-in bare root plants.

3. Protect balled and burlapped plants from freezing or drying out by covering the balls or roots with moist burlap, sawdust, wood chips, shredded bark, peat moss, or other approved material. Provide covering which allows air circulation.

4. Keep plants in a moist condition until planted by watering with a fine mist spray.

5. Do not store plant material directly on concrete or bituminous surfaces.

E. Fertilizer, Gypsum, pH adjusters and Mulch Storage: Store in dry locations away from contaminants.

F. Topsoil: Prior to stockpiling topsoil, eradicate on the site undesirable growing vegetation. Clear and grub existing vegetation three to four weeks prior to stockpiling existing topsoil.

G. Weed Control Fabric: Store materials on site in enclosures or under protective covering in dry location. Store under cover out of direct sunlight. Do not store materials directly on ground.

H. Handling: Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Handle boxed, balled and burlapped, and container plants carefully to avoid damaging or breaking the earth ball or root structure. Do not handle plants by the trunk or stem. Remove damaged plants from the site.

I. Time Limitation: Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum of 90 days. The time limitation between installing the plant material and placing the mulch shall be a maximum of 24 hours.

1.06 TIME RESTRICTIONS AND PLANTING CONDITIONS

A. Coordinate installation of planting materials during optimal planting seasons for each type of plant material required.

B. Planting Dates - Deciduous Material: Deciduous material from January to March for spring planting and from October to December for fall planting.

C. Planting Dates - Evergreen Material: Evergreen material from February to June for spring/summer planting and from September to December for fall/winter planting.

D. Restrictions: Do not plant when ground is frozen, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.07 GUARANTEE

A. All plants shall be guaranteed for one year beginning on the date of inspection by the

Contracting Officer to commence the plant establishment period, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by the Government or by weather conditions unusual for the warranty period.

B. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season. At end of warranty period, replace planting materials that die or have 25 percent or more of their branches that die during the construction operations or the guarantee period.

PART 2 - PRODUCTS

2.01 PLANTS

A. Regulations and Varieties: Existing trees and shrubs to remain shall be protected and a planting plan be arranged around them. Furnish nursery stock in accordance with ANSI Z60.1, except as otherwise specified or indicated. Each plant or group of planting shall have a “key” number indicated on the nursery certifications of the plant schedule. Furnish plants, including turf grass, grown under climatic conditions similar to those in the locality of the project. Spray plants budding into leaf or having soft growth with an antidesiccant before digging. Plants of the same specified size shall be of uniform size and character of growth. All plants shall comply with all Federal and State Laws requiring inspection for plant diseases and infestation.

B. Shape and Condition: Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and undamaged root system.

C. Deciduous Trees and Shrubs: Symmetrically developed and of uniform habit of growth, with straight boles or stems, and free from objectionable disfigurements.

D. Evergreen Trees and Shrubs: Well developed symmetrical tops with typical spread of branches for each particular species or variety.

E. Ground Covers and Vines: Number and length of runners and clump sizes indicated, and of the proper age for the grade of plants indicated, furnished in removable containers, integral containers, or formed homogeneous soil section.

F. Plant size: Minimum sizes measured after pruning and with branches in normal position, shall conform to measurements indicated, based on the average width or height of the plant for the species as specified in ANSI Z60.1. Plants larger in size than specified may be provided with approval of the Contracting Officer. When larger plants are provided, increase the ball of earth or spread of roots in accordance with ANSI Z60.1.

G. Root Ball Size: All box-grown, field potted, field boxed, collected, plantation grown, bare room, balled and burlapped, container grown, processed-balled, and in-ground fabric bag-grown root balls shall conform to ANSI Z60.1. All wrappings and ties shall be biodegradable. Root growth in container grown plants shall be sufficient to hold earth intact when removed from containers. Root bound plants will not be accepted.

H. Mycorrhizal fungi inoculum: Before shipment, root systems shall contain mycorrhizal fungi inoculum.

I. Growth of Trunk and Crown - Deciduous Trees: A height to caliper relationship shall be provided in accordance with ANSI Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be “poled” or the leader removed.

1. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

2. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there shall be no division of the trunk which branches more than 6 inches from ground level.

J. Palms: Palms shall have the specified height as measured from the base of the trunk to the base of the fronds or foliage in accordance with ANSI Z60.1. The palm shall have straight trunk and healthy fronds or foliage as typical for the variety grown in the region of the project. Palms trimmed or pruned for delivery shall retain a minimum of 6 inches of foliage at the crown as a means of determining plant health.

K. Deciduous Shrubs: Deciduous shrubs shall have the height and number of primary stems recommended by ANSI Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

L. Coniferous Evergreen Plant Material: Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANSI Z60.1. The coniferous evergreen trees shall not be "poled" or the leader removed. Acceptable plant material shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

M. Broadleaf Evergreen Plant Material: Broadleaf evergreen plant material shall have the height-to-spread ratio recommended by ANSI Z60.1. Acceptable plant material shall be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

N. Ground Cover and Vine Plant Material: Ground cover and vine plant material shall have the minimum number of runners and length of runner recommended by ANSI Z60.1. Plant material shall have heavy, well developed and balanced crown with vigorous, well developed root system and shall be furnished in containers.

2.02 TOP SOIL

A. On-Site Topsoil: Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition". When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 EARTHWORK.

B. Off-Site Topsoil: Conform to requirements specified in paragraph entitled "Composition". Additional topsoil shall be furnished by the Contractor or obtain from topsoil borrow areas indicated.

C. Composition: Evaluate soil for use as topsoil in accordance with ASTM D 5268. From 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, ¾ inch, with maximum 3 percent retained on ¼ inch screen. The pH shall be tested in accordance with ASTM D 4972. Topsoil shall be free of sticks, stones, roots, plants, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.03 SOIL CONDITIONERS

A. Provide singly or in combination as required to meet specified requirements for topsoil. Soil conditioners shall be nontoxic to plants.

B. Lime: Commercial grade hydrated limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C 602 of not less than 80 percent.

C. Aluminum Sulfate: Commercial grade.

D. Sulfur: 100 percent elemental

E. Iron: 100 percent elemental

F. Peat: Natural product of peat moss derived from a freshwater site and conforming to ASTM D 4427 as modified herein. Shred and granulate peat to pass a ½ inch mesh screen and condition in storage pile for minimum 6 months after excavation. Biobased content shall be a minimum of 100 percent. Peat shall not contain invasive species, including seeds.

G. Sand: Clean and free of salt and other materials harmful to plants.

H. Perlite: Horticultural grade.

I. Composted Derivatives: Ground bark, nitrolized sawdust, humus, or other green wood waste material free of stones, sticks, invasive species, including seeds, and soil stabilized with nitrogen and having the following properties:

Particle Size – Minimum percent by weight passing:

No. 4 mesh screen	95
No. 8 mesh screen	80

Nitrogen Content – Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

Biobased Content – Minimum 100 percent.

J. Gypsum: Coarsely ground gypsum from recycled scrap gypsum board comprised of calcium sulfate dehydrate 91 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 20 mesh screen, 100 percent passing thru 16 mesh screen.

K. Rotted Manure: Well rotted horse or cattle manure containing maximum 25 percent by volume of straw, sawdust, or other bedding materials; free of seeds, stones, sticks, soil, and other invasive species.

2.04 PLANTING SOIL MIXTURES

A. 100 percent topsoil as specified herein - Sandy topsoil: one part topsoil to one part peat; clay topsoil: two parts topsoil to one part peat. Thoroughly mix all parts of planting soil mixture to a uniform blend throughout.

2.05 FERTILIZER

A. Fertilizer for groundcover, wildflowers and grasses is not permitted. Fertilizer for trees, plants, and shrubs shall be as recommended by plant supplier, except synthetic chemical fertilizers are not permitted. Fertilizers containing petrochemical additives or that have been treated with pesticides or herbicides are not permitted.

B. Granular Fertilizer: Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

12 percent available nitrogen
12 percent available phosphorus
12 percent available potassium

C. Fertilizer Tablets: Organic, plant tablets composed of tightly compressed fertilizer chips forming a tablet that is insoluble in water, is designed to provide a continuous release of nutrients for at least 24 month and contains the following minimum percentages, by weight, of plant food nutrients:

20 percent available nitrogen
20 percent available phosphorus
5 percent available potassium

2.06 WEED CONTROL FABRIC

A. Roll type Polypropylene or Polyester Mats – Fabric shall be woven, needle punched or non-woven and treated for protection against deterioration due to ultraviolet radiation. Fabric shall be minimum 99 percent opaque to prevent photosynthesis and seed germination from occurring, yet allowing air, water and nutrients to pass thru to the roots. Minimum weight

shall be 5 ounces per square yard with a minimum thickness of 20 mils with a 20 year minimum guarantee.

2.07 DRAINAGE PIPE FOR PLANT PITS AND BEDS

A. Plastic polyvinyl chloride pipe, 4 inches in diameter, unperforated conforming to ASTM D 3034 SDR 35 perforated conforming to ASTM D 2729. Minimum 25 percent recycled content with a minimum of 5 percent post-consumer recycled content. Plastic HDPE pipe, 4 inches in diameter, unperforated and perforated conforming to ASTM D 5203. Minimum 100 percent post-consumer recycled content. Corrugated plastic drainage tubing, 6 inches in diameter, unperforated or perforated conforming to ASTM F 405.

2.08 MULCH

A. Free from noxious weeds, mold, pesticides, or other deleterious materials.

B. Organic Mulch Materials: Pine needles from site when available. Biobased content shall be a minimum of 100 percent.

2.09 STAKING AND GUYING MATERIAL

A. Staking Material - Tree Support Stakes: rough sawn FSC-certified or salvaged hard wood free of knots, rot, cross grain, bark, long slivers, or other defects that impair strength. Stakes shall be minimum 2 inches square or 2 ½ inch diameter by 8 feet long, pointed at one end.

D. Ground Stakes: FSC-certified or salvaged wood or 50 percent post-consumer recycled content plastic, 2 inches square are by 3 feet long, pointed at one end.

E. Guying Material - Guying Wire: 12 gauge annealed galvanized steel, ASTM A 580/A 580M.

F. Guying Cable: Minimum five-strand, 3/16 inch diameter galvanized steel cable.

G. Hose Chafing Guards: New or used 2 ply ¾ inch diameter reinforced rubber or plastic hose, black or dark green, all of same color.

H. Flags: White surveyor's plastic tape, 12 inches long, fastened to guying wires or cables.

G. Turnbuckles: Galvanized or cadmium-plated steel with minimum 3 inch long openings fitted with screw eyes. Eye bolts shall be galvanized or cadmium-plated steel with one inch diameter eyes and screw length 1 ½ inches, minimum.

H. Metal Anchors - Driven anchors: malleable iron, arrow shaped, galvanized, size as follows:

Tree Caliper	Anchor Size
2 inches and under	3 inches
3 to 6 inches	4 inches
6 to 8 inches	6 inches
8 to 10 inches	8 inches
10 to 12 inches	10 inches

I. Screw Anchors: Steel, screw type with welded-on 3 inch round helical steel plate, minimum 3/8 inch diameter, 15 inches long.

2.10 ANTIDESICCANTS

A. Sprayable, water insoluble vinyl-vinledine complex which produce a moisture retarding barrier not removable by rain or snow. Film shall form at temperatures commonly encountered out of doors during planting season and have a moisture vapor transmission rate (MVT) of the resultant film of maximum 10 grams per 24 hours at 70 percent humidity.

2.11 EROSION CONTROL MATERIALS

A. Erosion control material shall conform to the following

B. Erosion Control Fabric: Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings ¾ to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

C. Erosion Control Material Anchors: Erosion control anchors shall be as recommended by the manufacturer.

2.12 WATER

A. Source of water to be approved by Contracting Officer and suitable quality for irrigation and shall not contain elements toxic to plant life, including acids, alkalis, salts, chemical pollutants, and organic matter. Use collected storm water or graywater when available.

2.13 MYCORRHIZAL FUNGI INOCULUM

A. Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

2.14 SOURCE QUALITY CONTROL

A. The Contracting Officer and Landscape Architect of Record will inspect plant materials at the project site and approve them.

PART 3 - EXECUTION

3.01 EXTENT OF WORK

A. Provide soil preparation, fertilizing, tree, shrub, groundcover, and planting, staking and guying, week control fabric, erosion control material installation and a mulch topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are distributed by the Contractor's operations.

3.02 ALTERNATIVE HERBICIDE TREATMENT (SOLARIZING SOIL)

A. Within 48 hours of subsoil preparation, saturate soil with water to a depth of 3 feet. Immediately stake polyethylene sheeting over area to be planted. Stake tightly to surface of soil. Maintain sheeting in place for a minimum of 6 weeks. Immediately after removing sheeting, cover area to be planted with topsoil. Do Not till soil prior to applying topsoil.

3.03 PREPARATION

A. Protection: Protect existing and proposed landscape features, elements, and sites from damage or contamination. Protect trees, vegetation, and other designated features by erecting high-visibility, reusable construction fencing. Locate fence no closer to trees than the drip line. Plan equipment and vehicle access to minimize and confine soil disturbance and compaction to areas indicated on Drawings.

B. Layout: Stake out approved plant material locations and planter bed outlines on the project site before digging plant pits or beds. The Contracting Officer reserves the right to adjust plant material locations to meet field conditions. Do not plant closer than 12 inches to a pavement edge, fence or wall edge and other similar structures. Provide on-site locations for excavated rock, soil, and vegetation.

C. Soil Preparation: pH Adjuster Application Rates

1. Apply pH adjuster at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

   Lime 50 pounds per 1000 square feet

D. Soil Conditioner Application Rates: Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Peat 20 cubic yards per 1000 square feet

Or

Compost Derivatives 20 cubic yards per 1000 square feet

Or

Rotted Manure 20 cubic yards per 1000 square feet

E. Fertilizer Application Rates: Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Organic granular fertilizer 1200 pounds per acre.

F. Subsoil Drainage for Plant Pits and Beds – Provide as indicated. Lay perforated drain pipe with perforations down. Backfill trenches as specified in Section 31 EARTHWORK

3.04 PLANT BED PREPARATION

A. Verify location of underground utilities prior to excavation. Protect existing adjacent turf before excavations are made. Do not disturb topsoil and and vegetation in areas outside those indicated on Drawings. Where planting beds occur in existing turf areas, remove turf to a depth that will ensure removal of entire root system. Measure depth of plant pits from

finished grade. Depth of plant pit excavation shall be as indicated and provide proper relation between top of root ball and finished grade. Install plant material as specified in paragraph entitled “Plant Installation”. Do not install trees within 10 feet of any utility lines or building walls.

3.05 PLANT INSTALLATION

A. Individual Plant Pit Excavation: Excavate pits at least twice as large in diameter as the size of ball or container to depth shown.

B. Plant Beds with Multiple Plants: Excavate plant beds continuously throughout entire bed as outlined to depth shown.

C. Handling and Setting: Move plant materials only by supporting the root ball or container. Set plants on native soil and hold plumb in the center of the pit until soil has been tamped firmly around root ball. Set plant materials, so that the relation to surrounding finish grade, 2 to 3 inches above depth at which they were grown in the nursery, collecting field or container after the settlement occurs. Replace plant material whose root balls are cracked or damaged either before or during the planting process.

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas.

D. Balled and Burlapped Stock: Backfill with prepared soil mixture to approximately half the depth of ball and then tamp and water Carefully remove or fold back excess burlap and tying materials from the top a minimum 1/3 depth from the top of the rootball. Tamp and complete backfill, place mulch topdressing, and water. Remove wires and non-biodegradable materials from plant pit prior to backfill operations.

E. Container Grown Stock: Remove from container and prevent damage to plant or root system. Loosen circulating roots and gently open and spread out root ball.

F. Ground Covers: Smooth planting areas before planting to provide even, smooth finish. Plant after placing weed control fabric and mulch topdressing. Do not remove plant material from flats or containers until immediately before planting. Space at the intervals indicated. Plant at a depth to sufficiently cover all roots.

Start watering areas planted as required by temperature and wind conditions. Apply water at a rate sufficient to ensure through wetting of soil to a depth of 6 inches without run off or puddling. Add mulch topdressing as needed.

G. Earth Mounded Watering Basin for Individual Plant Pits: Form with topsoil around the edge of each plant pit. Watering basins shall be 6 inches deep for trees and 4 inches deep for shrubs. Eliminate basins around plants in plant beds containing multiple plants.

H. Weed Control Fabric Installation: Remove grass and weed vegetation, including roots, from within the area. Completely cover areas with specified weed control fabric prior to placing mulch layer. Overlap cut edges 6 inches.

I. Erosion Control Material: Install in accordance with manufacturer’s instructions.

J. Placement of Mulch Topdressing: Place specified mulch topdressing on top of weed control fabric covering total area enclosed by edging. Place mulch top-dressing to a depth of 3 inches.

K. Mulch Topdressing: Provide mulch topdressing over entire planter bed surfaces and individual plant surfaces including earth mound watering basin around plants to a depth of 3 inches after completion of plant installation and before watering. Keep mulch out of the crowns of shrubs. Place mulch a minimum 2 to 3 inches away from trunk of shrub or tree. Place on top of any weed control fabric.

L. Fertilization - Fertilizer Tablets: Place fertilizer planting tablets evenly spaced around the plant pits to the manufacturer’s recommended depth.

M. Grandular Fertilizer: Apply granular fertilizer as a top coat prior to placing mulch layer and water thoroughly.

N. Watering: Start watering areas planted as required by temperature and wind conditions. Slow deep watering shall be used. Apply water at a rate sufficient to ensure through wetting of soil to a depth of 24 inches without run off or puddling, except in ground cover beds. Ground cover beds are to be watered to a depth of 6 inches. Watering of other plant material or adjacent areas shall be prevented.

O. Staking and Guying - Staking: Stake plants with the number of stakes indicated as detailed. Attach guy wire half the tree height but not more than 5 feet high. Drive stakes to a dept of 2 ½ to 3 feet into the ground outside the plant pit. Do not injure the root ball. Use hose chafer guards where guy wire comes in contact with tree trunk.

P. Guying: Guy plants as indicated. Attach two strands of guying wire or guying cable around the tree trunk at an angle of 45 degrees at approximately ½ of the trunk height. Protect tree trunks with chafing guards where guying wire contacts the tree trunk. Anchor guys to wood ground stakes. Fasten flags to each guying wire approximately 2/3 of the distance up from ground level. Provide turnbuckles as indicated.

Q. Chafing Guards: Use hose chafing guards, as specified where guy wire will contact the plant.

R. Wood Ground Stakes: Drive wood ground stakes into firm ground outside of plant pit with top of stake flush with ground. Place equal distance from tree trunk and around the plant pit.

S. Flags: Securely fasten flags on each guy wire approximately two-thirds of the distance up from ground level.

T. Pruning: Prune in accordance with safety requirement of ANSI Z133.1

U. Trees and Shrubs: Remove dead and broken branches. Prune to correct structural defects only. Retain typical growth shape of individual plants with as much height and spread as practical. Do not flush cut with trunk or adjacent branches. Collars shall remain in place. Pruning shall be accomplished by trained and experienced personnel and shall be in accordance with ANSI A300.

V. Wound Dressing: Do not apply tree wound dressing to cuts.

3.06 RESTORATION AND CLEAN UP

A. Restoration: Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

B. Clean Up: Excess and waste material shall be removed from the installed area and shall be disposed offsite at an approved recycling center, or composting center. Separate and recycle or reuse the following landscape waste materials: nylon straps, wire, ball wrap, burlap, wood stakes, plastic pots. Adjacent paved areas shall be cleared and cleaned.

END OF SECTION

SECTION 33 10 00 - WATER DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes piping and specialties for potable-water service outside the building.

B. This Section does not include tapping of utility company water main.

C. Related Sections include the following:

1. Division 22.

D. Utility-furnished products include water meters that will be furnished to site, ready for installation.

1.03 DEFINITIONS

A. The following are industry abbreviations for plastic and rubber materials:

1. NP: Nylon.
2. PE: Polyethylene.
3. PP: Polypropylene.
4. PTFE: Polytetrafluoroethylene.
5. PVC: Polyvinyl chloride.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:

1. Potable-Water Service: 150 psig.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Water-meter bars.
2. Backflow preventers.
3. Pipe and fittings.
4. Valves.
5. Yard hydrants.

B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.

C. Shop Drawings: For cast-in-place concrete structures. Include frames and covers and drains.

D. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Contract Closeout."

E. Test Reports: As specified in "Field Quality Control" Article in Part 3.

F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-

service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.

C. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.

D. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."

E. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.

3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verifies existing utility locations. Contact utility-locating service for area where Project is located.

B. Verify that water-service piping may be installed to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.09 SEQUENCING AND SCHEDULING

A. Coordinate connection to water main with utility company.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Drilling-Machine, Sleeves, and Corporation Stops:
    a. Ford Meter Box Co., Inc.
    b. Grinnell Corp, Mueller Company - Water Products Div.
    c. Lee Brass Co.
2. Bronze Corporation Stops and Valves:
    a. Ford Meter Box Co., Inc.
    b. Grinnell Corp.; Mueller Co.; Water Products Div.
    c. Watts Industries, Inc., James Jones Co.
3. Tapping Sleeves and Valves:
    a. American Cast Iron Pipe Co.; Waterous Co.
    b. East Jordan Iron Works, Inc.
    c. Grinnell Corp.; Mueller Co.; Water Products Div.
4. Gate Valves:
    a. American Cast Iron Pipe Co.; American Flow Control Div.
    b. Grinnell Corp.; Grinnell Supply Sales Co.
    c. Grinnell Corp.; Mueller Co.; Water Products Div.
    d. Hammond Valve Corp.
5. Relief Valves:
    a. Bermad, Inc.
    b. GA Industries, Inc.
    c. MULTIPLEX Manufacturing Co.
6. Water-Regulating Valves:
    a. Ames Co., Inc.
    c. Cla-Val Co.
    c. Watts Industries, Inc.; Water Products Div.
7. Backflow Preventers:
    a. Ames Co., Inc.
    b. Cla-Val Co.
    c. Watts Industries, Inc - Water Products Div.
8. Keyed Couplings:

a. McWane, Inc., Tyler Pipe, Gustin-Bacon Div.

b. Victaulic Co. of America.

c. DryLink

9. Protective Enclosures:

a. Hot Box.

b. HydroCowl, Inc.

10. Drains:

a. Josam Co.

b. Watts Industries, Inc.; Ancon Drain Div.

c. Zurn Industries, Inc.; Hydromechanics Div.

11. Sanitary-Type Yard Hydrants:

a. Murdock, Inc.

12. Post-Type Yard Hydrants:

a. Josam Co.

b. Watts Industries, Inc.; Ancon Drain Div.

c. Zurn Industries, Inc.; Hydromechanics Div.

2.02 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Tube: ASTM B 88, seamless water tube, annealed temper.

C. PVC Plastic Pipe: PVC, AWWA C900, Class 200, with bell end with gasket and spigot end.

2.03 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.

D. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.

E. PVC Plastic Fittings: UL 1285 and AWWA C900, Class 200. With bell and spigot or double bell ends. Include elastomeric gasket in each bell.

F. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

2.04 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.

C. Ductile-Iron Piping: The following materials apply:

1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.

2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.

3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated and full-face or ring type, unless otherwise indicated.

b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Brazing Filler Metals: AWS A5.8, BCuP Series.

E. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.

F. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.

G. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

H. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

I. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.05 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.

1. Description: Combination of copper alloy and ferrous threaded, solder, plain, and weld-neck end types and matching piping system materials.

2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.

3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.

4. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.

5. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

2.06 VALVES

A. Non-rising Stem, Metal-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze, double-disc gate, bronze gate rings, bronze stem, and stem nut. Include 200-psig minimum working-pressure design; interior coating according to AWWA C550; and mechanical-joint ends, unless otherwise indicated.

B. Non-rising Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient

seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.

C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.

E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches in diameter.

1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb-stop head.

F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.

2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service-piping material.

3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops and outlet matching service piping.

G. Ball Valves AWWA C507, Class 250. Include interior coating according to AWWA C550.

H. Butterfly Valves: UL 1091, with 175-psig working-pressure rating.

I. Check Valves: UL 312, with swing clapper and 175-psig working-pressure rating.

2.07 SPECIALTY VALVES

A. Air-Release Valve AWWA C512, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.

2.08 WATER METERS

A. Water meters will be furnished by utility company.

2.09 WATER-METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter. Include lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC plastic, clay or other pipe.

2.10 BACKFLOW PREVENTERS

A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Working Pressure: 150 psig minimum, unless otherwise indicated.

C. 2-Inch NPS and Smaller: Bronze body with threaded ends.

D. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.

E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

F. Interior Components: Corrosion-resistant materials.

G. Strainer on inlet if strainer is indicated.

H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

I. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 12 psig maximum through middle third of flow range.

J. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.11 YARD HYDRANTS

A. Yard Hydrants, Post Type: Non-freeze. Include 3/4-inch NPS inlet, integral or field-installed vacuum breaker with outlet complying with ASME B1.20.7, 3/4-11.5NH threads for garden hose. Include bronze casing, cast-iron or cast-aluminum-casing guard, tapped drain port in valve housing, and key operation. Include body length required for installing inlet valve below frost line. Furnish 2 keys for each hydrant.

2.12 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.

1. Cement: ASTM C 150, Type I.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

2.13 IDENTIFICATION

A. Refer to Division 31 Section "Earthwork" for underground warning tape materials.

B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches, with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Refer to Division 31 Section "Earthwork" for excavation, trenching, and backfilling.

B. Refer to Division 32 Section "Hot-Mix Asphalt Paving" for cutting and patching of existing paving.

C. Refer to Division 32 Section "Portland Cement Concrete Paving" for cutting and patching of paving.

3.02 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:

B. Potable Water-Service Piping: Use the following:

1. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and soldered joints.
2. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joint
3. 3/4- to 2-Inch NPS: PE plastic pipe; molded PE plastic fittings; and heat-fusion joints.
4. Option for 2-1/2- to 3-1/2-Inch NPS: 3- or 4-inch NPS; ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
5. 2-1/2- to 3-1/2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joints.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, 3-Inch NPS and Larger: AWWA, gate valves, non-rising stem, with valve box.
2. Pit and Aboveground Installation Valves, 3-Inch NPS and Larger: AWWA, OS&Y gate valves.
3. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS and Larger: UL/FM, OS&Y gate valves.
4. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: MSS, non-rising stem gate valves.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

B. Install piping at indicated slope.

C. Install components with pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Install dielectric fittings to connect piping of dissimilar metals.

3.05 SERVICE ENTRANCE PIPING

A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping systems when those systems are installed.

B. Sleeves and mechanical sleeve seals are specified in Section 22 05 17- Sleeves and Sleeve seals for plumbing piping

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.06 PIPING INSTALLATION

A. Water-Main Connection: Arrange for tap in water main, of size and in location indicated, from water utility.

B. Make connections larger than 2-inch NPS with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to manufacturers written instructions.

2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.

4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

C. Make connections, 2-inch NPS and smaller, with drilling machine according to the following:

1. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's written instructions.

D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.

2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

F. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.07 ANCHORAGE INSTALLATION

A. Install anchorage for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorage for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.

2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.08 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger

underground installation. Use threaded- and flanged-end valves for installation in pits. Use non-rising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.09 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meter: Install displacement-type water meters, 2-inch NPS and smaller, in meter boxes with shutoff valve on water-meter inlet. Include valve on water-meter outlet and valved bypass around meter, unless prohibited by authorities having jurisdiction.

C. Water Meter: Install compound-type water meters, 3-inch NPS and larger, in meter pits. Include shutoff valves on water-meter inlet and outlet and valved bypass around meter. Support meters, valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.11 YARD HYDRANT INSTALLATION

A. Install post-type yard hydrants in pavement or with concrete anchor, and provide for drainage into dry well as indicated.

3.12 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

C. Prepare reports for testing activities.

3.14 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge new water distribution piping and parts of existing piping that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

    c. After allowed standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION

SECTION 33 30 00 – SANITARY SEWERAGE

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

B. Work on public sewer main shall be done in accordance with Hamilton County WWTA regulation and standards.

1.02 SUMMARY

A. This Section includes sanitary sewerage outside the building.

B. Related Sections include the following:
   1. Division 22 Section "Plumbing piping".
   2. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Backwater valves and clean-outs.
   2. Piping Specifications

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Pre-cast concrete manholes, including frames and covers.
   2. Cast-in-place concrete manholes and other structures, including frames and covers.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precuts concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without owner's written permission.

PART II- PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Gray-Iron Backwater Valves and Clean-outs:
      a. Josam Co.
      c. Smith: Jay R. Smith Mfg. Co.
      f. Zurn Industries, Inc. - Hydromechanics Div.
   2. PVC Backwater Valves and Clean-outs:
      b. IPS Corp.
      c. NDS, Inc.
      d. Plastic Oddities, Inc.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray iron, for gasketed joints.
   1. Gaskets: ASTM C 564, rubber, compression type, and thickness to match class

B. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
   1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   2. Gaskets: AWWA C111, rubber.

C. PVC Sewer Pipe and Fittings: According to the following:
   1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
   2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.

D. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794, open and closed profile, bell and spigot for gasketed joints.
   1. Gaskets: ASTM F 477, elastomeric seals.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for non-pressure joints.
   1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
   2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
   5. Bands: Stainless steel at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for non-pressure joints.
   1. Material for Concrete Pipe: ASTM C 443, rubber.
   2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.06 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.

D. Ballast and Pipe Supports: Portland cement design mix, 3000-psi minimum, with 0.58 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.07 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
   1. Concrete Manholes: On exterior surface.

2.08 BACKWATER VALVES

2.09 CLEANOUTS

A. Gray-Iron Clean-outs: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, and gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
   1. Medium Duty: In earth, grass, or paved foot-traffic areas.
   2. Heavy Duty: In vehicle-traffic service areas.
   3. Extra-Heavy Duty: In roads.
   4. Sewer PipeFitting and Riser to Clean out: ASTM A 74, Service class, cast-iron soil pipe and fittings.

PART III - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.03 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
2. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
3. NPS 4 to NPS 8: Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.

3.04 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for non-pressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
   2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.05 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
   2. Install piping with 36-inch minimum cover.

F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Install ductile-iron, force-main piping according to AWWA C600.

3.06 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

C. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

D. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
   2. Join profile sewer pipefittings with gaskets according to ASTM D 2321 and manufacturers written instructions.
   3. Install according to ASTM D 2321.

E. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

G. Install with top surfaces of components, except piping, flush with finished surface.

3.08 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.09 BACKWATER VALVE INSTALLATION

3.10 CLEANOUT INSTALLATION

A. Install clean outs and riser extension from sewer pipe to clean out at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for clean outs and cast-iron soil pipe for riser extensions to clean outs. Install piping so clean outs open in direction of flow in sewer pipe.

B. Set clean out frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set clean out frames and covers in concrete pavement with tops flush with pavement surface.

3.12 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:
   1. Remove structure and close open ends of remaining piping.
      Backfill to grade according to Division 31 Section "Earthwork."

3.13 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate reports for each test.
   5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
      a. Sanitary Sewerage: Perform hydrostatic test.
         1) Allowable leakage is a maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
         2) Close openings in system and fill with water.
         3) Purge air and refill with water.
         4) Disconnect water supply.
         5) Test and inspect joints for leaks.

6) Option: Test ductile-iron piping according to AWWA C600, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.

6. Manholes: Perform hydraulic test according to ASTM C 969.
7. Leaks and loss in test pressure constitute defects that must be repaired.
8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 33 40 00 – STORM DRAINAGE

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

B. Adhere to Hamilton County Water Quality Department standards for as-built survey.

1.02 SUMMARY

A. This Section includes storm drainage outside the building.

B. Related Sections include the following:
   1. Division 33 Section "Foundation Drainage Systems" for foundation drains connecting to storm drainage.
   2. Division 33 Section "Cast-in-Place Concrete" for concrete structures.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE or HDPE: Polyethylene plastic, or High Density Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

E. CMP: Corrugated Metal Pipe

F. RCP: Reinforced Concrete Pipe

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Precast concrete manholes and other structures, including frames, covers, and grates.
   2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Asbuilt Survey: As-Built Drawings shall at a minimum comply with the following items: 1.0 A registered professional engineer and surveyor will certify that the information furnished is a true and complete representation of the improvements that were constructed by the developer.

2.0 The registered professional engineer shall certify that the information reflects the original design or is an approved substitute for the original design by completing the As-Built Detention Facility Engineer's Certification Form (Attached).

3.0 The As-Built drawings shall be furnished in electronic format (both an AutoCAD R13 or greater and .pdf file) and shall be the true and accurate location and elevation of the structures shown, with a positional tolerance of 0.07 feet horizontal and 0.14 feet vertical.

4.0 English units and NAD 83 State Plane co-ordinates shall be used. ASCII format may be used if the table is included in the drawing.

5.0 All drainage structures and manholes shall be located by the center of the structure or the manhole cover when fully seated.

6.0 Drainage features (including drainage manholes) shall at a minimum include the following:

1. Drainage Structure Label (ex: oil skimmer, water quality unit type/model, etc.);

2. Northing, Easting, and Rim Elevation

3. Invert Elevations

4. Size, Material, and Direction of flow for each pipe entering and leaving the drainage feature

5. Detail drawings of water quality features including, but not limited, to profiles, contours, and elevations (ex: bio-retention areas, swales, grass filter strips, etc.).

7.0 following: Detention systems shall at a minimum include the

1. Northing, Easting, and Elevation of the limits, corners, and bottom of detention systems

2. Invert Elevation, Size, Material, and Direction of flow for each pipe entering and leaving the detention Detail drawing for all outlet control and emergency o verflow structures; Detail drawing for any other detention systems as necessary (ex: underground detention system); Required and provided detention storage volume.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without ownert's written permission.

PART II - PRODUCTS

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

A. Corrugated PE Pipe and Fittings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294.
   1. Soiltight Couplings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

B. PVC Sewer Pipe and Fittings: According to the following:
   1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
   2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.

C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.
   1. Gaskets: ASTM C 443, rubber.

D. HDPE Sewer Pipe and Fittings: According to the following:
   1. HDPE Sewer Pipe and Fittings, NPS 4 through NPS 60: ASTM F 2648, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
      b. Fittings: ASTM F 2306

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
   1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
   2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
   3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.

1. Material for Concrete Pipe: ASTM C 443, rubber.
2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

C. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.05 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.06 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
   1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
   3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
   4. Gaskets: ASTM C 443, rubber.
   5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
   6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
   7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. PVC Surface Inlets: PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.

2.08 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
   1. Include channels and benches in manholes.
      a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
         1) Invert Slope: 1 percent through manhole.
      b. Benches: Concrete, sloped to drain into channel.
         1) Slope: 4 percent.
   2. Include channels in catch basins.
      a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
         1) Invert Slope: 1 percent through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART III - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:
   1. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
   2. NPS 8 to NPS 15: Corrugated HDPE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10. Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15.
   3. NPS 8 to NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3.03 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for nonpressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
   2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.04 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.05 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.

C. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

D. Install with top surfaces of components, except piping, flush with finished surface.

E. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

F. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
   2. Install according to ASTM D 2321.

K Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
   1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

H. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

I. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.06 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

C. Install precast concrete manhole sections with gaskets according to ASTM C 891.

D. Construct cast-in-place manholes as indicated.

E. Install fiberglass manholes according to manufacturer's written instructions.

3.07 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

C. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines.

3.08 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.09 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

E. Fasten grates to channel sections if indicated.

F. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

3.11 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use extra-heavy-duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.12 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

B. Fasten grates to drains if indicated.

C. Set drain frames and covers with tops flush with pavement surface.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:
1. Remove structure and close open ends of remaining piping.
2. Backfill to grade according to Division 31 Section "Earthwork."

3.14 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and when work stops.
   3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

D. Contractor shall engage license surveyor to prepare as-built survey of all new stormdrainage pipes grater than 8-inch and all stormwater management practices within the project boundary. Plan shall besubmitted to the engineer for review at least 3 weeks prior to required project close out.

END OF SECTION