# CITY OF SOUTH DAYTONA, FLORIDA

LIFT STATION #5 REPLACEMENT

BID NO. 24-B-003



May 2025

Prepared by:



This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

#### ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by









AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE A Practice Division of the NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

## \*\*\*\*<u>AS AMENDED BY THE CITY OF SOUTH DAYTONA</u>\*\*\*\*

Copyright © 2007 National Society of Professional Engineers 1420 King Street, Alexandria, VA 22314-2794 (703) 684-2882 www.nspe.org

> American Council of Engineering Companies 1015 15th Street N.W., Washington, DC 20005 (202) 347-7474 www.acec.org

American Society of Civil Engineers 1801 Alexander Bell Drive, Reston, VA 20191-4400 (800) 548-2723 www.asce.org

Associated General Contractors of America 2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308 (703) 548-3118 www.agc.org

The copyright for this EJCDC document is owned jointly by the four EJCDC sponsoring organizations and held in trust for their benefit by NSPE.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

### TABLE OF CONTENTS

Artic	ele 1 – 1	Definitions and Terminology	7
	1.01	Defined Terms	7
	1.02	Terminology	. 13
Artic	2 - 1	Preliminary Matters	. 14
	2.01	Delivery of Bonds and Evidence of Insurance	. 14
	2.02	Copies of Documents	. 14
	2.03	Commencement of Contract Times; Notice to Proceed	. 14
	2.04	Starting the Work	. 14
	2.05	Before Starting Construction	. 14
	2.06	Preconstruction Conference; Designation of Authorized Representatives	. 15
	2.07	Initial Acceptance of Schedules	. 15
Artic	e = 3 - 6	Contract Documents: Intent, Amending, Reuse	. 16
	3.01	Intent	. 16
	3.02	Reference Standards	. 16
	3.03	Reporting and Resolving Discrepancies	. 17
	3.04	Amending and Supplementing Contract Documents	. 18
	3.05	Reuse of Documents	. 18
	3.06	Electronic Data	. 18
Artic		Availability of Lands: Subsurface and Physical Conditions: Hazardous Environmental	
AILC	C	anditions: Reference Points	10
	4.01	Availability of Lands	10
	4.01	Subsurface and Physical Conditions	10
	4.02	Differing Subsurface or Physical Conditions	20
	4.03	Underground Engliting	20
	4.04	Deference Deinte	21
	4.05	Hazardous Environmental Condition at Site	22
	<b></b> 00	Trazardous Environmental Condition at Site	23
Artic	ele 5 – 1	Bonds and Insurance	25
	5.01	Performance, Payment, and Other Bonds	25
	5.02	Licensed Sureties and Insurers	
	5.03	Certificates of Insurance	
	5.04	Contractor's Insurance	27
	5.05	Owner's Liability Insurance	
	5.06	Property Insurance	28
	5.07	Waiver of Rights	. 30
		5	

5.09	Acceptance of Bonds and Insurance; Option to Replace	
5.10	Partial Utilization, Acknowledgment of Property Insurer	
Article 6 –	Contractor's Responsibilities	
6.01	Supervision and Superintendence	
6.02	Labor; Working Hours	
6.03	Services, Materials, and Equipment	
6.04	Progress Schedule	
6.05	Substitutes and "Or-Equals"	
6.06	Concerning Subcontractors, Suppliers, and Others	
6.07	Patent Fees and Royalties	
6.08	Permits	
6.09	Laws and Regulations	
6.10	Taxes	
6.11	Use of Site and Other Areas	
6.12	Record Documents	
6.13	Safety and Protection	
6.14	Safety Representative	
6.15	Hazard Communication Programs	
6.16	Emergencies	
6.17	Shop Drawings and Samples	
6.18	Continuing the Work	
6.19	Contractor's General Warranty and Guarantee	
6.20	Indemnification	
6.21	Delegation of Professional Design Services	
Article 7 –	Other Work at the Site	
7.01	Related Work at Site	
7.02	Coordination	
7.03	Legal Relationships	
Article 8 –	Owner's Responsibilities	
8.01	Communications to Contractor	
8.02	Replacement of Engineer	
8.03	Furnish Data	
8.04	Pay When Due	
8.05	Lands and Easements: Reports and Tests	
8.06	Insurance	50
8.07	Change Orders	50
8.08	Inspections Tests and Approvals	50
8.00	Limitations on Owner's Responsibilities	50
8 10	Undisclosed Hazardous Environmental Condition	50
8 11	Evidence of Financial Arrangements	50
8 17	Compliance with Safety Program	
0.12	compriance with barety riogram	

Article 9 – I	Engineer's Status During Construction	
9.01	Owner's Representative	
9.02	Visits to Site	
9.03	Project Representative	
9.04	Authorized Variations in Work	
9.05	Rejecting Defective Work	
9.06	Shop Drawings, Change Orders and Payments	
9.07	Determinations for Unit Price Work	
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work	
9.09	Compliance with Safety Program	
Article 10 -	- Changes in the Work; Claims	
10.01	Authorized Changes in the Work	
10.02	Unauthorized Changes in the Work	
10.03	Execution of Change Orders	
10.04	· Notification to Surety	
10.05	Claims	55
Article 11 -	- Cost of the Work: Allowances: Unit Price Work	
11.01	Cost of the Work	
11.02	Allowances	
11.03	Unit Price Work	
Article 12 –	- Change of Contract Price; Change of Contract Times	
12.01	Change of Contract Price	
12.02	Change of Contract Times	61
12.03	Delays	
Article 13 -	- Tests and Inspections; Correction, Removal or Acceptance of Defective Work	
13.01	Notice of Defects	
13.02	Access to Work	
13.03	Tests and Inspections	
13.04	Uncovering Work	
13.05	Owner May Stop the Work	
13.06	Correction or Removal of Defective Work	
13.07	Correction Period	
13.08	Acceptance of Defective Work	
13.09	Owner May Correct Defective Work	
Article 14 -	- Payments to Contractor and Completion	
14.01	Schedule of Values	
14.02	Progress Payments	69
14.03	Contractor's Warranty of Title	
14.04	Substantial Completion	
14.05	Partial Utilization	
14.06	Final Inspection	
	1	

14.07 Final Payment	74
14.08 Final Completion Delayed	75
14.09 Waiver of Claims	75
rticle 15 Sugmention of Work and Termination	76
rucie 15 – Suspension of work and Termination	/0
15.01 Owner May Suspend Work	/6
15.02 Owner May Terminate for Cause	76
15.03 Owner May Terminate For Convenience	77
15.04 Contractor May Stop Work or Terminate	78
rticle 16 Dispute Desclution	70
Inticle 16 – Dispute Resolution	/8
16.01 Methods and Procedures	78
rticle 17 – Miscellaneous	79
17.01 Giving Notice	79
17.02 Computation of Times	79
17.03 Cumulative Remedies	79
17.04 Survival of Obligations	79
17.05 Controlling Law	79
17.06 Headings	80
17.07	
orms	

#### **ARTICLE 1 – DEFINITIONS AND TERMINOLOGY**

#### 1.01 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
- 1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
- 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
- 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
- 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
- 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
- 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
- 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
- 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
- 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
- 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both. A demand for money or services by a third party is not a Claim.

- 11. *Compensable Delay* A delay without the fault or negligence of the CONTRACTOR limited to OWNER-caused changes in the Work, suspensions of the Work, or termination for convenience by the OWNER.
- 12. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
- 13. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
- 14. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
- 15. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
- 16. Contractor—The individual or entity with whom Owner has entered into the Agreement.
- 17. *Correction Period* The time during which the CONTRACTOR must correct defective Work or remove defective Work from the site and replace it with non-defective Work, all at no cost to the OWNER, pursuant to paragraph 13.07 of the General Conditions, as supplemented.
- 18. Cost of the Work—See Paragraph 11.01 for definition.
- 19. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
- 20. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
- 21. *Engineer*—The individual or entity named as such in the Agreement.
- 22. *Excusable Delay* A delay without the fault or negligence of the CONTRACTOR, the OWNER, or any other contractor caused by events or circumstances limited to hurricanes, tornadoes, or new sink holes. Labor disputes and shall give rise only to Inexcusable Delays.

- 23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
- 24. *Final Completion* The date upon which final payment is due to be paid by OWNER to CONTRACTOR.
- 25. *Float or Slack Time* The time available in the progress schedule during which an unexpected activity can be completed without delaying the Substantial Completion of the Work.
- 26. General Requirements—Sections of Division 1 of the Specifications.
- 27. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
- 28. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
- 29. *Inexcusable Delay* Any delay caused either (i) by events or circumstances within the control of the CONTRACTOR, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the CONTRACTOR, (ii) by weather conditions (other than hurricanes and tornadoes) or (iii) labor disputes.
- 30. *Initiation of Operation* The date when the OWNER actually begins to use the entire Work for the purposes for which it was planned, designed and built, thus commences the Correction Period. The OWNER shall not be deemed to have accepted the Work until Initiation of Operation.
- 31. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 32. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
- 33. *Modification* (a) A written amendment of the Contract Documents signed by both parties,(b) a Change Order, or (c) a Field Order. A modification may be issued after the Effective Date of the Agreement.
- 34. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

- 35. *Non-prejudicial Delay* Any delay impacting a portion of the Work within the available total Float or Slack Time, as that term is used in Section 01310: Progress Schedules, and not necessarily preventing completion of the Work within the Contract Time.
- 36. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
- 37. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
- 38. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
- 39. *PCBs*—Polychlorinated biphenyls.
- 40. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
- 41. *Prejudicial Delay* Any Excusable or Compensable Delay impacting the Work and exceeding the total Float Time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.
- 42. *Preoperational Testing (Check-Out-Testing)* All field inspections, installation checks, water tests, performance tests, and necessary corrections required of the CONTRACTOR as a condition or conditions to achieving Substantial Completion to demonstrate to the OWNER and ENGINEER that individual components of the Work have been properly constructed and operate in accordance with the Contract Documents for their intended purposes.
- 43. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
- 44. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
- 45. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
- 46. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

- 47. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
- 48. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
- 49. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
- 50. *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.
- 51. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
- 52. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
- 53. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
- 54. *Start-Up Testing (Demonstration Testing)* A predefined trial period required as a condition to Initiation of Operation during which CONTRACTOR is to operate the entire Work (or any part thereof agreed to by the OWNER) under actual and simulated operating conditions for the purpose (i) of making such minor adjustments and changes to the Work as may be necessary for the Work to comply with the Contact Documents and (ii) of complying with the final test requirements in the Contract Documents.
- 55. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
- 56. *Substantial Completion* The Work (or a specified part thereof) has progressed to the point where, in the opinion of the OWNER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents and that all conditions precedent to Substantial Completion have been met in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

- 57. Successful Bidder—The Bidder submitting a responsive Bid to whom Owner makes an award.
- 58. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
- 59. *Supplier*—A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
- 60. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
- 61. Unit Price Work—Work to be paid for on the basis of unit prices.
- 62. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
- 63. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

#### 1.02 Terminology

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives:
- 1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or

determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

#### C. Day:

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

#### D. Defective:

- 1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. Does not conform to the Contract Documents; or
  - b. Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. Has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

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

- 1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
- 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
- 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
- 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

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

#### **ARTICLE 2 – PRELIMINARY MATTERS**

#### 2.01 Delivery of Bonds and Evidence of Insurance

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

#### 2.02 Copies of Documents

- A. After the Agreement has been executed, the Engineer will furnish the CONTRACTOR five (5) complete sets of Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.
- 2.03 Commencement of Contract Times; Notice to Proceed
  - A. A "Notice to Proceed" may be given to the Contractor at any time after the Effective date of the Agreement. The Contract Time will commence to run on the day indicated in the Notice to Proceed. In no event will the Contract Time commence to run later than the sixtieth (60th) day after the Effective Date of the Agreement.
- 2.04 Starting the Work
  - A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.
- 2.05 Before Starting Construction
  - A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

- 1. A preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
- 2. A preliminary Schedule of Submittals; and
- 3. A preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.
- 4. The submittals required in subparagraphs 1, 2 and 3 shall be as specified in Section 01310, 01340 and 01370, respectively.

#### 2.06 Preconstruction Conference; Designation of Authorized Representatives

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

#### 2.07 Initial Acceptance of Schedules

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
- 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefore.
- 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

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

#### ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

#### 3.01 Intent

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.
- D. When measurements are affected by conditions already established or where items are to be fitted into construction conditions, it shall be the CONTRACTOR's responsibility to verify all such dimensions at the site and the actual job dimensions shall take precedence over scale and figure dimensions on the Drawings.
- E. The CONTRACTOR shall carefully study and compare all Drawings, Specifications and other instructions; shall test all figures on the Drawings before laying out the Work; shall notify the ENGINEER of all errors, inconsistencies, or omissions which he may discover; and obtain specific instructions before proceeding with the Work. The CONTRACTOR shall not take advantage of any apparent error or omissions which may be found in the Drawings or Specifications, and the ENGINEER shall be entitled to make such corrections therein and interpretations thereof as may be deemed necessary for the fulfillment of their intent. The CONTRACTOR shall be responsible for all errors in construction which could have been avoided by such examination and notification and shall correct, at its own expense, all Work improperly constructed through failure to notify the ENGINEER and request specific instructions.
- 3.02 Reference Standards
  - A. Standards, Specifications, Codes, Laws, and Regulations
- 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the

Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

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

#### 3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
- 1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
- 2. Contractor's Review of Contract Documents During Performance of Work: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
- 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

#### B. Resolving Discrepancies:

- 1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
  - a. The provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

- b. The provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).
- 3.04 Amending and Supplementing Contract Documents
  - A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
  - B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
- 1. A Field Order;
- 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
- 3. Engineer's written interpretation or clarification.
- 3.05 Reuse of Documents
  - A. Contractor and any Subcontractor or Supplier shall not:
- 1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
- 2. Reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
  - B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

#### 3.06 Electronic Data

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

- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

#### 4.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.
- 4.02 Subsurface and Physical Conditions
  - A. *Reports and Drawings:* The Supplementary Conditions identify:
- 1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

- B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
- 1. The completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.
- 4.03 Differing Subsurface or Physical Conditions
  - A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
- 1. Is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. Is of such a nature as to require a change in the Contract Documents; or
- 3. Differs materially from that shown or indicated in the Contract Documents; or
- 4. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

Then Contractor shall, within three (3) days after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

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

#### C. Possible Price and Times Adjustments:

- 1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. Such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
  - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
- 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
  - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
  - b. The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
- 3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefore as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- 4.04 Underground Facilities
  - A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
- 1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

- 2. The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
  - a. Reviewing and checking all such information and data;
  - b. Locating all Underground Facilities shown or indicated in the Contract Documents;
  - c. Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
  - d. The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
  - B. Not Shown or Indicated:
- 1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- 2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefore as provided in Paragraph 10.05.

#### 4.05 Reference Points

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

responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

- 4.06 Hazardous Environmental Condition at Site
  - A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
  - B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
- 1. The completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
- 2. Other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
- 3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
  - C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
  - D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby; and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefore as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefore as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.
- J. No claim of the CONTRACTOR under paragraphs 4.02, 4.04 and 4.06 shall be allowed unless, (1) the CONTRACTOR has given the notice required in sub-paragraph 4.06D, and (2) within thirty (30) days (but before final payment) after the CONTRACTOR has given written notice, the CONTRACTOR submits to the OWNER a detailed claim setting forth the CONTRACTOR's right to an increase in the Contract Price or extension of the Contract Time as provided in Articles 11 and 12 of the Standard General Conditions.

#### **ARTICLE 5 – BONDS AND INSURANCE**

- 5.01 Performance, Payment, and Other Bonds
  - A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
  - B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- 1. The following requirements shall be met by all surety companies furnishing bid, performance, payment or other type of Bonds:
  - a. The Surety shall be rated as "A" or better as to General Policyholders Rating and Class X or better as to Financial Category by Best's Key Rating Guide, published by Alfred M. Best Company, Inc., 75 Fulton Street, New York, New York, 10038. All Surety Companies are subject to approval and may be rejected by the OWNER without cause.
  - 2. Limitations: Bonding limits or bonding capacity refers to the limit or amount of Bond acceptable on any one (1) risk.

- a. The bonding limit of the Surety shall not exceed ten percent (10%) of the policyholder surplus (capital and surplus) as listed by the aforementioned Best's Key Rating Guide, on any one risk (penalty or amount of any one bond).
- 3. Requirements:
  - a. Policyholders surplus is required to be five (5) times the amount of any one bond.
  - b. The Agent countersigning the bond shall be resident in the County where the Project is located and/or other counties that are acceptable to the OWNER.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.
- D. Contractor shall pay Owner all losses, damages, expenses, costs, and attorney's fees, including but not limited to any appellate proceedings, which the Owner sustains because of default by the Contractor under the contract.
- 5.02 Licensed Sureties and Insurers
  - A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverage so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.
- 5.03 Certificates of Insurance
  - A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
  - B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.
- 5.04 Contractor's Insurance
  - A. (In the case of a conflict between paragraph 5.04A of Section 00700 and one or more of the provisions of Section 00800A, the provisions of 00800A shall prevail.) Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
- 1. Claims under workers' compensation, disability benefits, and other similar employee benefit acts;
- 2. Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
- 3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
- 4. Claims for damages insured by reasonably available personal injury liability coverage which are sustained:
  - a. By any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
  - b. By any other person for any other reason;
- 5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from; and
- 6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
  - B. The policies of insurance required by this Paragraph 5.04 shall:

- 1. With respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
- 2. Include at least the specific coverage and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
- 3. Include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
- 4. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
- 5. Remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
- 6. Include completed operations coverage:
  - a. Such insurance shall remain in effect for two years after final payment.
  - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.
- 5.05 Owner's Liability Insurance
  - A. This paragraph has been deleted in its entirety.
- 5.06 Property Insurance
  - A. CONTRACTOR shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations). This insurance shall:

- 1. Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
- 2. Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils; fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, hurricanes, flood, tornadoes, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.
- 3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
- 4. Cover materials and equipment in transit for incorporation in the Work or stored at the site or at another location provided that such materials and equipment are to be included in an Application for Payment.
- 5. Allow for partial utilization of the Work by Owner;
- 6. Include testing and startup; and
- 7. Be maintained in effect until the later of the two; Initiation of Operation or Final Completion, unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.
- 8. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph 5.06 shall comply with the requirements of Section 00800A.
  - B. Delete this paragraph in its entirety.
  - C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and

Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

- D. Delete this paragraph in its entirety.
- E. Delete this paragraph in its entirety.

#### 5.07 Waiver of Rights

A. Delete this paragraph in its entirety.

#### 5.08 Receipt and Application of Insurance Proceeds

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

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

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

party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

- 5.10 Partial Utilization, Acknowledgment of Property Insurer
  - A. The CONTRACTOR shall maintain all insurance as required in Paragraph 5.06A for the Work and allow OWNER to occupy or use a portion or portions of the Work prior to Substantial Completion. CONTRACTOR shall make appropriate provisions with insurers providing the proper endorsements, if required. The property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

#### **ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES**

- 6.01 Supervision and Superintendence
  - A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
  - B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.
  - C. The Owner reserves the right to review and approve the resident superintendent.

#### 6.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.
- C. Maintenance work may be performed during hours other than regular working hours. Regular working hours are defined between 8 AM and 5 PM but not more than eight (8) hours per day at 5 days per week. Requests to Work during hours other that regular

working hours, hereinafter referred to as irregular hours, must be submitted to the OWNER at least seventy-two (72) hours in advance of the period proposed for such irregular working hours and shall set forth the proposed schedule for such hours to give the OWNER ample time to arrange for its personnel to be at the site of the Work.

- D. The OWNER will pay for charges of ENGINEER and construction observation/inspection performed during regular working hours. The CONTRACTOR shall pay for all additional engineering and construction observations charges required during irregular hours which may be authorized under the provisions of paragraph 6.02.C. The rate paid to the OWNER by the CONTRACTOR for additional engineering and construction observation changes shall be in accordance with the existing Contract between the OWNER and ENGINEER. The OWNER shall have the option to retain this amount from the compensation otherwise owed to the contractor.
- E. The CONTRACTOR shall also pay for the costs of all additional engineering charges and construction observation required during the correction of defective Work. Such additional costs incurred during irregular working hours and during the correction of defective Work, shall be a subsidiary obligation of the CONTRACTOR and no extra payment shall be made by the OWNER on account of such Work. The OWNER shall have the option to retain this amount from the compensation otherwise owed to the contractor.
- 6.03 Services, Materials, and Equipment
  - A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
  - B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
  - C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 Progress Schedule

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

- 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
- 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

#### 6.05 Substitutes and "Or-Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
- 1. "*Or-Equal*" *Items:* If the Engineer believes an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by the Engineer as an "or-equal" item only if all of the following apply:
  - a. In the exercise of reasonable judgment Engineer determines that:
    - 1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
    - 2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
    - 3) It has a proven record of performance and availability of responsive service.
  - b. Contractor certifies that, if approved and incorporated into the Work:
    - 1) There will be no increase in cost to the Owner or increase in Contract Times; and
    - 2) It will conform substantially to the detailed requirements of the item named in the Contract Documents.
  - c. Owner agrees and gives written approval of such agreement.
- 2. Substitute Items:

- a. If an item of material or equipment proposed by Contractor does not qualify as an "orequal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow the Engineer and Owner to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. Requests for review of proposed substitute items of material or equipment will not be accepted by the Engineer and Owner from anyone other than Contractor.
- c. The requirements for review by the Engineer and Owner will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as the Engineer and Owner may decide is appropriate under the circumstances.
- d. Contractor shall make written application to the Engineer and Owner for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
  - 1) Shall certify that the proposed substitute item will:
    - a) Perform adequately the functions and achieve the results called for by the general design,
    - b) Be similar in substance to that specified, and
    - c) Be suited to the same use as that specified;
  - 2) Will state:
    - a) The extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
    - b) Whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
    - c) Whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
  - 3) Will identify:
    - a) All variations of the proposed substitute item from that specified, and
    - b) Available engineering, sales, maintenance, repair, and replacement services; and

- 4) Shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction to be approved by both the Engineer and Owner. Contractor shall submit sufficient information to allow both the Engineer and Owner to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by the Engineer and Owner will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer and Owner's Evaluation:* The Engineer and Owner will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. The Engineer and Owner may require Contractor to furnish additional data about the proposed substitute item. Both the Engineer and Owner must agree as to the acceptability of the proposed substitute item or it will not be classified as such. No "or equal" or substitute will be ordered, installed or utilized until the Engineer and Owner's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." The Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement*: Engineer will record the Engineer and Owner's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not the Engineer and Owner approve a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of the Engineer and Owner for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of the Engineer in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

#### 6.06 Concerning Subcontractors, Suppliers, and Others

A. The CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom OWNER may have reasonable objection and shall not be required to employ as a Subcontractor, Supplier or
any person or organization against whom the CONTRACTOR has reasonable objection. A Subcontractor, Supplier or other person or organization identified in the CONTRACTOR's Bid and not objected to in writing by OWNER prior to the execution of the Agreement will be deemed acceptable to OWNER. All other Subcontractors shall be deemed to have been accepted if the OWNER delivers no written objection thereto within forty-five (45) days after CONTRACTOR's written identification of such Subcontractors.

- B. However, if the OWNER has reasonable objection (as determined by the ENGINEER) to any Subcontractor identified in the Bid or subsequently, the CONTRACTOR shall submit an acceptable substitute without entitlement to any change in Contract Price. If the OWNER demands the substitution of a Subcontractor at any time without having reasonable objection to such Subcontractor, the CONTRACTOR shall comply and shall be entitled to change in Contract Price (by appropriate Change Order or Written Amendment) for the difference in cost occasioned by such substitution. After acceptance by the OWNER, the CONTRACTOR shall make no substitution without written approval of the OWNER, which may be granted or withheld at OWNER's sole discretion. No acceptance by the OWNER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of the OWNER to reject defective work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
- 1. Shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
- 2. Shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
  - D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
  - E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
  - F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.
- H. The CONTRACTOR will be required to perform the Work as a prime contractor. The CONTRACTOR shall not sublet, sell, transfer, assign or otherwise dispose of the Work under the Agreement or any portion thereof, or his right, title or interest therein, without written consent of the OWNER. The CONTRACTOR shall perform on the site and with his own organization work equivalent to not less than 50 percent of the total dollar value of the work to be performed under the Agreement except that work hereinafter designated as specialty work may be performed by Subcontractors and the cost of any such specialty work so performed by Subcontractors may be subtracted from the total Contract Price before computing the amount of work required to be performed by the CONTRACTOR with his own organization.

## 6.07 Patent Fees and Royalties

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any

invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

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

# 6.08 Permits

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.
- B. The OWNER, prior to the advertisement of the Project, has applied for or has secured permits and/or licenses for the Project as described in "Location, Scope and Special Requirements."

## 6.09 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or

time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.

- 6.10 *Taxes* 
  - A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
- 6.11 Use of Site and Other Areas
  - A. Limitation on Use of Site and Other Areas:
- 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
- 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
- 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
- 4. Use of OWNER's property by the CONTRACTOR for storage of materials and equipment will be negotiated.
- 5. Use of the OWNER's existing washrooms, lavatories, sanitary facilities or plumbing fixtures by the CONTRACTOR or any of its employees or Subcontractors will not be permitted.
  - B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials,

EJCDC C-700 Standard General Conditions of the Construction Contract Copyright © 2007 National Society of Professional Engineers for EJCDC. All rights reserved. rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.
- 6.12 Record Documents
  - A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.
- 6.13 Safety and Protection The CONTRACTOR's obligations under paragraph 6.13 of the Standard General Conditions shall continue after the date of Substantial Completion until the Initiation of Operation.
  - A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
- 1. All persons on the Site or who may be affected by the Work;
- 2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
- 3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
  - The Engineer is not responsible for the safety of any person on the jobsite other than the Engineer's own employees. The Contractor is responsible for construction means, methods, sequences, testing, techniques and procedures necessary for performing,

superintending or coordinating all portions of the work in accordance with the contract documents and any health or safety precautions required by the contract documents and/or any regulatory agencies. The Engineer has no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Engineer does not have the authority to stop the work of any construction contractor. The Owner agrees that the Contractor is solely responsible for jobsite safety, and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Owner agrees that the Engineer shall be entitled to indemnification from the Contractor for any loss incurred by the Engineer arising out of any claim brought by any person or personal injuries sustained on the jobsite and warrants that this intent shall be made evident in the Contractor's general liability insurance policy for personal injuries to any person sustained on the jobsite.

- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. The CONTRACTOR shall be completely responsible for any tanks, wet wells or similar structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. If there is any possibility of buoyancy of a structure, the CONTRACTOR shall take the necessary steps to prevent its buoyancy either by increasing the structures weight, by filling it with approved material or other acceptable methods. The proposed final structures have been designed against buoyancy; however, during various construction stages, methods employed by the CONTRACTOR and other conditions which may affect the buoyancy, the CONTRACTOR shall take the necessary precautions against buoyancy. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the CONTRACTOR's expense.

## 6.14 Safety Representative

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

# 6.15 Hazard Communication Programs

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

# 6.16 Emergencies

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

# 6.17 Shop Drawings and Samples

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
- 1. Shop Drawings:
  - a. Submit number of copies specified in the General Requirements.

- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
- 2. Samples:
  - a. Submit number of Samples specified in the Specifications.
  - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended, and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
  - B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
  - C. Submittal Procedures:
- 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
  - a. Reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. Determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. Determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each

Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

- D. Engineer's Review:
- 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
- 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
- 3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.
- 4. Shop Drawings and other submittal data shall be reviewed by the ENGINEER for each original submittal and first resubmittal; thereafter, the CONTRACTOR shall reimburse OWNER for services rendered by ENGINEER for review time of subsequent resubmittals.
  - E. Resubmittal Procedures:
- 1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
- 6.18 Continuing the Work
  - A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

## 6.19 Contractor's 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. All Work not completed in accordance with the contract documents shall constitute a breach of contract on the part of the Contractor. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee. The contractor's warranty and guarantee against defective work shall not have an expiration date.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
- 1. Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
- 2. Normal wear and tear under normal usage.
  - C. Contractor warrants, without expiration, that (1) the supplies to be provided to the City pursuant to this Agreement are fit and sufficient for the purpose intended; (2) the supplies are merchantable, of good quality, and free from defects, whether patent or latent, in material or workmanship, and (3) the supplies sold to the City pursuant to this Agreement conform to the standards required by this Contract. The Contractor further warrants that the Contractor has title to the supplies provided, in that the supplies are free and clear of all liens encumbrances, and other security interests. All warranties made in this Agreement, together with service warranties and guarantees, shall run to the City and its successors and assigns.
  - D. Additional Warranties For all Work constructed in accordance with the Contract Documents and accepted by the Owner, the Contractor further expressly warrants the Work and all supplies for a period of one (1) year. This shall cover 100% of all component failures due to defects in workmanship or repeated use. This is a minimum acceptable warranty. Warranty will be considered in bid award.
- 6.20 Indemnification
  - A. (In the event of a conflict between this paragraph and other provisions of the Contract Documents, this paragraph shall control.) To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use

resulting there from 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. The Contractor agrees not to bring any claim, suite, action or other legal proceeding against the engineer and its consultants that may arise out of or in connection with the Work or this agreement. The Engineer and its consultants are intended third-party beneficiaries of this covenant not to sue, and are entitled to enforce this covenant in law or in equity.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
- 1. The preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
- 2. Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.
- 6.21 Delegation of Professional Design Services
  - A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
  - B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
  - C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
  - D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance

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

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

# **ARTICLE 7 – OTHER WORK AT THE SITE**

# 7.01 Related Work at Site

- A. Owner may perform other work related to the Project at the Site with Owner's employees or through other direct contracts therefore, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
- 1. Written notice thereof will be given to Contractor prior to starting any such other work; and
- 2. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefore as provided in Paragraph 10.05.
  - B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors in said direct contracts between Owner and such utility owners and other contractors.
  - C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

## 7.02 Coordination

- A. The parties expressly acknowledge that Work may be done by other contractors.
- 1. The CONTRACTOR shall cooperate with all other contractors who may be performing Work on behalf of the OWNER in the vicinity of the Work to be done under this contract, and he shall conduct his operation as to interfere to the least possible extent with the Work of such contractor;
- 2. The CONTRACTOR shall promptly make good, at its own expense, any injury or damage that may be caused by it to other contractors, employees or subcontractors or suppliers thereof;
- 3. Any difference or conflict which may arise between the CONTRACTOR and other contractors in regard to their respective Work shall be adjusted and determined by the OWNER; and
- 4. If the Work is delayed because of any acts of omissions of any other contractor, the CONTRACTOR shall have no claim against the OWNER on that account.
- 7.03 Legal Relationships
  - A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
  - B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
  - C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

# **ARTICLE 8 – OWNER'S RESPONSIBILITIES**

- 8.01 Communications to Contractor
  - A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.
- 8.02 Replacement of Engineer
  - A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

#### 8.03 Furnish Data

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

## 8.04 Pay When Due

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

#### 8.05 Lands and Easements; Reports and Tests

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

#### 8.06 Insurance

- A. Delete this paragraph in its entirety.
- 8.07 Change Orders
  - A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.
- 8.08 Inspections, Tests, and Approvals
  - A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.
- 8.09 *Limitations on Owner's Responsibilities* 
  - A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 8.10 Undisclosed Hazardous Environmental Condition
  - A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

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

## 8.12 Compliance with Safety Program

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

# **ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION**

- 9.01 Owner's Representative
  - A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.
- 9.02 Visits to Site
  - A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will endeavor to guard Owner against defective Work.
  - B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

## 9.03 Project Representative

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

## 9.04 Authorized Variations in Work

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.
- 9.05 Rejecting Defective Work
  - A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

# 9.06 Shop Drawings, Change Orders and Payments

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

#### 9.07 Determinations for Unit Price Work

A. ENGINEER will have authority to determine the actual quantities and classifications of items of Unit Price Work performed by CONTRACTOR, and the written decisions of ENGINEER on such matters will be final, binding on CONTRACTOR and not subject to appeal.

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

- A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. Claims, disputes and other matters relating to requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than ten (10) days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within thirty (30) days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty (30) days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty (30) days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty (30) days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty (60) days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.
- B. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which the ENGINEER has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in ENGINEER's decision being final and binding upon the OWNER and the CONTRACTOR. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations.

## 9.09 Compliance with Safety Program

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

# **ARTICLE 10 – CHANGES IN THE WORK; CLAIMS**

## 10.01 Authorized Changes in the Work

- A. Without invalidating the Agreement, and without notice to any Surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. The CONTRACTOR shall not proceed with any Change Order until the OWNER and Engineer have signed and delivered to the CONTRACTOR the written Change Order. Upon receipt of a Change Order, CONTRACTOR shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 11 or Article 12 on the basis of a claim made by either party.
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Paragraph 10.05.
- 10.02 Unauthorized Changes in the Work
  - A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16.
- 10.03 Execution of Change Orders
  - A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
- 1. Changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
- 2. Changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

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

## 10.04 Notification to Surety

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

## 10.05 Claims

- A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor to modify contract time, contract price, or both.
- B. Notice: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 10 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 30 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
- 1. Deny the Claim in whole or in part;
- 2. Approve the Claim; or

- 3. Notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
  - D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
  - E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within ten (10) days of such action or denial.
  - F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

- 11.01 Cost of the Work
  - A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
- 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
- 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall

accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

- 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
- 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
- 5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor,

any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor are required by the Contract Documents to purchase and maintain.
- B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
  - C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

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

## 11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. Cash Allowances:
- 1. Contractor agrees that:
  - a. The cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
  - C. Contingency Allowance:
- 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
  - D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.
- 11.03 Unit Price Work
  - A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
  - B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
- 1. The quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
- 2. There is no corresponding adjustment with respect to any other item of Work; and
- 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

A change in Contract Price or Contract Time can only be made through a written Change Order. Any Claim for an adjustment in the Contract Price or Contract Time shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05. Written notice stating the general nature of the Claim shall be submitted no later than ten (10) days after the start of the event giving rise to the Claim itself. Failure to submit any claim within the aforementioned timeframe constitutes an irrevocable waiver of the claim.

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

- a. Contractor knew of the existence of such conditions that would cause an adjustment of Contract Price or Contract Time prior to or at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
- b. The existence of such a condition(s) could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

## 12.01 Change of Contract Price

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

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
- 1. Where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
- 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
- 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
  - C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
- 1. A mutually acceptable fixed fee; or
- 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
  - a. For costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 10 percent;
  - b. For costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
  - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 10 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
  - d. No fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
  - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

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

# 12.02 Change of Contract Times

- A. The Contract Time may be changed only by a written Change Order. Any claim for an extension or shortening in the Contract Time shall be based on written notice delivered to the OWNER and ENGINEER within ten (10) days from detection or the beginning of any event or circumstance giving rise to an Excusable or Compensable Delay and setting forth the general nature of the cause of delay. Any Claim for an adjustment in the Contract Time shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. No forfeiture due to delay shall be made because of any Excusable and Prejudicial Delays in the completion of the entire Work or a specified part thereof. Any such delays shall not entitle the CONTRACTOR to any change in Contract Price. The sole remedy of the CONTRACTOR shall be an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Progress Schedules.
- C. No forfeiture due to delay shall be made because of any Compensable and Prejudicial Delays in the completion of the Work or a specified part thereof. Any such delays will entitle the CONTRACTOR solely to an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Construction Progress Schedules, of the General Requirements.
- D. No extensions of Contract Time or increases in Contract Price shall be granted for Nonprejudicial Delays of any type or for Inexcusable Delays, unless otherwise agreed to by the OWNER at his sole discretion.

# 12.03 Delays

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor (excluding rain days and holidays), the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefore as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include acts or neglect by Owner.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times only. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- C. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- D. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor or for rain days and holidays. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

## 13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.
- 13.02 Access to Work
  - A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.
- 13.03 Tests and Inspections
  - A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
  - B. Payment of testing and laboratory services is specified in Section 01410; Testing and Laboratory Services for inspections and tests required by the Contract Documents. CONTRACTOR shall pay for inspections, tests or approvals covered by paragraph 13.03C. Costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04B shall be paid as provided in said paragraph 13.04B.
  - C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for

arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.
- 13.04 Uncovering Work
  - A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
  - B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
  - C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of Work of others), and any additional expenses experienced by OWNER due to delays to other contractors, an appropriate deductive Change Order shall be issued. The CONTRACTOR shall further bear the responsibility for maintaining the schedule and will be excluded from a time extension and the recovery of delay damages due to the uncovering. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05.
  - D. If the uncovered work is not found to be defective, the Contractor shall not be entitled to any increase in Contract Price or Contract Time and should strive in the future to seek all necessary inspections on the on all pertinent work before covering.

## 13.05 Owner May Stop the Work

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

# 13.06 Correction or Removal of Defective Work

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- C. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contact Documents and will not be defective. The CONTRACTOR shall not be entitled to an extension of Contract Time for correcting or removing defective Work.

# 13.07 Correction Period

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

- 3. If the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
- 4. Satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting there from.
- 5. When deemed necessary by OWNER, CONTRACTOR shall furnish and install at no cost to OWNER, such temporary equipment and material necessary to maintain functionality of the Work while defective Work is being corrected or replaced.
  - B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
  - C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
  - D. Where defective Work (and damage to other Work resulting there from) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
  - E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.
  - F. Subject to adjustments as described in sub-paragraph 13.07G, the period during which the CONTRACTOR must correct defective Work or remove it from the site and replace it with non-defective Work, all at no cost to the OWNER (the "Correction Period"), shall be no more than one (1) year. If the date of Substantial Completion is not the same date as Initiation of Operation, such Correction Period shall commence upon Initiation of Operation, not upon the date of Substantial Completion. In such cases, the time between Substantial Completion and Initiation of Operation shall not exceed one hundred (100) days.
  - G. No later than thirty (30) days before Initiation of Operation the OWNER shall notify the CONTRACTOR in writing of the date upon which Initiation of Operation is expected to occur, and the CONTRACTOR shall ensure that the Work is ready in its entirety by such date for use by the OWNER as contemplated in the Contract Documents.

- H. From the date of Substantial Completion until Initiation of Operation, the CONTRACTOR shall bear all risks of injury, loss, or damage to any part of the Work arising from the elements or from any other cause. The CONTRACTOR shall rebuild, repair, restore, and make good at no cost to the OWNER, all injuries, losses, or damage to any portion of the Work occasioned by any cause and shall, at no expense to the OWNER, provide suitable drainage and erect such temporary structures and take all other actions as are necessary for the protection of the Work. Suspension of the Work or the granting of an extension of the Contract Time for any cause shall not relieve the CONTRACTOR of its responsibility for the Work as herein specified. The CONTRACTOR's responsibilities under this paragraph 13.07 are in addition to, not in lieu of, all other obligations imposed by these Contract Documents.
- I. At the OWNER's sole option, the Correction Period may be extended or shortened. The Contract Price shall be adjusted accordingly as provided in paragraphs 11 and 12 of the Standard General Conditions.

## 13.08 Acceptance of Defective Work

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

## 13.09 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude

Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

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

# **ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

## 14.01 Schedule of Values

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.
- 14.02 Progress Payments
  - A. Applications for Payments:
- 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has

received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner. Payment to Contractor for stored materials shall be the Owner's option and at the Owner's sole discretion.

- 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
- 3. The amount of retainage shall be 10% of the contract amount until the project has been deemed substantially complete whereby the retainage will be reduced to 5% of the contract amount. Once all work has been deemed fully complete by the Owner, the retainage will be released.
- 4. Each monthly Application for Payment shall incorporate the corresponding "Monthly Progress Status Report" prepared per the requirements of Section 01310: Progress Schedules.
  - B. Review of Applications:
- 1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
- 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. The Work has progressed to the point indicated;
  - b. The quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
  - c. The conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

- 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. Inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
  - b. There may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
- 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. To supervise, direct, or control the Work, or
  - b. For the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. For Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. To make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
  - e. To determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
- 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
  - a. The Work is defective, or completed Work has been damaged, requiring correction or replacement;
  - b. The Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.
- C. Payment Becomes Due:
- 1. Payment becomes due in accordance with Florida Statute 218.735(a) of the Florida Prompt Payment Act.
  - D. *Reduction in Payment:*
- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
  - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work including but not limited to failing to pay subcontractors;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. There are other items entitling Owner to a set-off against the amount recommended including but not limited to the Owner's disagreement as to the quantity or quality of the work performed and the amount of liquidated damages that the Contractor has incurred; or
  - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor, within ten (10) days of receipt of written notice of payment recommendation by Engineer, written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.
- 4. The OWNER can withhold payment owed to the CONTRACTOR if the damages, including liquidated damages, and the cost of completion exceed the amount of money owed or remaining under the Contract. In that case, the CONTRACTOR shall continue working until the project has been completed.

## 14.03 Contractor's Warranty of Title

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

## 14.04 Substantial Completion

- A. After all requirements of Section 01700: Contract Closeout have been met with respect to Substantial Completion, and when the CONTRACTOR considers the entire Work ready for its intended use, CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Owner does not consider the Work substantially complete, the Owner will direct the Engineer to notify Contractor in writing giving the reasons therefore.
- C. If Owner considers the Work substantially complete, the Owner shall direct the Engineer to deliver to the Contractor a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

# 14.05 Partial Utilization

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
- 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
- 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
- 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
- 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

# 14.06 Final Inspection

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

# 14.07 Final Payment

# A. Application for Payment:

- 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments. The Contractor must submit the Application for Final Payment and all required documentation, described below, within thirty calendar days after the Final Completion Date.
- 2. The final Application for Payment shall be accompanied (except as previously delivered) by:

- a. All documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
- b. Consent of the surety, if any, to final payment;
- c. A list of all Claims against Owner that Contractor believes are unsettled; and
- d. Complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.
  - B. Engineer's Review of Application and Acceptance:
- 1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

## C. Payment Becomes Due:

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

# 14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application

for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

## 14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
- 1. A waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

## **ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION**

- 15.01 Owner May Suspend Work
  - A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefore as provided in Paragraph 10.05.
- 1. Notwithstanding this paragraph 15.01A, if the OWNER stops Work under paragraph 13.05 or suspends the CONTRACTOR's services under paragraph 13.09 of the Standard General Conditions, or suspends the Work or any portion thereof because of the CONTRACTOR's failure to prosecute the Work without endangering persons and property, the CONTRACTOR shall not be entitled to an extension of Contract Time or increase in Contract Price.
- B. The OWNER may at any time, suspend the Work or any portion thereof for cause; in this case, the CONTRACTOR shall not be entitled to a change in contract time or contract price.

#### 15.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will justify termination for cause:
- 1. Contractor's failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable

materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

- 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
- 3. Contractor's repeated disregard of the authority of Engineer; or
- 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
  - B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
- 1. Exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
- 2. Incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
- 3. Complete the Work as Owner may deem expedient.
  - C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
  - D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
  - E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

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

## 15.03 Owner May Terminate For Convenience

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
- 1. Completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including those fees referenced in Section 12.01.C;
- 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, including those fees referenced in Section 12.01.C;
- 3. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
- 4. Reasonable expenses directly attributable to termination.
  - B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.
- 15.04 Contractor May Stop Work or Terminate
  - A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
  - B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or

Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

# **ARTICLE 16 – DISPUTE RESOLUTION**

## 16.01 Methods and Procedures

- A. The Engineer shall mediate all disputes between the Owner and the Contractor. The Engineer shall fairly and impartially consider disputes and claims placed before him or her and provide written recommendations for resolution of these disputes and claims to both the Owner and Contractor.
- B. The dispute resolution process shall be completed as follows:

1. If an event, action or order causes a dispute between the Owner and Contractor, the Owner or Contractor must file a written protest with the Engineer, within ten (10) days of the event, action or order that causes the dispute, stating clearly and in detail the basis for the objection. Failure to submit all disputes or claims to the Engineer within the aforementioned timeframe constitutes an irrevocable waiver of the dispute or claim.

2. The Engineer will consider the written protest and make a decision on the basis of the pertinent construction contract provisions, together with the facts and circumstances involved in the dispute.

3. The Engineer may request, in writing, written evidence or documentation from either the Contractor or Owner. The Owner or Contractor must furnish the requested evidence or documentation within ten (10) days of receiving the Engineer's written request. Any evidence or documentation received after the allotted ten (10) days shall not be considered during final judgement. The Engineer shall furnish copies of the requested information to the other party when received.

4. The Engineer's decision will be furnished in writing to both parties within thirty (30) days after receipt of the written protest. In cases of extreme complexity, the Engineer may be allowed additional time to formulate a decision upon notifying both parties within the thirty (30) day time allotted.

5. The Engineer's decision will be final and conclusive on the subject unless either party, within ten (10) days of receiving the decision, institutes arbitration or legal action. Venue for any litigation, at law or equity or arbitration, shall lie exclusively in the place of Volusia County, Florida. The Engineer's decision will be admissible as evidence in any arbitration or circuit proceedings as provided by law.

6. The Engineer's costs in formulating his or her decision is to be paid by the party submitting the written protest. Both parties shall not be entitled to hold the Engineer personally liable for any decision rendered.

7. The CONTRACTOR shall carry on the Work and maintain the progress schedule during any dispute, regardless of how resolved, unless otherwise mutually agreed in writing.

8. This Contract, or any provision hereof, shall be construed and interpreted, and any litigation arising there from, shall be governed by the laws of the State of Florida.

# **ARTICLE 17 – MISCELLANEOUS**

# 17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
- 1. Delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
- 2. Delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.
- 17.02 Computation of Times
  - A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.
- 17.03 Cumulative Remedies
  - A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

## 17.04 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations

indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

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

## 17.06 Headings

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

## 17.07 Forms

A. The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the ENGINEER. The forms for Notice to Proceed, Notice of Award and others, which the ENGINEER may use, are contained in the subsequent pages of these Supplementary Conditions.

#### SECTION 00800 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (NSPE/ACEC Document No. C-700, 2007 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1.01A.10 Delete the words "...other relief with respect to the terms of the Contract." in the definition for the word Claim.

- SC-1.01A.44 Delete the definition of *Substantial Completion* and insert the following in its place:
  - 44. *Substantial Completion* The Work (or a specified part thereof) has progressed to the point where, in the opinion of the ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents and that all conditions precedent to Substantial Completion have been met in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Add the following definitions at the end of Article 1 - definitions of the Standard General Conditions of the Constitutions Contracts:

- SC-1.01.A.52 <u>Compensable Delay</u> Any delay beyond the control and without the fault or negligence of the CONTRACTOR resulting from OWNER-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by the OWNER.
- SC-1.01.A.53 <u>Correction Period</u> The time during which the CONTRACTOR must correct defective Work or remove defective Work from the site and replace it with non-defective Work, all at no cost to the OWNER, pursuant to paragraph 13.07 of the General Conditions, as supplemented.
- SC-1.01A.54 <u>Final Completion</u> The date upon which final payment is due to be paid by OWNER to CONTRACTOR.
- SC-1.01A.55 <u>Excusable Delay</u> Any delay beyond the control and without the fault or negligence of the CONTRACTOR, the OWNER, or any other contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, acts of interveners, acts of the government, fires, floods, epidemics, quarantine restrictions, freight embargoes, and hurricanes, tornadoes, or new sink holes. Labor disputes and above average rainfall shall give rise only to Inexcusable Delays.

- SC-1.01A.56 <u>Float or Slack Time</u> The time available in the progress schedule during which an unexpected activity can be completed without delaying the Substantial Completion of the Work.
- SC-1.01A.57 <u>Initiation of Operation</u> The date when the OWNER actually begins to use the entire Work for the purposes for which it was planned, designed and built, thus commences the Correction Period. The OWNER shall not be deemed to have accepted the Work until Initiation of Operation.
- SC-1.01A.58 <u>Modification</u> (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Field Order. A modification may be issued after the Effective Date of the Agreement.
- SC-1.01A.59 <u>Inexcusable Delay</u> Any delay caused either (i) by events or circumstances within the control of the CONTRACTOR, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the CONTRACTOR, (ii) by weather conditions (other than hurricanes and tornadoes) or (iii) labor disputes.
- SC-1.01A.60 <u>Non-prejudicial Delay</u> Any delay impacting a portion of the Work within the available total Float or Slack Time, as that term is used in Section 01310: Progress Schedules, and not necessarily preventing completion of the Work within the Contract Time.
- SC-1.01A.61 <u>Prejudicial Delay</u> Any Excusable or Compensable Delay impacting the Work and exceeding the total Float Time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.
- SC-1.01A.62 <u>Preoperational Testing (Check-Out-Testing)</u> All field inspections, installation checks, water tests, performance tests, and necessary corrections required of the CONTRACTOR as a condition or conditions to achieving Substantial Completion to demonstrate to the OWNER and ENGINEER that individual components of the Work have been properly constructed and operate in accordance with the Contract Documents for their intended purposes.
- SC-1.01A.63 <u>Start-Up Testing (Demonstration Testing)</u> A predefined trial period required as a condition to Initiation of Operation during which CONTRACTOR is to operate the entire Work (or any part thereof agreed to by the OWNER) under actual and simulated operating conditions for the purpose (i) of making such minor adjustments and changes to the Work as may be necessary for the Work to comply with the Contact Documents and (ii) of complying with the final test requirements in the Contract Documents."
- SC-2.02 Modify paragraph 2.02A of the General Conditions:
  - A. After the Agreement has been executed, the Engineer will furnish the CONTRACTOR five (5) complete sets of Contract Documents.

- SC-2.03 Delete paragraph 2.03 of the General Conditions in its entirety and insert the following in its place.
  - A. A "Notice to Proceed" may be given to the Contractor at any time after the Effective date of the Agreement. The Contract Time will commence to run on the day indicated in the Notice to Proceed. In no event will the Contract Time commence to run later than the sixtieth (60th) day after the Effective Date of the Agreement.
- SC-2.05 Add the following immediately after subparagraph 2.05A.3 of the Standard General Conditions:
  - 4. The submittals required in subparagraphs 1, 2 and 3 shall be as specified in Section 01310, 01340 and 01370, respectively.
- SC-3.01 Add the following immediately after paragraph 3.01C of the Standard General Conditions:
  - D. When measurements are affected by conditions already established or where items are to be fitted into construction conditions, it shall be the CONTRACTOR's responsibility to verify all such dimensions at the site and the actual job dimensions shall take precedence over scale and figure dimensions on the Drawings.
  - E. The CONTRACTOR shall carefully study and compare all Drawings, Specifications and other instructions; shall test all figures on the Drawings before laying out the Work; shall notify the ENGINEER of all errors, inconsistencies, or omissions which he may discover; and obtain specific instructions before proceeding with the Work. The CONTRACTOR shall not take advantage of any apparent error or omissions which may be found in the Drawings or Specifications, and the ENGINEER shall be entitled to make such corrections therein and interpretations thereof as may be deemed necessary for the fulfillment of their intent. The CONTRACTOR shall be responsible for all errors in construction which could have been avoided by such examination and notification and shall correct, at its own expense, all Work improperly constructed through failure to notify the ENGINEER and request specific instructions.
- SC-4.03 Change the first sentence "Contractor shall promptly". Add "The CONTRACTOR shall, within three (3) days, after becoming aware thereof..."
- SC-4.06 Add a new paragraph immediately after paragraph 4.06 I. of the Standard General Conditions which is to read as following:
  - J. No claim of the CONTRACTOR under paragraphs 4.02, 4.04 and 4.06 shall be allowed unless, (1) the CONTRACTOR has given the notice required in sub-paragraph 4.06D, and (2) within thirty (30) days (but before final payment) after the CONTRACTOR has given written notice, the

CONTRACTOR submits to the OWNER a detailed claim setting forth the CONTRACTOR's right to an increase in the Contract Price or extension of the Contract Time as provided in Articles 11 and 12 of the Standard General Conditions.

- SC-5.01 Add a new paragraph immediately after paragraph 5.01 B. Of the Standard General Conditions which is to read as follows:
  - 1. The following requirements shall be met by all surety companies furnishing bid, performance, payment or other type of Bonds:
    - a. The Surety shall be rated as "A" or better as to General Policyholders Rating and Class X or better as to Financial Category by Best's Key Rating Guide, published by Alfred M. Best Company, Inc., 75 Fulton Street, New York, New York, 10038.

All Surety Companies are subject to approval and may be rejected by the OWNER without cause.

- 2. Limitations: Bonding limits or bonding capacity refers to the limit or amount of Bond acceptable on any one (1) risk.
  - a. The bonding limit of the Surety shall not exceed ten percent (10%) of the policyholder surplus (capital and surplus) as listed by the aforementioned Best's Key Rating Guide, on any one risk (penalty or amount of any one bond).
- 3. Requirements:
  - a. Policyholders surplus is required to be five (5) times the amount of any one bond.
  - b. The Agent countersigning the bond shall be resident in the County where the Project is located and/or other counties that are acceptable to the OWNER.
- SC-5.01 Add a new paragraph immediately after paragraph 5.01C of the Standard General Conditions which read as follows:
  - D. Contractor shall pay Owner all losses, damages, expenses, costs, and attorney's fees, including but not limited to any appellate proceedings, which the Owner sustains because of default by the Contractor under the contract.
- SC-5.04A In the case of a conflict between paragraph 5.04A of Section 00700 and one or more of the provisions of Section 00800A, the provisions of 00800A shall prevail.
- SC-5.05A Delete paragraph 5.05A of the Standard General Conditions in its entirety.

- SC-5.06A Delete paragraph 5.06 of the Standard General Conditions in its entirety and insert the following in its place:
  - A. CONTRACTOR shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations). This insurance shall:
    - 1. Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
    - 2. Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils; fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, hurricanes, flood, tornadoes, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions.
    - 3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
    - 4. Cover materials and equipment in transit for incorporation in the Work or stored at the site or at another location provided that such materials and equipment are to be included in an Application for Payment.
    - 5. Allow for partial utilization of the Work by Owner;
    - 6. Include testing and startup; and
    - 7. Be maintained in effect until the later of the two; Initiation of Operation or Final Completion, unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph 5.06 shall comply with the requirements of Section 00800A.

SC-5.06B Delete paragraph 5.06B of the Standard General Conditions in its entirety.

- SC-5.06D Delete paragraph 5.06D of the Standard General Conditions in its entirety.
- SC-5.06E Delete paragraph 5.06E of the Standard General Conditions in its entirety.
- SC-5.07 Delete paragraph 5.07 of the Standard General Conditions in its entirety.
- SC-5.10 Delete paragraph 5.10 of the Standard General Conditions in its entirety and insert the following in its place:
  - A. The CONTRACTOR shall maintain all insurance as required in Paragraph 5.06A for the Work and allow OWNER to occupy or use a portion or portions of the Work prior to Substantial Completion. CONTRACTOR shall make appropriate provisions with insurers providing the proper endorsements, if required. The property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.
- SC-6.01 Add the following sub-paragraphs immediately after paragraph 6.01B of the Standard General Conditions which are to read as follow:
  - C. The Owner reserves the right to review and approve the resident superintendent.
- SC-6.02 Add the following sub-paragraphs immediately after paragraph 6.02B of the Standard General Conditions which are to read as follow:
  - C. Maintenance work may be performed during hours other than regular working hours. Regular working hours are defined as daylight hours between one half hours after sunrise to one half hour before sunset between 8 AM and 5 PM but not more than eight (8) hours per day at 5 days per week or ten (10) hours per day at 4 days per week totaling forty (40) hours per week during weekdays. Requests to Work during other regular working hours, hours other that regular working hours, hereinafter referred to as irregular hours, must be submitted to the OWNER at least seventy-two (72) hours in advance of the period proposed for such irregular working hours and shall set forth the proposed schedule for such hours to give the OWNER ample time to arrange for its personnel to be at the site of the Work.
  - D. The OWNER will pay for charges of ENGINEER and construction observation performed during regular working hours. The CONTRACTOR shall pay for additional engineering and construction observations charges required during irregular hours which may be authorized under the provisions of paragraph SC-6.02C. The rate paid to the OWNER by the CONTRACTOR for additional engineering and construction observation changes shall be in accordance with the existing Contract between the OWNER and ENGINEER. The OWNER shall have the option to retain this amount from the compensation otherwise paid to the contractor.

- E. The CONTRACTOR shall also pay for the costs of additional engineering charges and construction observation required during the correction of defective Work. Such additional costs incurred during irregular working hours and during the correction of defective Work, shall be a subsidiary obligation of the CONTRACTOR and no extra payment shall be made by the OWNER on account of such Work. The OWNER shall have the option to retain this amount from the compensation otherwise paid to the contractor.
- SC-6.06 Delete paragraphs 6.06A and 6.06B of the Standard General Conditions and insert the following in its place:
  - A. The CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom OWNER may have reasonable objection and shall not be required to employ as a Subcontractor, Supplier or any person or organization against whom the CONTRACTOR has reasonable objection. A Subcontractor, Supplier or other person or organization identified in the CONTRACTOR's Bid and not objected to in writing by OWNER prior to the execution of the Agreement will be deemed acceptable to OWNER. All other Subcontractors shall be deemed to have been accepted if the OWNER delivers no written objection thereto within forty-five (45) days after CONTRACTOR's written identification of such Subcontractors.
  - B. However, if the OWNER has reasonable objection (as determined by the ENGINEER) to any Subcontractor identified in the Bid or subsequently, the CONTRACTOR shall submit an acceptable substitute without entitlement to any change in Contract Price. If the OWNER demands the substitution of a Subcontractor at any time without having reasonable objection to such Subcontractor, the CONTRACTOR shall comply and shall be entitled to change in Contract Price (by appropriate Change Order or Written Amendment) for the difference in cost occasioned by such substitution. After acceptance by the OWNER, the CONTRACTOR shall make no substitution without written approval of the OWNER, which may be granted or withheld at OWNER's sole discretion. No acceptance by the OWNER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of the OWNER to reject defective work.
- SC-6.06 Add a new subparagraph immediately after paragraph 6.06G. of the Standard General Conditions to read as follows:
  - H. The CONTRACTOR will be required to perform the Work as a prime contractor. The CONTRACTOR shall not sublet, sell, transfer, assign or otherwise dispose of the Work under the Agreement or any portion thereof, or his right, title or interest therein, without written consent of the OWNER. The CONTRACTOR shall perform on the site and with his own

organization work equivalent to not less than 50 percent of the total dollar value of the work to be performed under the Agreement except that work hereinafter designated as specialty work may be performed by Subcontractors and the cost of any such specialty work so performed by Subcontractors may be subtracted from the total Contract Price before computing the amount of work required to be performed by the CONTRACTOR with his own organization.

- SC-6.08 Add the following to the end of paragraph 6.08 in the Standard General Conditions:
  - B. "The OWNER, prior to the advertisement of the Project, has applied for or has secured permits and/or licenses for the Project as described in "Location, Scope and Special Requirements."
- SC-6.11 Add new sub-paragraphs immediately after paragraph 6.11A.3 of the Standard General Conditions which are to read as follows:
  - A. Use of OWNER's property by the CONTRACTOR for storage of materials and equipment will be negotiated.
  - B. Use of the OWNER's existing washrooms, lavatories, sanitary facilities or plumbing fixtures by the CONTRACTOR or any of its employees or Subcontractors will not be permitted.
- SC-6.13 Add the following at the end of Paragraph A:

The Engineer is not responsible for the safety of any person on the jobsite other than the Engineer's own employees. The Contractor is responsible for construction means, methods, sequences, testing, techniques and procedures necessary for performing, superintending or coordinating all portions of the work in accordance with the contract documents and any health or safety precautions required by the contract documents and/or any regulatory agencies. The Engineer has no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Engineer does not have the authority to stop the work of any construction contractor. The Owner agrees that the Contractor is solely responsible for jobsite safety, and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Owner agrees that the Engineer shall be entitled to indemnification from the Contractor for any loss incurred by the Engineer arising out of any claim brought by any person or personal injuries sustained on the jobsite and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Engineer shall be made an additional insured under the Contractor's general liability insurance policy for personal injuries to any person sustained on the jobsite.

SC-6.13 The CONTRACTOR's obligations under paragraph 6.13 of the Standard General Conditions shall continue after the date of Substantial Completion until the Initiation of Operation. Add the following paragraph after paragraph 6.13F of the Standard General Conditions:

- G. "The CONTRACTOR shall be completely responsible for any tanks, wet wells or similar structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. If there is any possibility of buoyancy of a structure, the CONTRACTOR shall take the necessary steps to prevent its buoyancy either by increasing the structures weight, by filling it with approved material or other acceptable methods. The proposed final structures have been designed against buoyancy; however, during various construction stages, methods employed by the CONTRACTOR and other conditions which may affect the buoyancy. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the CONTRACTOR's expense."
- SC-6.17 Add the following paragraph after 6.17D.3 in the Standard General Conditions:
  - 4. Shop Drawings and other submittal data shall be reviewed by the ENGINEER for each original submittal and first resubmittal; thereafter, the CONTRACTOR shall reimburse OWNER for services rendered by ENGINEER for review time of subsequent resubmittals.
- SC-6.19 Change the title to read Contractor's Warranty and Guarantee
- SC-6.19C Delete in its entirety.
- SC-6.19 Add the following after paragraph 6.19B.
  - C. Contractor warrants that (1) the supplies to be provided to the City pursuant to this Agreement are fit and sufficient for the purpose intended; (2) the supplies are merchantable, of good quality, and free from defects, whether patent or latent, in material or workmanship, and (3) the supplies sold to the City pursuant to this Agreement conform to the standards required by this Contract. The Contractor further warrants that the Contractor has title to the supplies provided, in that the supplies are free and clear of all liens encumbrances, and other security interests. All warranties made in this Agreement, together with service warranties and guarantees, shall run to the City and its successors and assigns.
  - D. Additional Warranties Contractor further expressly warrants the manufacturer must provide a one (1) year Warranty on equipment. This shall cover 100% of all component failures due to defects in workmanship or repeated use. Routine maintenance is not included. Warranty claims shall be

handled by manufacturer or distributor. This is a minimum acceptable warranty. Warranty will be considered in bid award.

- SC-6.20A In the event of a conflict between this paragraph and other provisions of the Contract Documents, this paragraph shall control.
- SC-6.20B Delete paragraph 6.20B of the Standard General Conditions in its entirety and insert the following in its place:
  - B. The Contractor agrees not to bring any claim, suite, action or other legal proceeding against the engineer and its consultants that may arise out of or in connection with the Work or this agreement. The Engineer and its consultants are intended third-party beneficiaries of this covenant not to sue, and are entitled to enforce this covenant in law or in equity.
- SC-7.02 Delete paragraph 7.02 of the Standard General Conditions in its entirety and insert the following in its place:

7.02 A.The parties expressly acknowledge that the Work to be done contractors.

- 1. The CONTRACTOR shall cooperate with all other contractors who may be performing Work on behalf of the OWNER in the vicinity of the Work to be done under this contract, and he shall conduct his operation as to interfere to the least possible extent with the Work of such contractor.
- 2. The CONTRACTOR shall promptly make good, at its own expense, any injury or damage that may be caused by it to other contractors, employees or subcontractors or suppliers thereof.
- 3. Any difference or conflict which may arise between the CONTRACTOR and other contractors in regard to their respective Work shall be adjusted and determined by the OWNER.
- 4. If the Work is delayed because of any acts of omissions of any other contractor, the CONTRACTOR shall have no claim against the OWNER on that account.
- SC-8.06 Delete paragraph 8.06 of the Standard General Conditions in its entirety.
- SC-9.07 Delete paragraph 9.07 of the Standard General Conditions in its entirety and insert the following in its place:

ENGINEER will have authority to determine the actual quantities and classifications of items of Unit Price Work performed by CONTRACTOR, and the written decisions of ENGINEER on such matters will be final, binding on CONTRACTOR and not subject to appeal.

SC-9.08 Delete paragraphs 9.08A-C in their entirety and insert the following:

- A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. Claims, disputes and other matters relating to requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty (30) days ten (10) days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty (60) thirty (30) days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty (30) days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty (30) days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty (30) days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty (60) days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.
- SC-9.08 Re-letter paragraph 9.08D as 9.08B.
- SC-9.08 Add the following sentences to the end of paragraph 9.08B of the Standard General Conditions:

"No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which the ENGINEER has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in ENGINEER's decision being final and binding upon the OWNER and the CONTRACTOR. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations."

SC-9.09 Delete paragraph 9.09 of the Standard General Conditions in its entirety.

- SC-10.05B Remove "(but in no event later than 30 days)" in the first sentence and replace with "(but in no event later than 10 days)".
- SC-10.05B Remove "shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event" in the third sentence and replace with "shall be delivered to the Engineer and the other party to the Contract within 30 days after the start of such event"
- SC-10.01 Delete paragraph 10.01 A of the Standard General Conditions in its entirety and insert the following in its place:
  - A. Without invalidating the Agreement, and without notice to any Surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. The CONTRACTOR shall not proceed with any Change Order until the OWNER and Engineer have signed and delivered to the CONTRACTOR the written Change Order. Upon receipt of a Change Order, CONTRACTOR shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 11 or Article 12 on the basis of a claim made by either party.
- SC-12.01 The Contractor's fee referenced in subparagraph C.2.a. shall be reduced from 15 percent to 10 percent.
- SC-12.01 The fee referenced in line 4 of subparagraph C.2.c. shall be reduced from 15 percent to 10 percent.
- SC-12.02 Delete paragraphs 12.02A and 12.02B of the Standard General Conditions in its entirety and insert the following in its place:
  - A. The Contract Time may be changed only by a Change Order or a Written Amendment. Any claim for an extension or shortening in the Contract Time shall be based on written notice delivered to the OWNER and ENGINEER within fifteen (15) ten (10) days from detection or the beginning of any event or circumstance giving rise to an Excusable or Compensable Delay and setting forth the general nature of the cause of delay. Within thirty (30) days of any such detection or beginning of event, the CONTRACTOR shall provide the analysis and documentation required to ascertain the facts, as specified in Section 01310: Progress Schedules and shall provide a written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. No claim by the CONTRACTOR under this provision shall be allowed unless the CONTRACTOR has given the notice

and the analysis and documentation required in this paragraph, or if asserted after final payment, as defined in paragraph 14.07 of the Standard General Conditions.

- B. No forfeiture due to delay shall be made because of any Excusable and Prejudicial Delays in the completion of the entire Work or a specified part thereof. Any such delays shall not entitle the CONTRACTOR to any change in Contract Price. The sole remedy of the CONTRACTOR shall be an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Progress Schedules.
- C. No forfeiture due to delay shall be made because of any Compensable and Prejudicial Delays in the completion of the Work or a specified part thereof. Any such delays will entitle the CONTRACTOR solely to an extension of the Contract Time pursuant to this Article and the provisions of Section 01310: Construction Progress Schedules, of the General Requirements.
- D. No extensions of Contract Time or increases in Contract Price shall be granted for Non-prejudicial Delays of any type or for Inexcusable Delays, unless otherwise agreed to by the OWNER at his sole discretion.
- SC-12.063 Paragraph 12.06B 12.03B is hereby revised to provide equitable adjustment in contract time only; not contract price.
- SC-13.03 Delete Paragraph 13.03B and sub-paragraphs 1, 2 and 3 in their entirety and insert the following:
  - B. Payment of testing and laboratory services is specified in Section 01410; Testing and Laboratory Services for inspections and tests required by the Contract Documents. CONTRACTOR shall pay for inspections, tests or approvals covered by paragraph 13.03C. Costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04B shall be paid as provided in said paragraph 13.04B.
- SC-13.04 Amend paragraph 13.04C of the Standard General Conditions to read as follows:

"...replacement of Work of others), and any additional expenses experienced by OWNER due to delays to other contractors, an appropriate deductive Change Order shall be issued. The CONTRACTOR shall further bear the responsibility for maintaining the schedule and will be excluded from a time extension and the recovery of delay damages due to the uncovering. If, the parties..."

- SC-13.04 Delete paragraph 13.04D of the Standard General Conditions and insert the following in its place:
  - D. If the uncovered work is not found to be defective, the Contractor shall not be entitled to any increase in Contract Price or Contract Time and should strive

in the future to seek all necessary inspections on the on all pertinent work before covering.

- SC-13.06 Add the following new paragraph immediately after paragraph 13.06B of the Standard General Conditions:
  - C. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contact Documents and will not be defective. The CONTRACTOR shall not be entitled to an extension of Contract Time for correcting or removing defective Work.
- SC-13.07 Add the following new sub-paragraph immediately after sub-paragraph 13.07A.4:
  - 5. When deemed necessary by OWNER, CONTRACTOR shall furnish and install at no cost to OWNER, such temporary equipment and material necessary to maintain functionality of the Work while defective Work is being corrected or replaced.

Add the following new paragraphs immediately after paragraph 13.07E:

- F. Subject to adjustments as described in sub-paragraph 13.07G, the period during which the CONTRACTOR must correct defective Work or remove it from the site and replace it with non-defective Work, all at no cost to the OWNER (the "Correction Period"), shall be no more than one (1) year. If the date of Substantial Completion is not the same date as Initiation of Operation, such Correction Period shall commence upon Initiation of Operation, not upon the date of Substantial Completion. In such cases, the time between Substantial Completion and Initiation of Operation shall not exceed one hundred (100) days.
- G. No later than thirty (30) days before Initiation of Operation the OWNER shall notify the CONTRACTOR in writing of the date upon which Initiation of Operation is expected to occur, and the CONTRACTOR shall ensure that the Work is ready in its entirety by such date for use by the OWNER as contemplated in the Contract Documents.
- H. From the date of Substantial Completion until Initiation of Operation, the CONTRACTOR shall bear all risks of injury, loss, or damage to any part of the Work arising from the elements or from any other cause. The CONTRACTOR shall rebuild, repair, restore, and make good at no cost to the OWNER, all injuries, losses, or damage to any portion of the Work occasioned by any cause and shall, at no expense to the OWNER, provide suitable drainage and erect such temporary structures and take all other actions as are necessary for the protection of the Work. Suspension of the Work or the granting of an extension of the Contract Time for any cause shall not relieve the CONTRACTOR of its responsibility for the Work as herein specified. The CONTRACTOR's responsibilities under this paragraph 13.07

are in addition to, not in lieu of, all other obligations imposed by these Contract Documents.

- I. At the OWNER's sole option, the Correction Period may be extended or shortened. The Contract Price shall be adjusted accordingly as provided in paragraphs 11 and 12 of the Standard General Conditions.
- SC-14.02.A.1 Add the following sentence to end of paragraph 14.02 A.1:

Payment to Contractor for stored materials shall be the Owner's option and at the Owner's sole discretion.

SC-14.02.A.3 Delete paragraph 14.02.A.3 in its entirety and insert the following in its place:

- 3. The amount of retainage shall be 10% of the contract amount until the project has been deemed substantially complete whereby the retainage will be reduced to 5% of the contract amount. Once all work has been deemed fully complete by the Owner, the retainage will be released.
- SC-14.02 Add the new sub-paragraph immediately after sub-paragraph 14.02A.3:
  - 4. Each monthly Application for Payment shall incorporate the corresponding "Monthly Progress Status Report" prepared per the requirements of Section 01310: Progress Schedules.
- SC-14.02.C.1 This section is hereby deleted. The requirements of Florida Statute 218.735(a) of the Florida Prompt Payment Act shall apply.
- SC-14.04.A Delete paragraph 14.04.A in its entirety and insert the following in its place:
  - A. After all requirements of Section 01700: Contract Closeout have been met with respect to Substantial Completion, and when the CONTRACTOR considers the entire Work ready for its intended use, CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion.
- SC-14.09.A.1 Delete paragraph 14.09.A.1 of the Standard General Conditions in its entirety.
- SC-15.01 Add a new subparagraph immediately after paragraph 15.01A of the Standard General Conditions to read as follows:
  - 1. Notwithstanding this paragraph 15.01A, if the OWNER stops Work under paragraph 13.05 or suspends the CONTRACTOR's services under paragraph 13.09 of the Standard General Conditions, or suspends the Work or any portion thereof because of the CONTRACTOR's failure to prosecute the

Work without endangering persons and property, the CONTRACTOR shall not be entitled to an extension of Contract Time or increase in Contract Price.

- SC-16 Delete Article 16 and all other references to "Dispute Resolution Agreement" in the Standard General Conditions. Disputes between OWNER and CONTRACTOR shall be arbitrated only if and to the extent agreed to by the parties at the time each dispute arises. The CONTRACTOR shall carry on the Work and maintain the progress schedule during any dispute, regardless of how resolved, unless otherwise mutually agreed in writing. Venue for any litigation, at law or equity or arbitration, shall lie exclusively in the place of Volusia County, Florida. This Contract, or any provision hereof, shall be construed and interpreted, and any litigation arising there from, shall be governed by the laws of the State of Florida.
- SC-17.06 Add the following paragraph immediately after paragraph 17.05 of the General Conditions which are to read as follows:
  - 17.06 The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the ENGINEER. The forms for Notice to Proceed, Notice of Award and others, which the ENGINEER may use, are contained in the subsequent pages of these Supplementary Conditions.

## END OF SECTION

## TABLE OF CONTENTS CITY OF SOUTH DAYTONA LIFT STATION #5 REPLACEMENT BID NO. 24-B-003

#### **Section**

## Title

#### DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

- 00 50 00 Agreement
- 00 70 00 Standard General Conditions of the Construction Contract
- 00 80 00 Supplementary Conditions

#### **DIVISION 1 – GENERAL REQUIREMENTS**

- 01 00 00 General Requirements
- 01 11 00 Summary of Work
- 01 20 00 Price and Payment Procedures
- 01 29 73 Schedule of Values
- 01 29 76 Progress Payment Procedures
- 01 30 00 Administrative Requirements
- 01 31 19 Project Meetings
- 01 32 16 Construction Progress Schedules
- 01 32 33 Photographic Documentation
- 01 33 23 Shop Drawings, Product Data and Samples
- 01 45 29 Testing Laboratory Services
- 01 57 13 Temporary Erosion and Sedimentation Controls
- 01 60 00 Product Requirements
- 01 71 13 Mobilization
- 01 74 00 Cleaning and Waste Management
- 01 75 16 Start Up Procedures
- 01 77 00 Close Out Procedures
- 01 78 23 Operation and Maintenance Data
- 01 78 33 Bonds
- 01 78 36 Warranties
- 01 78 39 Project Record Documents

## DIVISION 2 - EXISTING CONDITIONS

02 06 14 Geotechnical Data Report

#### **DIVISION 3 – CONCRETE**

- 03 30 00 Cast In Place Concrete
- 03 60 00 Grouting

## DIVISION 9 – FINISHES

#### 09 90 00 Painting and Coating

#### DIVISION 23 – MECHANICAL EQUIPMENT

23 11 00 Fuel Tank and Piping

#### **DIVISION 26 – ELECTRICAL**

- 26 05 00 Common Work Results for Electrical
- 26 05 19 Low Voltage Electrical Power Conductors and Cables
- 26 05 23 Control Voltage Electrical Power Cables
- 26 05 26 Grounding and Bonding for Electrical Systems
- 26 05 29 Hangars and Supports for Electrical Systems
- 26 05 33 Raceways and Boxes for Electrical Systems
- 26 05 43 Underground Ducts and Raceways for Electrical Systems
- 26 05 53 Identification for Electrical Systems

#### **DIVISION 31 – EARTHWORK**

- 31 22 00 Grading
- 31 23 00 Excavation and Fill
- 31 23 19 Dewatering

#### **DIVISION 32 – EXTERIOR IMPROVEMENTS**

32 92 00 Turf and Grasses

#### DIVISION 33 – UTILITIES

- 33 01 00 Operation and Maintenance of Utilities
- 33 01 30.09 Sanitary Sewer Bypass Pumping
- 33 01 30.82 HDPE Sheet Liner Wastewater Pump Stations
- 33 05 05.31 Hydrostatic Testing
- 33 05 61 Concrete Structures
- 33 32 20 Collection System Submersible Pumps
- 33 32 23 Submersible Mixer

# **DIVISION 40 – PROCESS INTERCONNECTIONS**

40 61 13 Process Instrumentation and Controls System General Provisions

# **DIVISION 44 – PROCESS INTERCONNECTIONS**

44 31 31 Odor Control Biotrickling Filters

## END OF TABLE OF CONTENTS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

**Prepared By** 



ACEC AMERICAN COUNCIL OF ENGINEERING COMPANIES





# **Endorsed By**



Copyright<sup>©</sup> 2018

National Society of Professional Engineers 1420 King Street, Alexandria, VA 22314-2794 (703) 684-2882

www.nspe.org

American Council of Engineering Companies 1015 15th Street N.W., Washington, DC 20005 (202) 347-7474 www.acec.org

American Society of Civil Engineers 1801 Alexander Bell Drive, Reston, VA 20191-4400 (800) 548-2723 www.asce.org

The copyright for this EJCDC document is owned jointly by the three sponsoring organizations listed above. The National Society of Professional Engineers is the Copyright Administrator for the EJCDC documents; please direct all inquiries regarding EJCDC copyrights to NSPE.

NOTE: EJCDC publications may be purchased at <u>www.ejcdc.org</u>, or from any of the sponsoring organizations above.

# GUIDELINES FOR USE OF EJCDC<sup>®</sup> C-700, STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

## 1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

EJCDC<sup>®</sup> C-700, Standard General Conditions of the Construction Contract (2018), is the foundation document for the EJCDC Construction Series. The General Conditions define the basic rights, responsibilities, risk allocations, and contractual relationship of the Owner and Contractor, and establish how the Contract is to be administered.

#### 2.0 OTHER DOCUMENTS

EJCDC documents are intended to be used as a system and changes in one EJCDC document may require a corresponding change in other documents. Other EJCDC documents may also serve as a reference to provide insight or guidance for the preparation of this document.

These General Conditions have been prepared for use with either EJCDC<sup>®</sup> C-520, Agreement Between Owner and Contractor for Construction Contract (Stipulated Price), or EJCDC<sup>®</sup> C-525, Agreement Between Owner and Contractor for Construction Contract (Cost-Plus-Fee) (2018 Editions). The provisions of the General Conditions and the Agreement are interrelated, and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC<sup>®</sup> C-800, Supplementary Conditions of the Construction Contract (2018).

The full EJCDC Construction series of documents is discussed in the EJCDC<sup>®</sup> C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

#### 3.0 ORGANIZATION OF INFORMATION

All parties involved in a construction project benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. Careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition) when preparing documents. EJCDC® N-122/AIA® A521 is available at no charge from the EJCDC website, www.ejcdc.org, and from the websites of EJCDC's sponsoring organizations.

If CSI MasterFormat<sup>™</sup> is used for organizing the Project Manual, consult CSI MasterFormat<sup>™</sup> for the appropriate document number (e.g., under 00 11 00, Advertisements and Invitations), and accordingly number the document and its pages.

#### 4.0 EDITING THIS DOCUMENT

Remove these Guidelines for Use. Some users may also prefer to remove the two cover pages.

Although it is permissible to revise the Standard EJCDC Text of C-700 (the content beginning at page 1 and continuing to the end), it is common practice to leave the Standard EJCDC Text of C-700 intact and unaltered, with modifications and supplementation of C-700's provisions set forth in EJCDC<sup>®</sup> C-800, Supplementary Conditions of the Construction Contract (2018). If the Standard Text itself is revised, the

user must comply with the terms of the License Agreement, Paragraph 4.0, Document-Specific Provisions, concerning the tracking or highlighting of revisions. The following is a summary of the relevant License Agreement provisions:

- 1. The term "Standard EJCDC Text" for C-700 refers to all text prepared by EJCDC in the main body of the document. Document covers, logos, footers, instructions, or copyright notices are not Standard EJCDC Text for this purpose.
- 2. During the drafting or negotiating process for C-700, it is important that the two contracting parties are both aware of any changes that have been made to the Standard EJCDC Text. Thus, if a draft or version of C-700 purports to be or appears to be an EJCDC document, the user must plainly show all changes to the Standard EJCDC Text, using "Track Changes" (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions.
- 3. If C-700 has been revised or altered and is subsequently presented to third parties (such as potential bidders, grant agencies, lenders, or sureties) as an EJCDC document, then the changes to the Standard EJCDC Text must be shown, or the third parties must receive access to a version that shows the changes.
- 4. Once the document is ready to be finalized (and if applicable executed by the contracting parties), it is no longer necessary to continue to show changes to the Standard EJCDC Text. The user may produce a final version of the document in a format in which all changes are accepted, and the document at that point does not need to include any "Track Changes," redline/strikeout, highlighting, or other indication of additions and deletions to the Standard EJCDC Text.

#### 5.0 LICENSE AGREEMENT

This document is subject to the terms and conditions of the License Agreement, 2018 EJCDC<sup>®</sup> Construction Series Documents. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at <u>www.ejcdc.org</u> and the websites of EJCDC's sponsoring organizations.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

## TABLE OF CONTENTS

	Pag	;e	
Article 1—Definitions and Terminology1			
1.01	Defined Terms	1	
1.02	Terminology	6	
Article 2-	-Preliminary Matters	7	
2.01	Delivery of Performance and Payment Bonds; Evidence of Insurance	7	
2.02	Copies of Documents	7	
2.03	Before Starting Construction	7	
2.04	Preconstruction Conference; Designation of Authorized Representatives	8	
2.05	Acceptance of Schedules	8	
2.06	Electronic Transmittals	8	
Article 3-	-Contract Documents: Intent, Requirements, Reuse	9	
3.01	Intent	9	
3.02	Reference Standards	9	
3.03	Reporting and Resolving Discrepancies1	.0	
3.04	Requirements of the Contract Documents1	0	
3.05	Reuse of Documents1	.1	
Article 4	-Commencement and Progress of the Work1	.1	
4.01	Commencement of Contract Times; Notice to Proceed1	.1	
4.02	Starting the Work1	.1	
4.03	Reference Points1	.1	
4.04	Progress Schedule1	.2	
4.05	Delays in Contractor's Progress1	.2	
Article 5	-Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions1	.3	
5.01	Availability of Lands1	.3	
5.02	Use of Site and Other Areas1	.4	
5.03	Subsurface and Physical Conditions1	.5	
5.04	Differing Subsurface or Physical Conditions1	.6	

5.05	Underground Facilities	.17
5.06	Hazardous Environmental Conditions at Site	.19
Article 6-	-Bonds and Insurance	.21
6.01	Performance, Payment, and Other Bonds	.21
6.02	Insurance—General Provisions	. 22
6.03	Contractor's Insurance	.24
6.04	Builder's Risk and Other Property Insurance	.25
6.05	Property Losses; Subrogation	. 25
6.06	Receipt and Application of Property Insurance Proceeds	. 27
Article 7-	-Contractor's Responsibilities	. 27
7.01	Contractor's Means and Methods of Construction	. 27
7.02	Supervision and Superintendence	. 27
7.03	Labor; Working Hours	. 27
7.04	Services, Materials, and Equipment	. 28
7.05	"Or Equals"	. 28
7.06	Substitutes	. 29
7.07	Concerning Subcontractors and Suppliers	.31
7.08	Patent Fees and Royalties	. 32
7.09	Permits	. 33
7.10	Taxes	. 33
7.11	Laws and Regulations	. 33
7.12	Record Documents	.33
7.13	Safety and Protection	.34
7.14	Hazard Communication Programs	. 35
7.15	Emergencies	.35
7.16	Submittals	. 35
7.17	Contractor's General Warranty and Guarantee	. 38
7.18	Indemnification	.39
7.19	Delegation of Professional Design Services	.39
Article 8-	—Other Work at the Site	.40
8.01	Other Work	.40
8.02	Coordination	.41
8.03	Legal Relationships	41

Article 9	-Owner's Responsibilities	
9.01	Communications to Contractor	42
9.02	Replacement of Engineer	42
9.03	Furnish Data	
9.04	Pay When Due	
9.05	Lands and Easements; Reports, Tests, and Drawings	
9.06	Insurance	
9.07	Change Orders	
9.08	Inspections, Tests, and Approvals	
9.09	Limitations on Owner's Responsibilities	
9.10	Undisclosed Hazardous Environmental Condition	
9.11	Evidence of Financial Arrangements	43
9.12	Safety Programs	
Article 1	0—Engineer's Status During Construction	
10.01	Owner's Representative	
10.02	Visits to Site	
10.03	Resident Project Representative	
10.04	Engineer's Authority	
10.05	Determinations for Unit Price Work	45
10.06	Decisions on Requirements of Contract Documents and Acceptability of Work	45
10.07	Limitations on Engineer's Authority and Responsibilities	45
10.08	Compliance with Safety Program	45
Article 1	1—Changes to the Contract	46
11.01	Amending and Supplementing the Contract	46
11.02	Change Orders	46
11.03	Work Change Directives	46
11.04	Field Orders	47
11.05	Owner-Authorized Changes in the Work	47
11.06	Unauthorized Changes in the Work	47
11.07	Change of Contract Price	47
11.08	Change of Contract Times	
11.09	Change Proposals	
11.10	Notification to Surety	50

Article 12-	-Claims	50			
12.01	Claims	50			
Article 13-	Article 13—Cost of the Work; Allowances; Unit Price Work				
13.01	Cost of the Work	51			
13.02	Allowances	55			
13.03	Unit Price Work	55			
Article 14—Tests and Inspections; Correction, Removal, or Acceptance of Defective Work		56			
14.01	Access to Work	56			
14.02	Tests, Inspections, and Approvals	56			
14.03	Defective Work	57			
14.04	Acceptance of Defective Work	58			
14.05	Uncovering Work	58			
14.06	Owner May Stop the Work	58			
14.07	Owner May Correct Defective Work	59			
Article 15-	-Payments to Contractor; Set-Offs; Completion; Correction Period	59			
15.01	Progress Payments	59			
15.02	Contractor's Warranty of Title	62			
15.03	Substantial Completion	62			
15.04	Partial Use or Occupancy	63			
15.05	Final Inspection	64			
15.06	Final Payment	64			
15.07	Waiver of Claims	65			
15.08	Correction Period	66			
Article 16-	-Suspension of Work and Termination	67			
16.01	Owner May Suspend Work	67			
16.02	Owner May Terminate for Cause	67			
16.03	Owner May Terminate for Convenience	68			
16.04	Contractor May Stop Work or Terminate	68			
Article 17-	Article 17—Final Resolution of Disputes69				
17.01	Methods and Procedures	69			
Article 18—Miscellaneous					
18.01	Giving Notice	69			
18.02	Computation of Times	69			

EJCDC<sup>®</sup> C-700, Standard General Conditions of the Construction Contract. Copyright<sup>®</sup> 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved. TOC Page 4 of 5

18.03	Cumulative Remedies	70
18.04	Limitation of Damages	70
18.05	No Waiver	70
18.06	Survival of Obligations	70
18.07	Controlling Law	70
18.08	Assignment of Contract	70
18.09	Successors and Assigns	70
18.10	Headings	70
## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

#### 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
  - 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;
  - 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;
  - 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, 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 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.
  - 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
      - 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
  - 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 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.
  - 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
  - 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
- I. 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):
  - 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 00800 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (NSPE/ACEC Document No. C-700, 2018 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1.01A.42 Delete the definition of *Substantial Completion* and insert the following in its place:

42. *Substantial Completion* - The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Engineer as evidenced by Engineer's definitive Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents and that all conditions precedent to Substantial Completion have been met in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Add the following definitions at the end of Article 1 - definitions of the Standard General Conditions of the Construction Contract:

- SC-1.01.A.51 <u>Compensable Delay</u> Any delay beyond the control and without the fault or negligence of the Contractor resulting from Owner-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by the Owner.
- SC-1.01.A.52 <u>Correction Period</u> The time during which the Contractor must correct defective Work or remove defective Work from the site and replace it with non-defective Work, all at no cost to the Owner, pursuant to paragraph 14.03 of the General Conditions, as supplemented.
- SC-1.01A.53 <u>Final Completion</u> The date upon which final payment is due to be paid by Owner to Contractor.
- SC-1.01A.54 <u>Excusable Delay</u> Any delay beyond the control and without the fault or negligence of the Contractor, the Owner, or any other Contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, acts of interveners, acts of the government, fires, floods, epidemics, quarantine restrictions, freight embargoes, and hurricanes, tornadoes, or new sink holes. Labor disputes and above average rainfall shall give rise only to Inexcusable Delays.
- SC-1.01A.55 <u>Float or Slack Time</u> The time available in the progress schedule during which an unexpected activity can be completed without delaying the Substantial Completion of the Work.

- SC-1.01A.56 <u>Initiation of Operation</u> The date when the Owner actually begins to use the entire Work for the purposes for which it was planned, designed and built, thus commences the Correction Period. The Owner shall not be deemed to have accepted the Work until Initiation of Operation.
- SC-1.01A.57 <u>Modification</u> (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Field Order. A modification may be issued after the Effective Date of the Agreement.
- SC-1.01A.58 <u>Inexcusable Delay</u> Any delay caused either (i) by events or circumstances within the control of the Contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the Contractor, (ii) by weather conditions (other than hurricanes and tornadoes) or (iii) labor disputes.
- SC-1.01A.59 <u>Non-Prejudicial Delay</u> Any delay impacting a portion of the Work within the available total Float or Slack Time, as that term is used in Section 01 31 00: Progress Schedules, and not necessarily preventing completion of the Work within the Contract Time.
- SC-1.01A.60 <u>Prejudicial Delay</u> Any Excusable or Compensable Delay impacting the Work and exceeding the total Float Time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.
- SC-1.01A.61 <u>Preoperational Testing (Check-Out-Testing)</u> All field inspections, installation checks, water tests, performance tests, and necessary corrections required of the Contractor as a condition or conditions to achieving Substantial Completion to demonstrate to the Owner and Engineer that individual components of the Work have been properly constructed and operate in accordance with the Contract Documents for their intended purposes.
- SC-1.01A.62 <u>Start-Up Testing (Demonstration Testing)</u> A predefined trial period required as a condition to Initiation of Operation during which Contractor is to operate the entire Work (or any part thereof agreed to by the Owner) under actual and simulated operating conditions for the purpose (i) of making such minor adjustments and changes to the Work as may be necessary for the Work to comply with the Contract Documents and (ii) of complying with the final test requirements in the Contract Documents."
- SC-2.02 Modify paragraph 2.02A of the General Conditions:
  - A. Owner shall furnish Contractor one portable document format (PDF) copy of contract.
- SC-3.03 Add the following immediately after paragraph 3.03 A.3. of the Standard General Conditions:
- A. The Contractor shall not take advantage of any apparent error or omissions which may be found in the Drawings or Specifications, and the Engineer shall be entitled to make such corrections therein and interpretations thereof as may be deemed necessary for the fulfillment of their intent. The Contractor shall be responsible for all errors in construction which could have been avoided by such examination and notification and shall correct, at its own expense, all Work improperly constructed through failure to notify the Engineer and request specific instructions.
- SC-3.03 Add the following immediately after paragraph 3.03B:
  - C. Order of Precedence of Contract Documents:
    - 1. In resolving differences resulting from conflicts, errors or discrepancies in any of the following Contract Documents, the order of precedence shall be as follows:
      - a. Permits
      - b. Change Orders
      - c. Contract Agreement
      - d. Specification
      - e. Drawings
    - 2. Within the Specifications, the order of precedence is as follows:
      - a. Addenda
      - b. Notice to Bidders
      - c. Instructions to Bidders
      - d. Supplementary General Conditions
      - e. General Conditions
      - f. Division 1, General Requirements
      - g. Technical Specifications
      - h. Referenced Standard Specifications
    - 3. With reference to the Drawings, the order of precedence is as follows:
      - a. Figures govern over scaled dimensions
      - b. Detail drawings govern over general drawings
      - c. Change order drawings govern over contract drawings
      - d. Contract drawings govern over standard or shop drawings

- SC-4.01 Delete paragraph 4.01 of the General Conditions in its entirety and insert the following in its place.
  - A. A "Notice to Proceed" may be given to the Contractor at any time after the Effective date of the Agreement. The Contract Time will commence to run on the day indicated in the Notice to Proceed. In no event will the Contract Time commence to run later than the sixtieth (60th) day after the Effective Date of the Agreement.
- SC-5.04 Change the first sentence in the paragraph to "Then Contractor shall, within three (3) days after becoming aware thereof..."
- SC-5.06 Add a new paragraph immediately after paragraph 5.06 K of the Standard General Conditions which is to read as following:
  - L. No claim of the Contractor under paragraphs 5.03, 5.05 and 5.06 shall be allowed unless, (1) the Contractor has given the notice required in sub-paragraph 5.06E, and (2) within thirty (30) days (but before final payment) after the Contractor has given written notice, the Contractor submits to the Owner a detailed claim setting forth the Contractor's right to an increase in the Contract Price or extension of the Contract Time as provided in Articles 11 and 13 of the Standard General Conditions.
  - SC-6.01 Add a new paragraph immediately after paragraph 6.01 C of the Standard General Conditions which is to read as follows:
    - 1. The following requirements shall be met by all surety companies furnishing bid, performance, payment or other type of Bonds:
      - a. The Surety shall be rated as "A" or better as to General Policyholders Rating and Class X or better as to Financial Category by Best's Key Rating Guide, published by Alfred M. Best Company, Inc., 75 Fulton Street, New York, New York, 10038.

All Surety Companies are subject to approval and may be rejected by the Owner without cause.

2. Limitations: Bonding limits or bonding capacity refers to the limit or amount of Bond acceptable on any one (1) risk.

a. The bonding limit of the Surety shall not exceed ten percent

(10%) of the policyholder surplus (capital and surplus) as listed by the aforementioned Best's Key Rating Guide, on any one risk (penalty or amount of any one bond).

- 3. Requirements:
  - a. Policyholders surplus is required to be five (5) times the amount of any one bond.
  - b. The Agent countersigning the bond shall be resident in the County where the Project is located and/or other counties that are acceptable to the Owner.
- SC-6.01 Add a new paragraph immediately after paragraph 6.01 H of the Standard General Conditions which read as follows:
  - I. Contractor shall pay Owner all losses, damages, expenses, costs, and attorney's fees, including but not limited to any appellate proceedings, which the Owner sustains because of default by the Contractor under the contract.
- SC-7.02 Add the following sub-paragraphs immediately after paragraph 7.02 B of the Standard General Conditions which are to read as follow:
  - C. The Owner reserves the right to review and approve the resident superintendent.
- SC-7.03 Add the following sub-paragraphs immediately after paragraph 7.03C of the Standard General Conditions which are to read as follow:
  - D. Maintenance work may be performed during hours other than regular working hours. Regular working hours are defined as daylight hours between one-half hour after sunrise to one-half hour before sunset. Requests to Work during other regular working hours must be submitted to the Owner at least seventy-two (72) hours in advance of the period proposed for such irregular working hours and shall set forth the proposed schedule for such hours to give the Owner ample time to arrange for its personnel to be at the site of the Work.
  - E. The Owner will pay for charges of Engineer and construction observation performed during regular working hours. The Contractor shall pay for additional engineering and construction observations charges required during irregular hours which may be authorized under the provisions of paragraph SC-7.03D. The rate paid to the Owner by the Contractor for additional engineering and construction observation changes shall be in accordance with the existing Contract between the Owner and Engineer.

- F. The Contractor shall also pay for the costs of additional engineering charges and construction observation required during the correction of defective Work. Such additional costs incurred during irregular working hours and during the correction of defective Work, shall be a subsidiary obligation of the Contractor and no extra payment shall be made by the Owner on account of such Work.
- SC-7.07E. Revise 2<sup>nd</sup> to last sentence of paragraph to "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 within 45 days of identification submission), 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."
- SC-7.13 Add the following paragraphs immediately following paragraph 7.13J.
  - K. The Engineer is not responsible for the safety of any person on the jobsite other than the Engineer's own employees. The Engineer has no authority to exercise any control over any construction Contractor or other entity or their employees in connection with their work or any health or safety precautions. The Owner agrees that the Contractor is solely responsible for jobsite safety and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Owner agrees that the Engineer shall be entitled to indemnification from the Contractor for any loss incurred by the Engineer arising out of any claim brought by any person or personal injuries sustained on the jobsite and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Engineer shall be made an additional insured under the Contractor's general liability insurance policy for personal injuries to any person sustained on the jobsite.
- SC-8.02 Add the following paragraphs immediately following paragraph 8.02B:
  - C. The Contractor shall cooperate with all other Contractors who may be performing Work on behalf of the Owner in the vicinity of the Work to be done under this contract, and he shall conduct his operation as to interfere to the least possible extent with the Work of such Contractor.
  - D. If the Work is delayed because of any acts of omissions of any other Contractor, the Contractor shall have no claim against the Owner on that account.
- SC-15.01D This section is hereby deleted. The requirements of Florida Statute 218.735 of the Florida Prompt Payment Act shall apply.
- SC-15.08 Add the following new sub-paragraph immediately after sub-paragraph 15.08A.4:

- 5. When deemed necessary by Owner, Contractor shall furnish and install at no cost to Owner, such temporary equipment and material necessary to maintain functionality of the Work while defective Work is being corrected or replaced.
- SC-15.08 Add the following new paragraphs immediately after paragraph 15.08F:
  - G. Subject to adjustments as described in sub-paragraph 15.08H, the period during which the Contractor must correct defective Work or remove it from the site and replace it with non-defective Work, all at no cost to the Owner (the "Correction Period"), shall be no more than one (1) year. If the date of Substantial Completion is not the same date as Initiation of Operation, such Correction Period shall commence upon Initiation of Operation, not upon the date of Substantial Completion and Initiation of Operation shall not exceed one hundred (100) days.
  - H. No later than thirty (30) days before Initiation of Operation the Owner shall notify the Contractor in writing of the date upon which Initiation of Operation is expected to occur, and the Contractor shall ensure that the Work is ready in its entirety by such date for use by the Owner as contemplated in the Contract Documents.
  - I. From the date of Substantial Completion until Initiation of Operation, the Contractor shall bear all risks of injury, loss, or damage to any part of the Work arising from the elements or from any other cause. The Contractor shall rebuild, repair, restore, and make good at no cost to the Owner, all injuries, losses, or damage to any portion of the Work occasioned by any cause and shall, at no expense to the Owner, provide suitable drainage and erect such temporary structures and take all other actions as are necessary for the protection of the Work. Suspension of the Work or the granting of an extension of the Contract Time for any cause shall not relieve the Contractor of its responsibility for the Work as herein specified. The Contractor's responsibilities under this paragraph 15.08 are in addition to, not in lieu of, all other obligations imposed by these Contract Documents.
- SC-17 Delete Article 17 and all other references to "Dispute Resolution Agreement" in the Standard General Conditions. Disputes between Owner and Contractor shall be arbitrated only if and to the extent agreed to by the parties at the time each dispute arises. The Contractor shall carry on the Work and maintain the progress schedule during any dispute, regardless of how resolved, unless otherwise mutually agreed in writing. Venue for any litigation, at law or equity or arbitration, shall lie exclusively in the place of the County of the Owner's location. This Contract, or any provision hereof, shall be construed and interpreted, and any litigation arising there from, shall be governed by the laws of the State of Florida.

## SECTION 01 00 00 GENERAL REQUIREMENTS

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work: The Work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all Work included in this Contract. The summary of the Work is presented in Section 01 11 00: Summary of Work.
- B. Work Included:
  - 1. The Contractor shall furnish all labor, superintendence, materials, plant power, light, heat, fuel, water, tools, appliances, equipment, supplies, and means of construction necessary for proper performance and completion of the Work. The Contractor shall obtain and pay for all necessary local building permits. The Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the Work and maintain it during and after construction, until accepted, and shall do all Work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.
  - 2. The cost of incidental work described in these Project Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the Work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.
  - 3. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the Work required by this

Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials, and equipment, prior approval of the Engineer notwithstanding.

- C. Public Utility Installations and Structures:
  - 1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies, or privately owned by individuals, firms, or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water, or other public or private property which may be affected by the Work shall be deemed included hereunder.
  - 2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition, and extent of all such installations and structures as may be encountered and as may affect the construction operations.
  - 3. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor shall be repaired by the Contractor, at his expense. No separate payment shall be made for such protection or repairs to public utility installations or structures.
  - 4. Public utility installations or structures owned or controlled by the Owner or other governmental body which are shown on the Drawings to be removed, relocated, replaced, or rebuilt by the Contractor shall be

considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract Items; therefore, no separate payment shall be made.

- 5. Where public utility installations of structures owned or controlled by the Owner or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement, or rebuilding is necessary to complete the Work under this Contract, such Work shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously, and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement, or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the Agreement.
- 6. The Contractor shall, at all times in performance of the Work, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage, or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.
- 7. The Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least 48-hours in advance of breaking ground in any area or on any unit of the Work.
- 8. The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

#### 1.02 DRAWINGS AND PROJECT MANUAL

- A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.
- B. Supplementary Drawings:
  - 1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer, and the Contractor will be furnished an electronic copy of the plans and project manual.
  - 2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation therefore to the Contractor shall be subject to the terms of the Agreement.
- C. Contractor to Check Drawings and Data:
  - 1. The Contractor shall verify all dimensions, quantities, and details shown on the Drawings, Supplementary Drawings, schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction, or improper operation resulting there from, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.
  - 2. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall

assume all responsibility or the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

- D. Specifications: The Technical Specifications consist of three (3) parts: General, Products, and Execution. The General part of a Specification contains General Requirements which govern the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.
- E. Intent:
  - 1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
  - 2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, the interpretation of these Specifications shall be made upon that basis.

#### 1.03 MATERIALS AND EQUIPMENT

- A. Manufacturer:
  - 1. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request and at the Engineer's option, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

- 2. Any two (2) or more pieces of material or equipment of the same kind, type, or classification, and being used for identical types of service, shall be made by the same manufacturer.
- B. Delivery:
  - 1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.
  - 2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.
- C. Tools and Accessories:
  - 1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one (1) complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.
  - 2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.
  - 3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.
- D. Service of Manufacturer's Engineer:
  - 1. The Contract Prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install,

adjust, test, and place in operation, the equipment in conformity with the Contract Documents.

2. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

#### 1.04 INSPECTION AND TESTING

- A. General:
  - 1. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. One (1) original and one (1) electronic copy of the reports shall be submitted, and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.
  - 2. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof, and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the Work and replace it with acceptable material, without cost to the Owner.
  - 3. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with the recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.
  - 4. The Contractor shall be fully responsible for the proper operation of equipment during testing and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

- B. Costs:
  - 1. All inspection and testing of materials furnished under this Contract will be provided by the Contractor, unless otherwise expressly specified.
  - 2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor, and such costs shall be deemed to be included in the Contract Price.
  - 3. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests of materials and equipment which are rejected for non-compliance.
- C. Certificate of Manufacture:
  - 1. Contractor shall furnish to Engineer authoritative evidence in the form of a certificate of manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents.
  - 2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.
- D. Shop Tests:
  - 1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.

- 2. Five (5) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be submitted to the Engineer for approval.
- 3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.
- E. Start-up Tests:
  - 1. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make start-up tests of equipment.
  - 2. If the start-up tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to demonstration tests, make all changes, adjustments, and replacements required. The furnishing Contractor shall assist in the start-up tests as applicable.
- F. Demonstration Tests:
  - 1. Prior to Contractor's request for a Substantial Completion inspection, all equipment and piping installed under this Contract shall be subjected to demonstration tests as specified or required to prove compliance with the Contract Documents.
  - 2. The Contractor shall furnish labor, fuel, energy, water, and all other materials, equipment, and instruments necessary for all demonstration tests, at no additional cost to the Owner. Contractor shall assist in the demonstration tests as applicable.

#### 1.05 LINES AND GRADES

- A. Grade:
  - 1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
  - 2. The vertical bench marks provided is USGS "Public Records" monumentation and the horizontal control is the monumentation on plats contained in the "Public Records of Volusia County."
- B. Surveys:
  - 1. The Contractor shall furnish and maintain, at his own expense, stakes and other such materials.
  - 2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies.
  - 3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review by the Engineer.
- C. Safeguarding Marks:
  - 1. The Contractor shall safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes, and marks.

2. The Contractor shall safeguard all existing and known property corners, monuments, and marks adjacent to but not related to the Work and shall bear the cost of re-establishing them if disturbed or destroyed.

#### PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

#### END OF SECTION

## SECTION 01 11 00 SUMMARY OF WORK

#### PART 1 - GENERAL

#### 1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. This Contract is for the construction of the LIFT STATION #5 REPLACEMENT. The work consists of furnishing all labor, equipment, and materials for the construction of the facilities consisting of, but not limited to, the following:

Replacement of the City's Lift Station #5. Work includes demolition of existing lift station, installation of a new wet well with three (3) submersible pumps and one (1) mixer, emergency generator, odor control, new electrical system and associated improvements. Pump, mixer, and permanent bypass pump equipment will be provided by the City.

- B. The Contractor shall furnish all labor, equipment, tools, services and incidentals to complete all Work required by these Specifications and as shown on the Drawings.
- C. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, cleanup, replacements and restoration required as a result of damages caused during this construction.
- D. All materials, equipment, skills, tools and labor which is reasonably and properly inferable and necessary for the proper completion of the Work in a substantial manner and in compliance with the requirements stated or implied by these Specification or Drawings shall be furnished and installed by the Contractor without additional compensation, whether specifically indicated in the Contract Documents or not.
- E. The Contractor shall comply with all City, County, State, Federal, and other codes which are applicable to this Project.

#### 1.02 CONTRACTOR'S USE OF PREMISES

A. The Contractor shall assume full responsibility for the protection and safekeeping of products and materials at the job site. If additional storage or work areas are required, they shall be obtained by the Contractor at no additional cost to the Owner.

#### 1.03 PROJECT SEQUENCE

A. The Contractor shall establish his work sequence based on the use of crews to facilitate completion of construction and testing within the specified Contract time.

#### END OF SECTION

## SECTION 01 20 00 PRICE AND PAYMENT PROCEDURES

#### PART 1 – GENERAL

#### 1.01 SCOPE

A. Separate payment will be made only for the items of work described herein and listed on the Bid Form. Any related work not specifically listed, but required for satisfactory completion of the work, shall be considered to be included in the scope of the appropriate listed work items.

B. The Contractor's attention is called to the fact that cleanup is considered a part of the work of construction. No payment will be made until cleanup is essentially complete.

C. No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work if not shown as a separate pay item.

- 1. Clearing and grubbing.
- 2. Excavation, including necessary pavement base removal.
- 3. Shoring and sheeting.
- 4. Dewatering and disposal of surplus water.
- 5. Structural fill.
- 6. Backfill.
- 7. Grading.
- 8. Replacement of unpaved roadways, grass, and shrubbery plots.
- 9. Cleanup.
- 10. Testing and placing system in operation.
- 11. Any material and equipment required to be installed and utilized for the test.
- 12. Pipe, structures, pavement replacement and/or appurtenances included within the limits of lump sum work.
- 13. Maintaining the existing quality of service during construction.
- 14. Appurtenant work as required for a complete and operable system.
- 15. Maintaining or detouring or traffic.
- D. No payment shall be made for work constructed outside the authorized limits of work.

#### PART 2 - MATERIALS AND EQUIPMENT

#### 2.01 **Pre-Construction Video**

Lump sum payment will be made based on delivery to the City of two copies with documentation of the video for the project route. The contract lump sum price shall be full compensation for all materials and work necessary to complete the professional videotaping in accordance with the project specifications. Construction work shall not start until DVD's are delivered and approved by the project representative.

#### 2.02 **Bypass Pumping**

Lump sum payment will be made at the completion of the operational lift station for temporary bypass pumping. The bypass pumping system shall be duplex pumps and each pump shall be capable of passing the flows with one unit on standby. Temporary systems shall be automatic float operated and switch over to standby, have cellular alarm notification, and have a noise level no greater than 70 dba at seven (7) meters.

#### 2.03 **Demolition of Existing Lift Station**

Lump sum payment will be made for the demolition, removal of equipment, abandonment, filling, and/or other work to existing facilities as shown on the plans and as required to complete the required work. Restoration, including fill required, shall be included. Demolished facilities shall be shown on the as-builts. City shall have right to all abandoned equipment. CONTRACTOR is responsible for proper disposal of all removed materials.

#### 2.04 **Complete Lift Station**

Lump sum payment will be made for the pumps, mixer, rails, top slab, hatch, new wetwell, valves, valve vault, yard piping, mechanical equipment, permanent bypass pump, and all other items necessary for a complete installation. This includes all materials, equipment and labor required to construct the station as shown on the plans and described in the specifications.

**Bid Item 4** 

#### **Bid Item 1**

**Bid Item 2** 

#### **Bid Item 3**

#### 01 20 00-3

#### 2.05 Tie-Ins

Payment will be made at the applicable unit price for the cost of the "tie-in" performed. The lump sum price will be full compensation for all pipe, valves, fittings, materials and labor required to satisfactorily accomplish this item as detailed in the plans and specifications.

#### 2.06 Odor Control

Lump sum payment will be made for the installation of the odor control system, as shown on the plans and described in the specifications. This includes all materials, equipment and labor required to construct the odor control system for a complete and operable system.

#### 2.07 Electrical

Lump sum payment will be made for the installation of all Electrical equipment, as shown on the plans and described in the specifications. Payment will be full compensation for furnishing all plant labor, materials, equipment, and electrical work to integrate and connect the new motors, lighting, control panels, telemetry, junction boxes, cables, wiring, and miscellaneous components required to complete all electrical work in accordance with the contract plans, specifications, the National Electric Code and FBC. CONTRACTOR shall obtain requisite electrical permits prior to commencement of work.

#### 2.08 Generator and Fuel Tank

Lump sum payment will be made for the complete installation of the generator and fuel tank system, including the generator, ATS, wiring, fuel tank, fuel piping, concrete slabs, etc. The lump sum price shall be full compensation for all materials, equipment and labor required for a complete and operable system.

#### 2.09 FPL Power Switchover Allowance

An allowance is established to pay costs directly to FPL for the electrical switchover to 460v 3ph power. No provisions for mark-up are included within the allowance.

**Bid Item 6** 

**Bid Item 7** 

#### Bid Item 9

**Bid Item 8** 

#### 2.10 Permit Allowance

An allowance is established to pay costs associated with building permit fees and ancillary costs associated with construction of the lift station improvements. No provisions for mark-up are included within the allowance.

#### 2.11 As-Built Plans

Lump sum payment will be made based on delivery of record drawings produced by a licensed surveyor conforming to the specifications. Periodical record drawings shall be submitted with each pay estimate on which the ENGINEER shall rely to ensure the improvements are constructed in accordance with the design locations and elevations. Progress payments submitted without updated record drawings to document work constructed that pay period shall be a basis for rejection of the pay request until such time as adequate record drawings are submitted.

#### 2.12 Restoration, Landscaping, Wall and Gate

At the completion of construction, lump sum payment shall be made for site restoration to provide landscaping, irrigation, precast wall, gate, rock interior, sod, positive drainage, acceptable finish grades, base and asphalt pavement restorations. All pavement, sod, grading for a final site acceptable to the City and their project representative are included in this pay item.

#### END OF SECTION

#### Bid Item 12

# Bid Item 11

## SECTION 01 29 73 SCHEDULE OF VALUES

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work, at the Pre-Construction Conference, and as otherwise specified or requested to be submitted earlier as evidence of the Apparent Low Bidder's qualifications.
  - 2. Upon request of the Engineer support the values with data which will substantiate their correctness. The data shall include, but not be limited to quantity of materials, all sub-elements of the activity, and their units of measure.
  - 3. The Schedule of Values shall establish the actual value for each activity of the Work to be completed taken from the approved Critical Path Method (CPM) Construction Schedule and shall be used as the basis for the Contractor's Applications for Payment.
- B. Related Requirements Described Elsewhere:
  - 1. Conditions of the Construction Contract.

#### 1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Identify schedule with:
  - 1. Title of project and location.
  - 2. Owner and purchase order number.
  - 3. Engineer and project number.
  - 4. Name and address of Contractor.

- 5. Contract designation.
- 6. Date of submission.
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing item prices for progress payments during construction.
- C. Identify each line item with the number and the title of the respective section of the Specifications.
- D. For each major item of the Work, list sub-values of major products or operations under the major item.
- E. For the various portions of the Work:
  - 1. The amount for each item shall reflect a total installed cost including a directly proportional amount of the Contractor's overhead and profit.
  - 2. For items on which progress payments will be requested for stored materials, break down the value into:
    - a. The cost of the materials delivered and unloaded, with taxes paid.
      Paid invoices are required for materials. Payment for materials shall be limited to the invoiced amount only.
    - b. The total installed value.
- F. Round off figures to nearest dollar amount.
- G. The sum of the costs of all items listed in the schedule shall equal the total Contract Price.
- H. For each item which has an installed value of more than \$15,000, provide a breakdown of costs to list major products or operations under each item.

#### 1.03 SUB-SCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a separate schedule of unit prices for materials to be stored on site and for those materials incorporated into the Work for which progress payments will be requested.
- B. The unit values for the materials shall be broken down into:
  - 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
  - 2. Copies of paid invoices for component material shall be included with the payment request in which the material first appears.
- C. Only materials unique to the project may be billed when stored on site. Materials of standard use such as conduit, wire, small-diameter pipe, steel, etc., shall not be accepted for payment.
- D. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

#### 1.04 REVIEW AND RESUBMITTAL

- A. After review by Engineer, revise and resubmit Schedule of Values and Schedule of Unit Material Values as required.
- B. Resubmit revised schedules in same manner.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

#### END OF SECTION

## SECTION 01 29 76 PROGRESS PAYMENT PROCEDURES

#### PART 1 – GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work: Submit Application for payment to the ENGINEER on accordance with schedule established by Conditions of the Contract and Agreement between OWNER and CONTRACTOR. CONTRACTOR shall use the Application and Certificate for Payment Form included on Section 00 84 40 as the official pay request form.
- B. Related Requirements Described Elsewhere:
  - 1. Agreement: Section 00 50 00.
  - 2. Construction Progress Schedule: Section 01 32 16.
  - 3. Schedule of Values: Section 01 29 73.
  - 4. Photographic Documentation: Section 01 32 33.
  - 5. Project Record Documents: Section 01 78 39.

#### 1.02 FORMAT REQUIRED

- A. Submit applications typed on the form provided in Division 0, Section 00 84 40:
  Application and Certificate for Payment Form, with itemized data typed on eight and one-half inch by 11 inch (8-1/2" x 11") or white paper continuation sheets.
- B. Provide itemized data on continuation sheets of format, schedules, line items, and values specified on the Application and Certificate for Payment Form. The CONTRACTOR shall use the item descriptions and contract values included in schedule of values, approved, and accepted by the ENGINEER as a basis for preparation of the Application for Payment Form.

#### 1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
  - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
  - 2. Fill in percent complete for each activity and dollar values to agree with respective percent.
  - 3. Execute certification with signature of a responsible officer of CONTRACTOR.
- B. Continuous Sheets:
  - 1. Fill in total of all scheduled component items of the Work, with item number and schedule dollar value for each item.
  - 2. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
  - 3. List each Change Order executed prior to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item Work.
  - 4. To receive approval for payment on component material stored on site, submit copies of the original invoices with Application and Certificate for Payment.
  - 5. As provided for in the Application and Certificate for Payment Form, the CONTRACTOR shall certify, for each current pay request, that all previous progress payments received from the OWNER, under this Contract, have been applied by the CONTRACTOR to discharge in full, all obligations of the CONTRACTOR in connection with Work covered

by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances. CONTRACTOR shall attach to each Application and Certificate for Payment like affidavits by all Subcontractors.

#### 1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. CONTRACTOR shall submit suitable information, with a cover letter identifying:
  - 1. Project.
  - 2. Application number and date.
  - 3. Detailed list of enclosures.
  - 4. For stored products:
    - a. Item number and identification as shown on application.
    - b. Description of specific material.
- B. Submit one (1) copy of data and cover letter for each copy of application.
- C. The CONTRACTOR is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01 78 39: Project Record Documents. As a prerequisite for monthly progress payments, the CONTRACTOR is to exhibit the updated record drawings for review by the OWNER and the ENGINEER.
- D. Each monthly application for payment shall incorporate the corresponding "monthly progress status report" and updated construction schedule, prepared in accordance with the requirements of Section 01 32 16: Construction Progress Schedule.
- E. As a prerequisite for payment, CONTRACTOR shall submit a duly executed letter from surety consenting to payment due and progress to date.

F. Provide construction photographs in accordance with Section 01 32 33: Photographic Documentation.

#### 1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments. Provide information as required by the General Conditions and Section 01 77 00: Closeout Procedures.
- B. Furnish evidence of completed operations and insurance in accordance with the General Conditions.
- C. Provide CONTRACTOR's Final Release of Lien (Section 00 84 90) and other close-out submittals as required by the General Conditions.

#### 1.06 SUBMITTAL PROCEDURE

- A. Submit Application for Payment to the ENGINEER at the time stipulated in the Agreement, or as agreed to at the pre-construction meeting. Review the percents complete with the ENGINEER and resolve any conflict or discrepancies.
- B. Application for payment to be submitted electronically in color for processing and payment.
- C. When the ENGINEER finds the Application and Certificate for Payment Form is properly completed and correct, he will execute the Certificate for Payment and transmit the forms to the OWNER, with a copy to the CONTRACTOR.

#### PART 2 – PRODUCTS (NOT USED)

#### PART 3 – EXECUTION (NOT USED)

#### END OF SECTION

#### SECTION 01 30 00 ADMINISTRATIVE REQUIREMENTS

#### PART 1 - GENERAL

- 1.01 The Contractor shall not have any right in property in any materials taken from any excavation and he shall not remove any earth, sand or other material from the lines of the work before the excavation is refilled except upon direction of the Engineer. The provisions of this paragraph shall not be construed as relieving the Contractor of any kind of his obligations to remove and dispose of any of the material excavated, with or without rehandling, at his cost and expense as provided in these specifications.
- 1.02 Where reference is made within these documents to government specifications, or those of well known organizations such as ASTM, ASA, ASME, etc., the latest editions shall be used, any or all references in these documents to earlier stated editions notwithstanding.
- 1.03 The Contractor shall take all necessary precautions to prevent damage to existing pipe which is to remain in service during any of his construction operations. Should such pipe be damaged by the Contractor, he shall be required to replace it to the complete satisfaction of the Engineer, at no additional cost to the Owner.
- 1.04 The Contractor agrees that the work shall be started no later than the date indicated in the Notice to Proceed, and that the total work shall be completed within **90** calendar days.

The Contractor further agrees that for each calendar day, with the exception of Sundays and legal holidays, that any such work shall remain uncompleted after the completion time, the sum of **One Thousand Dollars (\$1,000)** per day shall be deducted by the Owner from monies due the Contractor, not as a penalty but as liquidated damages. If the Contractor is declared in default in accordance with the provisions of the specifications, liquidated damages shall be charged as provided herein, and such amounts shall be deducted from the final amount payable to the Contractor or his Surety. Should the total amount chargeable as liquidated damages exceed the amount due or payable to the Contractor or his Surety, then such excess shall be paid to the Owner by the Contractor or his Surety.

1.05 At least thirty (30) days prior to the first progress payment request, the Contractor shall submit to the Owner a schedule of anticipated draws, which estimates as accurately as possible the amount of the anticipated "work in place" which will be completed each month.

Failure to comply may result in delay in payment, as funds from several sources customarily serve as the project funding source.

- 1.06 All dewatering and bypass pumping necessary to accomplish the work of this Contract shall be done by the Contractor at no extra or additional cost to the Owner. Any permits required will be the responsibility of the Contractor.
- 1.07 Examination of Contract Documents and Site. Before submitting a Bid each Contractor must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the work, (c) familiarize himself with federal, state and local laws, ordinance, rules and regulations that may in any manner affect cost, progress or performance of the work, and (d) study and carefully correlate Bidder's observations with the Contract Documents.
- 1.08 The Contractor is required to maintain the water service to customers within the project area at no extra cost to the Owner.
- 1.09 The Contractor is responsible for recording the Payment and Performance Bond and the Public Construction Bond in the Official Records of Volusia County, Florida. The Contractor shall provide copies of the recorded documents and/or the recording receipt from the County Clerk's office to the Engineer prior to the issuance of the "Notice to Proceed". The Contractor shall be responsible for paying all costs associated with the recording of these documents and no separate contract payment shall be made to the Contractor for this item.
- 1.10 The Contractor acknowledges that he is responsible for complying with all aspects of the Florida Trench Safety Act (90-96, Laws of Fla.) effective October 1, 1990. He assumes all responsibility and costs entailed.
- 1.11 Construction materials may be stockpiled at the South Daytona Public Works Yard. Additional storage locations are allowed but all arrangements and costs incurred are the responsibility of the Contractor. Prior to making arrangements with individual property owners, the Contractor shall indicate to the City and the Engineer which sites have been targeted for material storage. The City reserves the right to approve or disapprove the proposed locations.

- 1.12 The Contractor is responsible for obtaining a St. Johns River Water Management District Permit for (dewatering) consumptive use if the Contractor's "means or methods" trip the Agency's thresholds requiring permits. No separate payment or contract time extension for the Contractor obtaining the permit will be granted by the City.
- 1.13 The Contractor shall submit an executed "Consent of Surety for Final Payment" form, copy of which is included with the Contract Documents, prior to submitting a final request for payment as well as lien releases from all suppliers filing 'Notice to Owners' with the City.
- 1.14 The Contractor is advised that all bypass pumping shall be coordinated with the Public Works Department. All pumping equipment, piping, operation and clean up is the sole responsibility of the Contractor.
- 1.15 All unit pricing shall remain valid for the duration of the contract.
- 1.16 Florida Sales Tax on materials, as well as all other customary taxes on construction activities, shall be paid for by the Contractor at no additional expense to the Owner.
- 1.17 All service outages shall be coordinated through the Public Works Department. Provisions shall be made for extended outages provisions may include temporary piping and services or alternative means of maintaining potable water service for affected residents. It is the Contractor's responsibility to notify the homeowner's of any potential impacts resulting from construction activities. The contractor shall document all notification procedures and provide written notification to the residents which specifically describe time frames for scheduled outages. Any claims for damages resulting from construction activities are the sole responsibility of the contractor.
- 1.18 The Contractor will set up an account and pay for all water used in the construction of the proposed improvements.
- 1.19 Construction shall be limited to weekday 'day light' working hours. No weekend, night time or holiday work shall be performed without obtaining permission in advance from the Project Engineer.

- 1.20 The Contractor must submit a work plan and traffic control plan in writing prior to commencement of work. The plan is subject to the approval of the fire department, police department, public works department and the Engineer.
- 1.21 The Contractor shall schedule his work in a manner that will result in a continuous process from commencement through completion. The intention of this requirement is to complete an area once work has commenced and avoid skipping from one site to another and disrupting several areas of the City simultaneously.
- 1.22 The Contractor must maintain access to driveways while construction is in progress.
- 1.23 This work may have an impact upon system customers. The Contractor shall have someone on call to take emergency calls on a 24 hour per day seven day per week basis. This individual will be able to respond to emergency calls from City personnel.

#### END OF SECTION

## SECTION 01 31 19 PROJECT MEETINGS

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. The Contractor shall coordinate with the Engineer to schedule and administer the preconstruction meeting, resident meeting, utility coordination, periodic progress meetings, and specifically called meetings throughout the progress of the Work.
  - 2. The Engineer shall:
    - a. Prepare agenda for meetings.
    - b. Make physical arrangements for meetings.
    - c. Preside at meetings.
    - d. Take and distribute meeting minutes.
  - 3. The Contractor shall:
    - a. Attend all meetings along with pertinent subcontractors and suppliers.
    - b. Appoint attendees who are qualified and authorized to act on behalf of the entity each represents.
    - c. Provide requested information at meetings.
  - 4. The Owner shall:
    - a. Attend meetings to ascertain that the Work is expedited consistent with Contract Documents and construction schedules.

#### B. RELATED REQUIREMENTS DESCRIBED ELSEWHERE:

1. Section 01 32 16 - Construction Progress Schedules

#### 01 31 19-1

- 2. Section 01 33 23 Shop Drawings, Product Data, and Samples
- 3. Section 01 78 39 Project Record Documents

#### 1.02 PRECONSTRUCTION MEETING

- A. Purpose: To initiate coordination of contractual requirements prior to start of work.
- B. Scheduling: Engineer will schedule a preconstruction meeting after execution of the Contract. Invites shall be sent via electronic mail.
- C. Location: A local site, convenient for all parties, designated by the Engineer.

#### D. Attendance:

- 1. Owner's representative.
- 2. Engineer and his sub-consultants.
- 3. Resident project representative.
- 4. Contractor and his superintendent.
- 5. Major subcontractors.
- 6. Representatives of major suppliers and manufacturers, as appropriate.
- 7. Governmental and franchised utility representatives, as appropriate.
- 8. Permit agency representatives, as appropriate.
- 9. Funding agency representatives, as appropriate.
- 10. Others as requested by the Contractor, Owner, and Engineer.
- E. Suggested Agenda:
  - 1. Introductions and Roles
  - 2. Contract Execution and Dates
    - a. Contracts
    - b. Contract Time/Dates
    - c. Copies of Conformed Documents
  - 3. Communications
    - a. Lines of Communication

- b. Coordination Meetings
- c. Contact List
- d. Requests for Information (RFIs)
- 4. Preconstruction Matters
  - a. Submittals
  - b. Material Acquisition
  - c. Mobilization
  - d. Permitting
- 5. Construction/Coordination
  - a. Working Days/Hours
  - b. Change Orders
  - c. Locating Existing Facilities
  - d. Demolition
  - e. Testing
  - f. Updated Schedules
- 6. Pay Requests
  - a. Process
  - b. Schedule of Values
  - c. Stored Materials
  - d. Preliminary As-Builts
- 7. Contract Closeout
  - a. Substantial Completion
  - b. Punch-list
  - c. Final Acceptance
  - d. Warranty
  - e. Final Payment
#### 1.03 RESIDENT MEETING(S)

- A. Purpose: To present construction approach to effected residents and to allow residents to ask questions concerning such.
- B. Scheduling: Engineer/Owner will schedule resident meeting(s) after preconstruction meeting is held, but before construction begins. Invites shall be distributed via electronic mail and hard copy flyers. Contractor shall assist in the distribution of flyers.
- C. Location: A local site, convenient for all parties, designated by the Engineer/Owner.
- D. Attendance:
  - 1. Owner's representative.
  - 2. Engineer.
  - 3. Resident project representative.
  - 4. Contractor and his superintendent.
  - 5. Major subcontractors, as appropriate.
  - 6. Residents.
- E. Suggested Agenda: To be determined by Engineer/Owner

#### 1.04 UTILITY COORDINATION MEETING(S)

- A. Purpose: To discuss the coordination of the construction with existing and proposed utilities.
- B. Scheduling: Engineer will schedule utility coordination meeting(s) as needed.
  These meetings may be held in conjunction with Progress Meetings. Invites shall be distributed via electronic mail.
- C. Location: A local site, convenient for all parties, designated by the Engineer.

- D. Attendance:
  - 1. Owner's representative.
  - 2. Engineer.
  - 3. Resident project representative.
  - 4. Contractor and his superintendent.
  - 5. Major subcontractors, as appropriate.
  - 6. Utility representatives.
- E. Suggested Agenda: To be determined by Engineer.

# 1.05 PROGRESS MEETINGS

- A. Purpose: To discuss the progress of the construction and projected work activities.
- B. Scheduling: Engineer will schedule progress meetings on a regular basis at a minimum frequency of once per week and at a maximum frequency of once per month. Invites shall be distributed via electronic mail.
- C. Location: A local site, convenient for all parties, designated by the Engineer.
- D. Attendance:
  - 1. Owner's representative.
  - 2. Engineer and sub-consultants, as appropriate.
  - 3. Resident project representative.
  - 4. Contractor and his superintendent.
  - 5. Major subcontractors, as appropriate.
  - 6. Utility representatives, as appropriate.
  - 7. Permit agency representatives, as appropriate.
  - 8. Funding agency representatives, as appropriate.
- E. Suggested Agenda:
  - 1. Work progress since last meeting
  - 2. Work scheduled this period
  - 3. Field observations, problems and conflicts.

- 4. Construction schedule
  - a. Status of current schedule
  - b. Issues impacting schedule
  - c. Fabrication and delivery schedules
  - d. Corrective measures to regain projected schedule
- 5. Submittals
- 6. RFIs
- 7. Pending Changes and Substitutions
- 8. Quality Control
- 9. Pay Requests
- 10. Other Business

## PART 2- PRODUCTS (NOT USED)

# PART 3 - EXECUTION (NOT USED)

#### END OF SECTION

# SECTION 01 32 16 CONSTRUCTION PROGRESS SCHEDULES

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Promptly after award of the Contract, prepare and submit to the Engineer estimated construction progress schedules demonstrating complete fulfillment of all Contract requirements utilizing a Critical Path Method (hereinafter referred to as CPM) in planning, coordinating, and performing the Work under this Contract (including all activities of subcontractors, equipment vendors, and suppliers). The principles and definition of CPM terms used herein shall be as set forth in the Associated General Contractors of America (AGC) publication, <u>The Use of CPM in Construction, A Manual</u> <u>for General Contractors and the Construction Industry</u>, latest edition, but the provisions of this Specification shall govern the planning, coordinating, and performance of the Work.
  - 2. Submit revised progress schedules on a monthly basis. No partial payments shall be approved until there is an approved construction progress schedule on hand.
- B. Related Requirements Described Elsewhere:
  - 1. Conditions of the Contract.
  - 2. Section 01 11 00 Summary of Work
  - 3. Section 01 31 19 Project Meetings
  - 4. Section 00 62 76 Application for Payment Form
  - 5. Section 01 33 23 Shop Drawings, Project Data, and Samples
  - 6. Section 01 29 73 Schedule of Values

### 1.02 QUALIFICATIONS

- A. A statement of computerized CPM capability shall be submitted in writing prior to the award of the Contract and shall verify that either Contractor's organization has in-house capability to use the CPM technique or that Contractor will employ a CPM consultant who is so qualified.
- B. In-house capability shall be verified by description of construction projects to which Contractor or Contractor's consultant has successfully applied computerized CPM and shall include at least two (2) projects valued at least half the expected value of this project.

# 1.03 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart.
  - 1. Provide a separate horizontal bar for each trade or operation within each structure or item.
  - 2. Horizontal time scale:
    - a. Show starting and completion dates for each activity in terms of the number of days after Notice to Proceed. All completion dates shown shall be within the period specified for contract completion.
    - b. Identify the first workday of each month.
  - 3. Scale and Spacing: Sufficient to allow space for notations and future revisions.
  - 4. Maximum Sheet Size: 24 inches by 36 inches.
- B. Format of Listings: The chronological order of the start of each item of work for each structure.

- C. Identification of Listings: By major specification section numbers as applicable and by utility.
- D. Construction Progress Schedules shall be computer generated using software offered by Primavera, or approved equal.

# 1.04 CONTENT OF SCHEDULES

- A. Construction Progress Schedule:
  - 1. Show the complete sequence of construction by activity and by structure.
  - 2. Show the dates for the beginning and completion of each major element of construction in no more than a two (2) week increment scale. Specifically, list, but do not limit to:
    - a. Shop Drawing Schedule.
    - b. Installation of temporary facilities.
    - c. Clearing.
    - d. Demolition
    - e. Subcontractor work
    - f. Utility Installations
    - g. Paving
    - h. Start-Up
    - i. Project closeout
  - 3. Show projected percentage of completion for each item, as of the first day of each month.
  - 4. Show projected dollar cash flow requirements for each month of construction and for each activity as indicated by the approved Schedule of Values.
- B. Submittals for construction progress schedules shall be in accordance with Section 01 33 23: Shop Drawings, Product Data, and Samples. Indicate on the schedule the following:

- 1. The dates for Contractor's submittals.
- 2. The date submittals will be required for Owner-furnished products, if applicable.
- 3. The date approved submittals will be required from the Engineer.
- C. A typewritten list of all long lead items (equipment, materials, etc.).
- D. To the extent that the progress schedule or any revised progress schedule shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Engineer. Failure to include any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the Engineer's approval of the progress schedule.
- E. Scheduling Constraints: The work within Owner's property must be completed within the maximum number of days start to finish, as indicated in the Contract. Additionally, work must proceed on a continuous basis, without stoppages, except for nights and weekends. There shall be no lapses between phases of construction.

#### 1.05 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
  - 1. Major changes in scope.
  - 2. Activities modified since previous submission.
  - 3. Revised projections of progress and completion.
  - 4. Other identifiable changes.
- C. Provide a narrative report as needed to define:
  - 1. Problem areas, anticipated delays, and the impact on the schedule.
  - 2. Corrective action recommended, and its effect.
  - 3. The effect of changes on schedules of other prime contractors.

D. If the Work falls behind the critical path schedule by two (2) weeks or more, the Contractor shall prepare a recovery schedule.

## 1.06 SUBMISSIONS

- A. Submittal Requirements.
  - 1. Logic network and/or time-phased bar chart, computer generated.
  - 2. Computerized network analysis:
    - a. Sort by early start
    - b. Sort by float
    - c. Sort by predecessor/successor
  - 3. Narrative description of the logic and reasoning of the schedule.
- B. Time of Submittals.

Within ten (10) working days after Notice to Proceed, Contractor shall submit a network diagram describing the activities to be accomplished in the project and their dependency relationships, (predecessor/successor) as well as a tabulated schedule as herein defined. The total length of time indicated on the initial CPM schedule shall equal the exact number of days in the Contract Time as defined in Agreement. The schedule produced and submitted shall also indicate calendar dates, including project starting and completion dates, based on the Contract Commencement and completion dates indicated in the Notice to Proceed. The Engineer will complete the review of the complete schedule within fifteen (15) working days after receipt. During the review process, the Engineer may meet with a representative of Contractor to review the proposed plan and schedule to discuss any clarifications that may be necessary.

C. Within ten (10) working days after the conclusion of the Engineer's review period, Contractor shall revise the network diagram as required and resubmit the network diagram and a tabulated schedule produced therefrom. The revised network diagram and tabulated schedule shall be reviewed and accepted or rejected by the Engineer within fifteen (15) working days after receipt. The network diagram and tabulated schedule, when accepted by the Engineer, shall constitute the project work schedule unless a revised schedule is required due to substantial changes in the Work, a change in Contract Time or a recovery schedule is required and requested.

- D. Acceptance. The finalized schedule will be acceptable to the Engineer when, in the opinion of the Engineer, it demonstrates an orderly progression of the Work to completion in accordance with the Contract Documents. Such acceptance will neither impose on the Engineer responsibility for the progress or scheduling of the Work nor relieve Contractor from full responsibility, therefore. The finalized schedule of shop drawing submittals will be acceptable to the Engineer when, in the opinion of the Engineer, it demonstrates a workable arrangement for processing the submittals in accordance with the requirements. The finalized Schedule of Values (lump sum price breakdown), as applicable, will be acceptable to the Engineer as to form and content when, in the opinion of the Engineer, it demonstrates a substantial basis for equitably distributing the Contract Price. When the network diagram and tabulated schedule have been accepted, the Contractor shall submit to the Engineer six (6) copies of the time-scaled network diagram, six (6) copies of a computerized tabulated schedule in which the activities have been sequenced by numbers, six (6) copies of a computerized tabulated schedule in which the activities have been sequenced by early starting date, and six (6) copies of a computerized, tabulated schedule in which activities have been sequenced by total float, and six (6) copies sorted by predecessor/successor.
- E. Revised Work Schedules. Contractor, if requested by the Engineer, shall provide a revised work schedule if, at any time, the Engineer considers the completion date to be in jeopardy because of "activities behind schedule." The revised work schedule shall include a new diagram and tabulated schedule conforming to the requirements of Paragraph 1.09 herein, designed to show how Contractor intends to accomplish the Work to meet the completion date. The form and method employed by Contractor shall be the same as for the original work schedule. No payment will be made if activities fall more than two (2) weeks behind schedule and a revised work schedule is not furnished.

F. Schedule Revisions. The Engineer may require Contractor to modify any portions of the work schedule that become infeasible because of "activities behind schedule" or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule. No change may be made to the sequence, duration, or relationships of any activity without approval of the Engineer.

# 1.07 DISTRIBUTION

- A. Distribute copies of the reviewed schedules to:
  - 1. Engineer.
  - 2. Jobsite file.
  - 3. Subcontractors.
  - 4. Other concerned parties.
  - 5. Owner (two copies).
- B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

# 1.08 CHANGE ORDERS

A. Upon approval of a change order, the approved changes shall be reflected in the next scheduled revision or update submittal of the construction progress schedule by the Contractor.

# 1.09 CPM STANDARDS

- CPM, as required by this Section, shall be interpreted to be generally as outlined in the Associated General Contractors (AGC) publication, <u>The Use of CPM in</u> <u>Construction, A Manual for General Contractors and the Construction Industry</u>, Copyright 1976.
- B. Work schedules shall include a graphic network and computerized, tabulated schedules as described below. To be acceptable the schedule must demonstrate the following:

- 1. A logical succession of work from start to finish.
- 2. Definition of each activity. Activities shall be identified by major specification section numbers, as applicable, and by major utility.
- 3. A logical flow of work crews/equipment (crews are to be defined by manpower category and man-hours; equipment by type and hours).
- 4. Show all work activities and interfaces including submittals as well as major material and equipment deliveries.
- C. Networks.
  - 1. The CPM network, or diagram, shall be in the form of a time-scaled diagram of the customary activity-on-type and may be divided into a number of separate pages with suitable notation relating the interface points among the pages. Notation on each activity line shall include a brief work description and duration, as described in Paragraph 1.09, D. herein.
  - 2. All construction activities and procurement shall be indicted in a timescaled format, and a calendar shall be shown on all sheets along the entire sheet length. Each activity arrow shall be plotted so the beginning and completion dates of said activity can be determined graphically by comparison with the calendar scale. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical path activities, and float for each non-critical activity. All non-critical path activities shall show estimated performances time and float time in scaled form.
- D. The duration indicated for each activity shall be in calendar days and shall represent the single best time considering the scope of the work and resources planned for the activity including time for inclement weather. Except for certain non-labor activities, such as curing concrete or delivering materials, activity durations shall not exceed fourteen (14) days nor be less than one (1) day unless otherwise accepted by the Engineer.

- E. Tabulated Schedules. The initial schedule shall include the following minimum data for each activity:
  - 1. Activity Beginning and Ending Numbers (i-j numbers) (single activity numbers may be used).
  - 2. Duration.
  - 3. Activity Description.
  - 4. Early Start Date (Calendar Dated).
  - 5. Late Start Date (Calendar Dated).
  - 6. Early Finish Date (Calendar Dated).
  - 7. Late Finish Date (Calendar Dated).
  - 8. Identified Critical Path.
  - 9. Total Float (Note: No activity may show more than 20 days float).
  - 10. Cost of Activity.
  - 11. Equipment Hours, by type; Man-Power Hours, by crew or trade.
- F. Project Information. Each tabulation shall be prefaced with the following summary data:
  - 1. Project Name.
  - 2. Contractor.
  - 3. Type of Tabulation (Initial or Updated).
  - 4. Project Duration.
  - 5. Project Scheduled Completion Date.
  - 6. Effective or Starting Date of the Schedule.
  - 7. New Project Completion Date and Project Status (if an updated or revised schedule).
  - 8. Actual Start Date and Actual Finish Date (for all updated schedules.)

# 1.10 SCHEDULE MONITORING

A. At not less than monthly intervals or when specifically requested by Engineer,
 Contractor shall submit to the Engineer a computer printout of an updated schedule
 for those activities that remain to be completed. Typically, the updated schedule
 will be submitted with the application for payment as specified below.

B. The updated schedule shall be submitted in the form, sequence, and number of copies requested for the initial schedule.

# 1.11 PROGRESS MEETINGS

A. For the monthly progress meeting, Contractor shall submit a revised CPM schedule and a three-week look-ahead schedule, showing all activities completed, in progress, uncompleted, or scheduled to be worked during the weeks. The three weeks include the current week plus the next two weeks. All activities shall be from the approved CPM and must be as shown on the CPM unless behind or ahead of schedule. One copy of the revised CPM schedule shall be submitted with each copy of that month's application for payment, electronically in color.

# PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# END OF SECTION

# SECTION 01 32 33 PHOTOGRAPHIC DOCUMENTATION

# PART 1 - GENERAL

### 1.01 SCOPE OF WORK

- A. Scope of Work: The Contractor shall employ a competent photographer to take construction record photographs and video recording prior to start of the Work, periodically during the course of the Work, and following the completion of the Work.
- B. Summary: This Section includes administrative and procedural requirements for the following
  - 1. Preconstruction photographs
  - 2. Preconstruction video recordings
  - 3. Periodic Construction photographs
  - 4. Completion construction photographs
- C. Related Requirements Described Elsewhere:
  - 1. Section 01 00 00 General Requirements
  - 2. Section 01 11 00 Summary of Work
  - 3. Section 01 30 00 Administrative Requirements
  - 4. Section 01 78 39 Project Record Documents
- D. Photographs and videos shall be taken in conformance with this Section and shall be furnished to the Engineer with each pay request. Failure to comply will result in rejection of pay request.

#### 1.02 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of the Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include the same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three (3) days of taking photographs
  - 1. Digital Camera: Minimum sensor resolution of 8 megapixels
  - 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph accompanied by key plan file.
  - 3. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- C. Construction Photographs: Submit two (2) prints of each photographic view within seven (7) days of taking photographs.
  - 1. Format: Electronic submittal to Engineer.
  - 2. Identification: With each submittal, provide the following information:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.

- e. Date photograph was taken if not date stamped by camera.
- f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- g. Unique sequential identifier keyed to accompanying key plan.
- D. Video Recordings: Submit video recordings within seven (7) days of recording.
  - 1. Submit video recordings in digital video disc format acceptable to Architect by posting to Web-based photographic documentation service provider's Web site.
  - 2. Identification: With each submittal, provide the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date video recording was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Weather conditions at time of recording.

# 1.03 COST OF PHOTOGRAPHY

A. The Contractor shall pay costs for specified ground and aerial photography, videography, and web-based documentation.

# 1.04 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three (3) years.
- B. Digital photographs may be taken by the Contractor's personnel but must be of professional quality as herein specified. Photographs which are deemed unsatisfactory will be rejected and retakes will be required.

## 1.05 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from the Photographer to the Owner for unlimited reproduction of photographic documentation.

## PART 2 - PRODUCTS

### 2.01 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide high- resolution digital video disc in format acceptable to Architect.

### PART 3 - EXECUTION

# 3.01 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.

- 2. Field Office Images: Maintain one (1) set of images accessible in the field office at Project site, available always for reference. Identify images in the same manner as those submitted to Architect and Construction Manager.
- D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect and Construction Manager.
  - 1. Flag excavation areas and construction limits before taking construction photographs.
  - 2. Take twenty (20) photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take twenty (20) photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Periodic Construction Photographs: Take twenty (20) photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take twenty (20) color photographs after date of Substantial Completion for submission as project record documents. Architect and Construction Manager will inform photographer of desired vantage points.
  - 1. Do not include date stamp.

G. Additional Photographs: Architect or Construction Manager may request photographs in

addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three (3) days' notice will be given, where feasible.

- 2. In emergency situations, take additional photographs within 24 hours of request.
- 3. Circumstances that could require additional photographs include, but are not limited to, the following:
  - a. Special events planned at Project site.
  - b. Immediate follow-up when on-site events result in construction damage or losses.
  - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
  - d. Substantial Completion of a major phase or component of the Work.
  - e. Extra record photographs at time of final acceptance.
  - f. Owner's request for special publicity photographs.

# 3.02 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings. Time must be accurate and continuously generated.
- B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Narration: Describe scenes on video recording by dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  - 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

- D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.
- E. Preconstruction Video Recording: Before starting construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect and Construction Manager.
  - 1. Flag excavation areas and construction limits before recording construction video recordings.
  - 2. Show existing conditions adjacent to Project site before starting the Work.
  - 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
  - 4. Show protection efforts by Contractor.
- F. Periodic Construction Video Recordings: Record video recording monthly, coinciding weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be thirty (30) minutes.
- G. Time-Lapse Sequence Construction Video Recordings: Record video recording to show status of construction and progress.
  - Frequency: During each of the following construction phases, set up video recorder to automatically record one frame of video recording every five (5) minutes, from same vantage point each time, to create a time-lapse sequence of thirty (30) minutes in length as follows:
    - a. Commencement of the Work, through completion of subgrade construction.
    - b. Above-grade structural framing.
    - c. Exterior building enclosure.
  - 2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.

3. Vantage points: Following suggestions by Architect and Construction Manager and Contractor, photographer shall select vantage points.

# 3.03 DELIVERY OF PHOTOGRAPHS AND VIDEOS

- A. Photographs and videos will be delivered electronically following specifications above with a coordinating log, to the Engineer as attachment to Application for Payment.
- B. Distribution of construction photographs, as soon as processed, is anticipated to be as follows:
  - 1. Engineer one (1) set.
  - 2. Project record file one (1) set to be stored by Contractor until the end of the project which shall then be delivered with Project Record Documents as specified in Section 01 78 39.
  - 3. Contractor one (1) set.

# END OF SECTION

# SECTION 01 33 23 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

# PART 1 - GENERAL

# 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the Engineer for review and approval, such working drawings, shop drawings, test reports and data on materials and equipment, and material samples materials list, certificates and affidavits as are required for the proper control of work, including but not limited to those working drawings, shop drawings, data and samples for materials and equipment specified elsewhere in the Specifications and in the Contract Drawings.
- B. Within twenty (20) calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete materials list of preliminary data on items for which Shop Drawings are to be submitted. Included in this materials list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way be expressed or implied relief to the Contractor from submitting complete Shop Drawings and providing material, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of Shop Drawings.
- C. The Contractor shall maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log shall include the following items:
  - 1. Submittal Description and Number assigned.
  - 2. Date submitted to Engineer
  - 3. Date returned to Contractor (from Engineer).
  - 4. Status of Submittal (Approved, Approved as Noted, Not Approved/Resubmit).
  - 5. Date of Resubmittal and Return (as applicable).
  - 6. Date of material release (for fabrication).
  - 7. Projected date of fabrication.
  - 8. Projected date of delivery to site.

- 9. Status of O&M manuals submitted.
- 10. Specification Section.
- 11. Drawings Sheet Number.
- D. Related Work Specified Elsewhere
  - 1. Section 01 60 00: Product Requirements

# 1.02 CONTRACTOR'S RESPONSIBILITY

- A. It is the duty of the Contractor to check all drawings, data and samples prepared by or for him before submitting them to the Engineer for review. Each and every copy of the drawings and data shall bear Contractor's stamp and signature showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp and signature will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer. Shop drawings submittals shall not be used as a vehicle for requesting approval of substitute or alternative equipment and materials. Substitution requests will be considered only when submitted in accordance with the applicable provisions of Section 01 60 00.
- B. Determine and Verify:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance with Specifications.
- C. The Contractor shall furnish the Engineer a schedule of Shop Drawings submittals fixing the respective dates for the submission of shop and working drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.

- D. The Contractor shall not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.
- E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.
- F. All submittals shall be accompanied by a transmittal letter prepared in duplicate containing the following information:
  - 1. Date.
  - 2. Project Title and Number.
  - 3. Contractor's name and address.
  - 4. Notification of deviations from Contract Documents.
  - 5. Submittal Log Number conforming to Specification Section Numbers.
- G. The CONTRACTOR shall submit descriptive or product data submittals/drawings electronically to the ENGINEER. The ENGINEER will review the submittals/drawings and return marked-up submittals/drawings with appropriate review comments electronically to the CONTRACTOR.
- H. Once submittals/drawings are approved, they are to be distributed electronically to the OWNER, ENGINEER and CONTRACTOR.
- I. The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by Engineer of the necessary shop drawings.
- J. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposed to supply both as pertaining to his own work and any work affected under other parts, headings, or divisions of Drawings and Specifications.

## 1.03. ENGINEER'S REVIEW OF SHOP DRAWINGS

- A. The Engineer's review of drawings, data and samples submitted by the Contractor will cover only general conformity to the Specifications, external connections, and dimensions which affect the installation. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
  - 1. As permitting any departure from the Contract requirements;
  - 2. As relieving the Contractor of responsibility of any errors, including details, dimensions, and materials;
  - 3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings, without noting an exception.
- D. When reviewed by the Engineer, each of the Shop Drawings will be identified as having received such review, being so stamped and dated. Shop Drawings stamped "NOT APPROVED/RESUBMIT" and with required corrections shown will be returned to the Contractor for correction and re-submittal.
- E. Resubmittals will be handled in the same manner as first submittals. On Resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.
- F. If the Contractor considers any correction indicated on the drawings to constitute a

change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

- G. Shop Drawings and submittal data shall be reviewed by the Engineer for each original submittal and first Resubmittal; thereafter review time for subsequent Resubmittals shall be charged to the Contractor in accordance with the terms of the Engineer's Agreement with the Owner.
- H. When the Shop Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- I. No partial submittals will be reviewed. Submittals not complete will be returned to the Contractor for Resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:
  - 1. Systems
  - 2. Processes
  - 3. As indicated in Specifications Sections, all drawings, schematics, manufacturer's product data, certifications and other shop drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface checking.

# 1.04 SHOP DRAWINGS

A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project. These drawings shall be completed and detailed. Shop Drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawing, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive to required shop drawings as defined above. As used herein, the term "manufactured" applied to standard units usually mass-

produced; and "fabricate" means items specifically assembled or made out of selected materials to meet individual design requirements.

- B. Manufacturer's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.
- D. Each Shop Drawing shall have a transmittal sheet. The transmittal sheet shall display the following:
  - 1. Project title and number
  - 2. Name of project building or structure
  - 3. Number and title of the shop drawing
  - 4. Date of shop drawing or revision
  - 5. Name of Contractor and subcontractor submitting drawing
  - 6. Supplier/manufacturer
  - 7. Separate detailer when pertinent
  - 8. Specification number
  - 9. Drawing number
- E. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the work in accordance with the Contract, even though such drawings have been reviewed.
- F. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall

give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

- G. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.
- H. All manufacturers or equipment suppliers who are proposed to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least one (1) year.
- I. Only the Engineer will utilize the color "red" in marking shop drawing submittals.

# 1.05 WORKING DRAWINGS

- A. When used in the Contract Documents, the term "working drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and false work; for underpinning; and for such other work as may be required for construction but does not become an integral part of the project.
- B. Copies of working drawings as noted in paragraph 1.05 A. above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for work.
- C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Review of working drawings by the Engineer will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks

of error are assumed by the Contractor; the Owner and Engineer shall have no responsibility therefore.

## 1.06 SAMPLES

- A. The Contractor shall furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until approved by the Engineer.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
  - 2. Full range of color, texture and pattern.
  - 3. A minimum of two (2) samples of each item shall be submitted.
- C. Each sample shall have a label indicating:
  - 1. Name of project.
  - 2. Name of Contractor and subcontractor.
  - 3. Material or equipment represented.
  - 4. Place of origin.
  - 5. Name of producer and brand (if any).
  - 6. Location in project.
  - 7. Submittal Number.

(Samples of finished materials shall have additional marking that will identify them under the finish schedules).

D. The Contractor shall prepare a transmittal letter in triplicate for each shipment of samples containing the information required in paragraph 1.06 B. above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the

Engineer. Approval of a sample shall be only for the characteristics or use names in such approval and shall not be construed to change or modify any Contract requirements.

E. Approved samples not destroyed in testing shall be sent to the Engineer or stored at the site of work. Approved samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the approved samples. Samples which failed testing or were not approved will be returned to the Contractor at his expense, if so, requested at time of submission.

### PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED) END OF SECTION

# SECTION 01 45 29 TESTING LABORATORY SERVICES

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Contractor will employ and pay for services of an Independent testing Laboratory to perform testing specifically indicated on the Contract Documents or specified in the Specifications herein and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.
  - 2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
  - 3. Contractor shall provide Engineer with all test results as indicated herein within five (5) days of receipt.
- B. Related Requirements Described Elsewhere:
  - 1. Testing laboratory inspection, sampling and testing is required for, but not limited to the following:
    - a. Section 31 23 00 Excavation and Fill
    - b. Section 03 30 00 Cast-in-Place Concrete
    - c. Section 33 05 05 Hydrostatic Testing
- C. The following schedule defines the responsibility for various tests.

Test	Notes	Paid for By
Soil Compaction	Pipe Work: every 300 ft. at each lift of compaction minimum. Beneath Structures: each 500 sq. ft. lift of compaction minimum and each lift around structures.	Contractor
Pressure	As specified in Section 33 05 05	Contractor
Bacteriological	As required by local and state agencies.	Contractor
LBR	Each 1500 SF of pavement (minimum).	Contractor
Concrete	Slump test each delivery and compression test five cylinders every 50 C.Y. (minimum	). Contractor

D. Additional Tests: The Contractor shall pay for first tests as specified herein. In the event that first test samples do not meet the applicable material specification, the Contractor shall take measures to conform the material and equipment to the Specifications. All subsequent tests shall be paid for by the Contractor.

#### 1.02 LABORATORY TESTS

A. The materials listed below shall require advance and periodic laboratory tests as indicated, and shall be sampled in accordance with the methods of the A.S.T.M. and as directed by the Engineer. With the exception of concrete test cylinders and mixing water, duplicate advance samples of all materials requiring laboratory tests shall be submitted to the Engineer, one of which will be certified by the Engineer for submission to the testing laboratory and the other retained on the job site in suitable storage provided by the Contractor. Except as noted below, preliminary samples of materials for advance laboratory tests shall be submitted at least two weeks prior to starting delivery of such materials to the site of the project. The testing laboratory shall furnish both the Engineer and the Contractor with two (2) copies of the reports showing the results of such tests, and the reports shall be considered as sufficient evidence of the acceptance or rejection of the quality of the materials tested. The specifications for, and the method of testing, will be found

MATERIALS	TEST FREQUENCY	SAMPLE SIZE	SHIPPING CONTAINER	
Fine Aggregate	Advance, first shipment then each 100 tons	100 lbs.	Canvas Sack	
Coarse	Advance, first shipment then each	Stone or Gravel	Strong Sack	
Aggregate	200 tons	200 lbs.		
Concrete	Advance test using approved materials	4 cylinders per mix, 2 broken at 7 days, 2 at 28 days		
Concrete (b)	Advance test on trial mix air			
Air	entraining agent is used. Test as			
Entrainment	specified under Article 405 (e)			

under the detailed specifications for the particular material involved. All samples shall be properly packed and clearly marked as to source and intended use.

# 1.03 TESTS

A. The materials listed below shall be tested at the shop or plant of, and by, the producer. Each manufacturer of such materials shall be fully equipped to carry out the tests herein designated. Upon demand of the Engineer, the manufacturer shall perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use. The Engineer shall be furnished with the certified records of reports of the results of all tests, such reports of records to contain a sworn statement that the tests have been made as specified.

MATERIAL	TEST METHOD
Cement	ASTM C114
Ductile Iron Pipe	As required under ANSI A21.51-
(Centrifugally Cast)	1176
Brick	ASTM C-32
Reinforcement	ASTM A-15 & A-305

#### 1.04 FIELD TESTS

A. All sewers, water lines, piping and equipment shall be tested in the field in the presence of the Engineer or his authorized assistant, in the manner prescribed in the sections of these specifications pertaining to such installations. The Engineer may also perform or have performed any other field tests necessary to determine compliance with the Contract requirements. The Contractor shall furnish all necessary labor, equipment, and materials for such tests and, with the exception of the Engineer's expenses, shall bear all the cost thereof.

### 1.05 PAVING TESTS

A. The following tests will be made, unless otherwise stipulated by the Engineer, by a testing laboratory approved by the Engineer:

Material	Test or Test Method	Frequency
Subbase	1) AASHO T-180 (Modified Proctor Minimum	Every 300 LF
	98% Density)	
	2) Lime rock Bearing Ratio 40	Every 300 LF
Base	(Soil Cement)	
	(1) Mix Design 350 psi @ 28 days. Mix design	Prior to Mixing Base
	required 7 days in advance.	
	(2) Optimum Moisture content and Maximum Density (AASHTO T-134)	Every 300 LF
	(3) LBR 100	Every 1500 sf
	(4) Depth (6-inch minimum)	Every 300 feet
Paving	(1) Job Mix Formula. Required 7 days in advance and submit to Engineer	Each Job
	(2) Bitumen Content of Mix	Every 2500 SV or
	(2) Ditalien Content of Wix	fraction thereof
	(3) In Place Density	Every 300' (left, right & center)
	(4) Marshall Field Stability Index	Every 1500 SY or fraction thereof
	(5) Thickness Cores	Every 300' (left, right, & center)

# 1.06 Basis of Payment

A. All shop tests and mill inspection shall be included in the price of the manufactured article, and no separate or extra payment will be made for such tests and inspection.

B. All laboratory and field tests will be paid for by the Contractor; he shall furnish all necessary labor, equipment and materials for such tests and, with the exception of the Engineer's expenses, shall bear all the costs thereof.

# 1.07 LABORATORY DUTIES: LIMITATIONS OF AUTHORITY

- A. Cooperate with Engineer and Contractor; provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction:
  - 1. Comply with specific standards; ASTM, other recognized authorities, and as specified.
  - 2. Determine and report on compliance with requirements of Contract Documents.
- C. Promptly notify the Engineer and Contractor of material or operations which do not meet the specifications.
- D. Promptly submit one (1) original and (1) electronic copy of reports of inspections and tests to the Engineer including:
  - 1. Date issued.
  - 2. Project title and Engineer's job number.
  - 3. Testing Laboratory name and address.
  - 4. Name and signature of inspector.
  - 5. Date of inspection of inspector.
  - 6. Date of inspection or sampling.
  - 7. Date of test.
  - 8. Identification of product and Specification section.
  - 9. Location in project.
  - 10. Type of inspection or test.
  - 11. Compliance with Contract Documents or not.
- E. Laboratory is not authorized to:
  - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Approve or reject any portion of work.
  - 3. Perform any duties of the Contractor.

## 1.08 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work and manufacture's operations.
- B. Secure and deliver to the laboratory adequate representational samples of materials purposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be for concrete, and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer of fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.
- E. Furnish incidental labor and facilities:
  - 1. To provide access to Work to be tested.
  - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
  - 3. To facilitate inspections and tests.

- 4. For storage and curing of test samples.
- 5. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# SECTION 01 57 13 TEMPORARY EROSION AND SEDIMENTATION CONTROLS

## PART 1 - GENERAL

### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls for construction activities impacting **less** than one acre, as required by Rules and Regulations and permit conditions.
  - 2. Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering and re-seeding on-site surfaces, soil and borrow area surfaces, providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner.
  - 3. Temporary sedimentation controls include, but are not limited to silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Owner.
  - 4. Temporary dust controls include, but are not limited to mulching, establishing temporary vegetation, water spraying, surface roughening through tilling, barriers, and spray on adhesives which will ensure minimal dust deposition into water bodies and reduce airborne dust that may cause low visibility or respiratory hazards.
  - 5. Contractor is responsible for designing, providing, maintaining and removing effective temporary erosion, sediment and dust control measures during construction or until final controls become effective.

- B. Related Work Described Elsewhere:
  - 1. Section 31 23 00 Excavation and Fill
  - 2. Section 32 92 00 Turf and Grasses

#### PART 2 - PRODUCTS

#### 2.01 EROSION CONTROL

A. Netting shall be fabricated of material acceptable to the Owner.

#### 2.02 SEDIMENTATION CONTROL

- A. Bales shall be clean, see-free cereal hay type.
- B. Netting shall be fabricated of material acceptable to the Owner.
- C. Filter stone shall be crushed stone which conforms to Florida Department of Transportation (FDOT) specifications.
- D. Concrete block shall be hollow, non-load bearing type.
- E. Concrete shall be exterior grade not less than 1-inch thick.
- F. Sediment Fence

#### PART 3 - EXECUTION

#### 3.01 EROSION CONTROL

- A. Minimum procedures for grassing are:
  - 1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.

- 2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
- 3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.
- 4. Apply netting over mulched areas on sloped surfaces.
- 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

## 3.02 SEDIMENTATION CONTROL

A. Install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

#### 3.03 PERFORMANCE

A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Florida, the Owner or Engineer, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

# SECTION 01 60 00 PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Conform to applicable specifications and standards.
  - 2. Comply with size, make, type and quality specified, or as specifically approved in writing by Engineer.
  - 3. Manufactured and fabricated products:
    - a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
    - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
    - c. Two or more items of the same kind shall be identical, by the same manufacturer.
    - d. Products shall be suitable for service conditions.
    - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
  - 4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

## 1.02 APPROVAL OF MATERIALS

A. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by Contractor shall be subject to the inspection and

approval of Engineer. No material shall be delivered to the work without prior approval of Engineer.

- B. Within twenty (20) days after the Effective Date of the Agreement, Contractor shall submit to Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable Engineer to identify the particular product to form an opinion as to its conformity to the specifications.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by Contractor. If Engineer requires, either prior to beginning or during progress of the work, Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed and shipped as directed at Contractor's expense. Except as otherwise noted, Contractor shall make arrangements for and pay for the tests.
- D. Contractor shall submit data and samples sufficiently early to permit consideration and approval before materials are necessary for incorporation in the work. Any delay of approval resulting from Contractor's failure to submit samples or data promptly shall not be used as a basis of claim against Owner or Engineer.
- E. In order to demonstrate the proficiency of workers or to facilitate the choice among several textures, types, finishes and surfaces, Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the approved samples or other data.

## 1.03 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. The substitution requirements of this Section are in addition to the requirements of the General Conditions and Supplementary Conditions.
- B. The intent of these Specifications is to provide Owner with a quality facility without discouraging competitive bidding. Substitutions may be submitted and will be evaluated as specified herein.

- C. A Request for Substitution of Product may be submitted after the Contractor:
  - 1. Has investigated the proposed product and determined that it is equal to or superior to specified product, furnishes a certification to that effect and waives all rights to additional payment or time that may subsequently become necessary due to the failure of the substituted product to perform adequately.
  - 2. Agrees to provide same warranties or bonds for product substitution as for product specified.
  - 3. Agrees to be responsible for coordinating and paying for any necessary changes to other work required by approved substitutions or product options which he selects and shall pay all such costs including the costs of the services of the design professional to revise the Contract Documents, if such revisions are required.
  - 4. Waives all claims for additional costs due to substitution which may subsequently become apparent.
  - 5. Is offering either a substantial credit to the Owner for acceptance of the substitution or a convincing justification that the product to be provided as the substitution is substantially superior in quality, performance, compatibility with adjacent products, durability, vandal-resistance or in other important ways.
- D. Engineer's Action:
  - 1. Engineer will consider written requests for product substitution for a period of 45 calendar days after the effective date of the Agreement. Engineer will review requests for substitutions and notify Contractor in writing of Owner's decision to accept or reject requested substitutions within ten (10) working days of receiving request. Only the Owner may accept a substitution.
  - 2. Substitution requests made by means of Shop Drawings or product data submittal will not be considered.

3. After the period of 45 days has elapsed, the only substitution requests which will be considered are those which are made necessary by the removal of the specified products from the market or by other similar, unavoidable circumstances beyond the control of the Contractor.

## 1.04 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five (5) electronic copies to Engineer.
  - 1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, correct, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
  - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
  - 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

## 1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
  - 1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
  - 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

## 1.06 STORAGE AND PROTECTION

- A. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry, noncorrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants in equipment, etc. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.
- B. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
  - 1. Store products subject to damage by the elements in weathertight enclosures such as buildings or trailers which have a concrete or wooden floor, a roof and fully closed walls on all sides.
  - 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions (i.e. electrical and instrumentation equipment).
  - 3. Protect mechanical and electrical equipment from being contaminated by dust, dirt and moisture.
  - 4. Store fabricated products above the ground, on blocking or skids prevent soiling and staining. Cover products which are subject to deterioration with impervious sheet coverings, provided adequate ventilation to avoid condensation.
  - 5. Provide heated storage space for material which would be damaged by freezing.

- 6. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- 7. Prior to the installation or equipment, it shall be stored at locations designated and approved by the Engineer.
- C. All materials and equipment to be incorporated in the work shall be handled and stored by Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.
- D. Cement, sand and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored of off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete beams shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.
- E. All materials which, in the opinion of Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work, and Contractor shall receive no compensation for the damaged material or its removal.
- F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored materials and equipment to assure that products are maintained under specified conditions, and free from damage or deterioration.
- G. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.
- H. The Contractor shall be responsible for all material, equipment, and supplies delivered to Owner under this Contract until final inspection of the work and acceptance thereof by Owner. In the event any such material, equipment and

supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, Contractor shall replace same without additional cost to Owner.

I. Should Contractor fail to take proper action on storage and handling of equipment supplied under the Contract within seven (7) days after written notice to do so has been given. Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary corrections.

#### 1.07 SPECIAL TOOLS

A. Manufacturers of equipment and machinery shall furnish any special tools (including grease guns or other lubricating devices) required for normal adjustment, operations and maintenance, together with instructions for their use. Contractor shall preserve and deliver to Owner these tools and instructions in good order no later than upon completion of the Contract.

#### 1.08 STORAGE AND HANDLING OF EQUIPMENT ON SITE.

- A. Attention shall be given to the storage and handling of equipment on site. As a minimum, the procedure outlined below shall be followed:
  - 1. Equipment shall not be shipped until approved by Engineer. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from Engineer. Equipment shipped to the site shall be stored in accordance with Paragraph 1.06, herein. Operation and maintenance data shall be submitted to Engineer for review prior to shipment of equipment.
  - 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity-controlled building approved by Engineer, until such time as the equipment is to be installed.

- 3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
- 4. Manufacturer's storage instructions shall be carefully studied by Contractor and reviewed with Engineer by him. These instructions shall be carefully followed and a written record of this kept by the Contractor.
- 5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
- 6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to Owner.
- 7. Prior to acceptance to the equipment, Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at Contractor's expense.

## 1.09 WARRANTY

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer as specified. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year after the time of acceptance.

#### 1.10 SPARE PARTS

A. Spare parts for certain equipment have been specified in the pertinent sections of the Specifications. Contractor shall collect and store all spare parts so required in an area to be designated by Engineer. In addition, Contractor shall furnish Engineer an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each items. Spare parts shall be turned over in conjunction with the "Spare Parts List" as shown. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivered cost.

#### 1.11 GREASE, OIL AND FUEL

- A. All grease, oil and fuel required for testing of equipment shall be furnished with the respective equipment. Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by manufacturer with each item of equipment supplied.
- B. Contractor shall be responsible for changing the oil in all drives and intermediate drives of each mechanical equipment after initial break-in of the equipment, which in no event shall be any longer than three weeks of operation.

# SECTION 01 71 13 MOBILIZATION

#### PART I - GENERAL

#### 1.01 DEFINITION AND SCOPE

- A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the Work. Mobilization shall include, but not be limited to, the following principal items.
  - 1. Move onto the site all Contractors' plant and equipment required for first month operations.
  - 2. Install temporary construction power, wiring, and lighting facilities.
  - 3. Establish fire protection plan and safety program.
  - 4. Secure construction water supply.
  - 5. Provide field office trailers for Contractor and as may be specified for Owner and Engineer.
  - 6. Provide on-site sanitary facilities and potable water facilities as specified.
  - 7. Arrange for and erect Contractor's work and storage yard and employee's parking facilities.
  - 8. Submit all required insurance certificates and bonds.
  - 9. Obtain all required permits.
  - 10. Post all OSHA, EPA, Department of Labor, and all other required notices.

#### 01 71 13-1

- 11. Have Contractor's superintendent at the job site full time.
- 12. Submit a detailed construction CPM schedule acceptable to the Engineer as specified.
- 13. Submit a schedule of values of the Work.
- 14. Submit a schedule of submittals.

## 1.02 DEMOBILIZATION

A. Demobilization is the timely and proper removal of all contractor owned material, equipment or plant, from the job site and the proper restoration or completion of work necessary to bring the site into full compliance with the contract documents.

## 1.03 PAYMENT FOR MOBILIZATION/DEMOBILIZATION

A. The Contractor's attention is directed to the condition that no payment for mobilization, or any part thereof, will be approved for payment under the Contract. Mobilization/Demobilization is a subsidiary obligation of the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 01 74 00 CLEANING AND WASTE MANAGEMENT

## PART I - GENERAL

### 1.01 DESCRIPTION

- A. Scope of Work: Execute cleaning, during the progress of Work and at completion of the Work. This Section includes operations which cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent of work involved. The Contractor shall furnish all labor, materials, equipment and incidentals to complete the work under this Section.
  - 1. The work of this Section includes, but is not limited to, the following:
    - a. Restoring of driveways and fences.
    - b. Cleaning up.
    - c. Incidental work.

#### 1.02 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations and anti-pollution laws.

## PART II - PRODUCTS

#### 2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material

manufacturer.

D. Materials required for this Section shall be of the same quality as materials that are to be restored. Where possible, the Contractor shall reuse existing materials that are removed and then replaced.

## PART III - EXECUTION

## 3.01 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations or personal activities.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically, or as directed by the Owner and dispose of at legal disposal areas away from the site.

## 3.02 DUST CONTROL

- A. The Contractor shall employ construction techniques that minimize the production and distribution of dust.
- B. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- C. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

## 3.03 RESTORATION OF DRIVEWAYS, FENCES, AND SIDEWALKS

 A. Existing public and private driveways and sidewalks disturbed by the Contractor shall be replaced. Paved drives shall be repaved to the limits and thickness existing prior to construction. Gravel drives shall be replaced and regraded. Concrete driveways and sidewalks shall be replaced.

B. The Contractor shall remove, store and replace existing fences during construction. Only the sections directed by the Engineer shall be removed. If any section of fence is damaged due to the Contractor's negligence, it shall be replaced with fencing equal to or better than that damaged, and the work shall be satisfactory to the Engineer.

## 3.04 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary for the proper completion of the contract as specified and as shown on the Drawings.

## 3.05 FINAL CLEANING

- A. Employee skilled workman for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- C. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire Work site is clean.

# SECTION 01 75 16 STARTUP PROCEDURES

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

A. The Work may be segmented into several phases of construction in a logical order to meet the project schedule. Portions of the Work may be utilized prior to Substantial Completion of all the Work. Also, certain items of equipment are to be temporarily utilized in a phased segment of the Work and then relocated in a subsequent phase in a permanent installation.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

#### 3.01 PRELIMINARY MATTERS

- A. Start-up Certification: Prior to start-up, successfully complete all testing required of the individual components of work in the presence of the ENGINEER or their representative.
- B. Demonstrate to the ENGINEER that all temporary jumpers and/or bypass have been removed and that all components are operating under their own controls as designated.
- C. Coordinate start-up activities with equipment suppliers, subcontractors, and the Owner's operating personnel at the site and with the ENGINEER prior to commencing system start-up. All coordination is the responsibility of the Contractor.

#### 3.02 START-UP

- A. Confirm that all equipment is properly installed and that the flow path through the new work is unobstructed.
- B. Make adjustments as necessary.

#### 3.03 START-UP DEMONSTRATION AND TESTING

- A. After all Work components have been constructed, field tested and started up in accordance with the individual specifications, perform the start-up demonstration and testing in the presence of the ENGINEER and the Owner. The demonstration shall be held upon completion of all systems at a date to be agreed upon in writing with the Owner.
- B. Acceptability of the Work's performance will be based on the Work performing as specified, under these actual and simulated operating conditions as defined in the Contract Documents. The intent of the start-up demonstration and testing is for the Contractor to demonstrate to the Owner and the ENGINEER the Work will function as a complete and operable system under normal operating conditions and is ready for acceptance.
- C. Certificate of Completed Demonstration: Submit five (5) copies of Demonstration Certification memo signed by the Contractor, Subcontractor and Owner and insert one (1) copy in each Operation and Maintenance Manual.

# EQUIPMENT TRAINING & STARTUP CHECKLIST

PROJECT:			
OWNER:			
ENGINEER:			
CONTRACTOR:	_	_	
DATE:			
STRUCTURE:			
EQUIPMENT DESCRIP	ΓΙΟΝ:		
VENDOR:			
REPRESENTATIVE:		INIT.:	
# of training days required:# received:			
STARTUP/TRAINING DESCRIPTION: COMMENTS:			
ACCEPTABLE: PARTIALLY ACCEPTABLE: NON-ACCEPTABLE:			
ATTENDEES:			
NAME	<b>AFFILIATION</b>	DATE	

# SECTION 01 77 00 CLOSEOUT PROCEDURES

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work: Comply with requirement stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.
- B. Related Requirements Described Elsewhere:
  - 1. Startup Procedures: Section 01 75 16
  - 2. Cleaning and Waste Management: Section 01 74 00
  - 3. Project Record Documents: Section 01 78 39
  - 4. Operation and Maintenance Data: Section 01 78 23
  - 5. Bonds: Section 01 78 33
  - 6. Warranties: Section 01 78 36

## 1.02 SUBSTANTIAL COMPLETION

- A. The Work will not be substantially complete, and Contractor may not request substantial completion inspection unless the following submittals and work is completed:
  - 1. All Operation and Maintenance manuals have been submitted and approved to the requirements of Section 01 78 23.
  - 2. All equipment has been checked-out by the equipment manufacturer and Certificates of Manufacturer's Check-Out has been submitted as required by Section 01 75 16.
  - All start-up and demonstration testing completed, and Certificates of Completed Demonstration submitted to the requirements of Section 01 75 16.

- 4. Project Record Documents are complete and have been submitted and reviewed to the requirements of Section 01 78 39.
- 5. All training of Owner's personnel completed.
- 6. All areas to be used and occupied are safe, operable in automatic and complete.
- 7. All building occupancy certificates have been issued by the appropriate building permitting agency.
- 8. All painting, finishes, fencing, cleanup, final grading, grassing, planting, sidewalk construction, and paving shall have been completed and ready for inspection.
- 9. All deficiencies noted on inspection reports or nonconformances are corrected or the correction plan approved.
- B. When the conditions of paragraph 1.02 A. are met the Contractor shall submit to the Engineer:
  - 1. A written notice that he considers the Work, or portion thereof, is substantially complete, and requests an inspection.
  - 2. A punchlist of items to be corrected. (Uncompleted work which is not related to the safe, effective, efficient use of the Project may be allowed on the punchlist with the Engineer's approval.)
- C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
- D. Should the Engineer determine that the Work is not substantially complete:
  - 1. The Engineer will promptly notify the Contractor in writing, giving the reasons therefore.

- 2. Contractor shall remedy the deficiencies in the Work and send another written notice of substantial completion to the Engineer.
- 3. The Engineer will within reasonable time, reinspect the Work. The Contractor will be liable for reinspection fees as described in paragraph 1.04, herein.
- E. When the Engineer finds that the Work is substantially complete, he will:
  - 1. Schedule a walk-through of the facility to include the Owner. Engineer shall determine the completeness of the punchlist and readiness of the facility for occupancy by the Owner.
  - 2. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with the tentative punchlist of items to be completed or corrected before final inspection.
  - 3. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected. Any incomplete work allowed on a punchlist must be reinspected upon completion and any deficiencies found will be added to the punchlist.

#### 1.03 FINAL INSPECTION

- A. Prior to Contractor's request for a final inspection the following submittals and work must be complete:
  - 1. Project Record Documents must be approved.
  - 2. All spare parts and maintenance materials must be suitably delivered to the Owner per the requirements of the Technical Sections of the Specifications.

- 3. Contractor to submit evidence of compliance with requirements of governing authorities.
- B. After satisfying the requirements of paragraph 1.03 A. and when Contractor considers the Work complete, he shall submit written certification that:
  - 1. Contract Document requirements have been met.
  - 2. Work has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
  - 5. All punchlist items have been corrected or completed and the Work is ready for final inspection.
- C. The Engineer will, within reasonable time, make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- D. Should the Engineer consider that the Work is incomplete or defective:
  - 1. The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
  - 2. Contractor shall take immediate steps to remedy the stated deficiencies and send another written certification to the Engineer that the Work is complete.
  - 3. The Engineer will, within a reasonable amount of time, reinspect the Work and the Contractor shall be liable for reinspection fees as described in paragraph 1.04, herein.
- D. When the Engineer finds that the Work is acceptable under the Contract Documents, the Contractor may make closeout submittals.

#### 1.04 REINSPECTION FEES

- A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
  - 1. Contractor will compensate the Owner for such additional services.
  - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

## 1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Warranties and Bonds: To requirements of Sections 01 78 36 and 01 78 33.
- B. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- C. Certificate of Insurance for Products and Completed Operations.

## 1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
  - 1. The original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Previous change orders or written amendment.
    - b. Allowances.
    - c. Unit prices.
    - d. Deductions for uncorrected work.
    - e. Penalties and bonuses.
    - f. Deductions for liquidated damages.
    - g. Deductions for reinspection payments

- h. Other adjustments.
- 3. Total Contract Sum, as adjusted.
- 4. Previous payments.
- 5. Sum remaining due.
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

## 1.07 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION (NOT USED)

# SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
  - 2. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of the Specifications.
  - 3. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.
- B. Related Requirements Described Elsewhere:
  - 1. Section 01 33 23: Shop Drawings, Product Data, and Samples
  - 2. Section 01 78 39: Project Record Documents
  - 3. Section 01 78 33: Bonds
  - 4. Section 01 78 36: Warranties

#### 1.02 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel:
  - 1. Trained and experienced in maintenance and operation of described products.
  - 2. Familiar with requirements of this Section.
  - 3. Skilled as a technical writer to the extent required to communicate essential data.
  - 4. Skilled as draftsman competent to prepare required drawings.

#### 1.03 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by Owner's personnel.
- B. Hard Copy Format:
  - 1. Size: 8<sup>1</sup>/2" x 11 inches
  - 2. Paper: 20 pound minimum, white, for typed pages.
  - 3. Text: Manufacturer's printed data, or neatly typewritten
  - 4. Drawings:
    - a. Provide reinforced punched binder tab, bind in with text.
    - b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches x 17 inches.
  - 5. Provide fly-leaf for each separate product, or each piece of operating equipment.
    - a. Provide typed description of products and major component parts of equipment.
    - b. Provide indexed tabs.
  - 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
    - a. Title of project.
    - b. Identity of separate structure as applicable.
    - c. Identity of general subject matter covered in the manual.
  - 7. Binders:
    - a. Commercial quality three-post binders with durable and cleanable plastic covers.

#### 01 78 23-2

- b. Maximum post width: 2 inches.
- c. When multiple binders are used, correlate the data into related consistent groupings.
- C. Electronic Format Copy
  - 1. Provide electronic copy of operation and maintenance data on CD/DVD or portable storage unit device. File(s) should be organized/named to correspond with hard copy.

## 1.04 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
  - 1. Contractor, name of responsible principal, address and telephone number.
  - 2. A list of each product required to be included, indexed to content of the volume.
  - 3. List, with each product, name, address and telephone number of:
    - a. Subcontractor or installer.
    - b. A list of each product required to be included, indexed to content of the volume.
    - c. Identify area of responsibility of each.
    - d. Local source of supply for parts and replacement.
  - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
  - 1. Include only those sheets which are pertinent to the specified product.

- 2. Annotate each sheet to:
  - a. Clearly identify specific product or part installed.
  - b. Clearly identify data applicable to installation.
  - c. Delete references to inapplicable information.
- C. Drawings:
  - 1. Supplement product data with drawings as necessary to clearly illustrate:
    - a. Relations of component parts of equipment and systems.
  - 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
  - 3. Do not use Project Record Documents as maintenance drawings.
- D. Written text, as required to supplement product data for the particular installation:
  - 1. Organize in consistent format under separate headings for different procedures.
  - 2. Provide logical sequence of instructions of each procedure.
- E. Copy of each warranty, bond and service contract issued.
  - 1. Provide information sheet for Owner's personnel, give:
    - a. Proper procedures in event of failure.
    - b. Instances which might affect validity of warranties or bonds.

## 1.05 MANUAL FOR MATERIALS AND FINISHES

- A. Submit four copies of the complete manual in final form.
- B. Content: for architectural products, applied materials and finishes:

#### 01 78 23-4

- 1. Manufacturer's data, giving full information on products
  - a. Catalog number, size, and composition.
  - b. Color and texture designations.
  - c. Information required for reordering special manufactured products.
- 2. Instructions for care and maintenance
  - a. Manufacturer's recommendation for types of cleaning agents and methods.
  - b. Cautions against cleaning agents and methods which are detrimental to product.
  - c. Recommend schedule for cleaning and maintenance.
- C. Content, for moisture protection and weather-exposed products:
  - 1. Manufacturer's data, giving full information on products.
    - a. Applicable standards
    - b. Chemical composition
    - c. Details of installation
  - 2. Instructions for inspection, maintenance and repair
- D. Additional requirements for maintenance data: Applicable sections of the Specifications.
- PART 2 PRODUCTS (NOT USED)
- PART 3 EXECUTION (NOT USED)

# SECTION 01 78 33 BONDS

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Compile specified bonds as specified in these Specifications.
  - 2. Co-execute submittals when so specified.
  - 3. Review submittals to verify compliance with Contract Documents.
  - 4. Submit to Engineer for review and transmittal to Owner.
- B. Related Work Described Elsewhere:
  - 1. Instructions to Bidders: Bid Bonds
  - 2. Performance Bond and Payment Bond

#### 1.02 SUBMITTAL REQUIREMENTS

- A. Assembly bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two (2) each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product of work item.
  - 2. Firm, with name of principal, address and telephone number.
  - 3. Scope.
  - 4. Date of beginning of bond or service and maintenance contract.
  - 5. Duration of bond or service maintenance contract.
  - 6. Provide information for Owner's personnel:

- a. Proper procedure in case of failure.
- b. Instances which might affect the validity of warranty or bond.
- 7. Contractor, name of responsible principal, address and telephone numbers.

### 1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
  - Size 8 <sup>1</sup>/<sub>2</sub>" x 11 inches, punch sheets for standard three-post binder.
    a. Fold larger sheets to fit into binders.
  - 2. Cover: Identify each packet with typed or printed title "BONDS". List:
    - a. Title of Project
    - b. Name of Contractor
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

# PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION (NOT USED)

# SECTION 01 78 36 WARRANTIES

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. Compile specified warranties as specified in these Specifications.
  - 2. Co-execute submittals when so specified.
  - 3. Review submittals to verify compliance with Contract Documents.
  - 4. Submit to Engineer for review and transmittal to Owner.

#### 1.02 SUBMITTAL REQUIREMENTS

- A. Assembly warranties and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product of work item
  - 2. Firm, with name of principal, address and telephone number
  - 3. Scope
  - 4. Date of beginning of warranty or service and maintenance contract
  - 5. Duration of warranty or service maintenance contract.
  - 6. Provide information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Instances which might affect the validity of warranty.
  - 7. Contractor, name of responsible principal, address and telephone numbers.
#### 1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets
- B. Format:
  - 1. Size  $8\frac{1}{2}$ " x 11 inches, punch sheets for standard three-post binder.
    - a. Fold larger sheets to fit into binders.
  - 2. Cover: Identify each packet with typed or printed title "WARRANTIES". List:
    - a. Title of Project
    - b. Name of Contractor
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

#### 1.04 WARRANTY SUBMITTALS REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. Manufacturer's warranty period shall be concurrent with Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by Owner.
- B. Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment which has at least a 1 hp motor or which lists for more than \$1,000. Engineer reserves the right to request warranties for equipment not classified as major. Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
- C. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of Owner acceptance, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the

manufacturer shall not relieve the Contractor of the one-year warranty starting at the time of Owner acceptance of the equipment.

- D. Owner shall incur no labor or equipment cost during the guarantee period.
- E. Guarantee shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by manufacturer.

PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

#### END OF SECTION

#### SECTION 01 78 39 PROJECT RECORD DOCUMENTS

#### PART 1 - GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the Owner one record copy of:
  - 1. Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Change Orders and other modifications of the contract
  - 5. Engineer's Field Orders or written instructions
  - 6. Approved Shop Drawings
  - 7. Field Test records
  - 8. Construction photographs, preconstruction videos, and pipeline videos.
  - 9. Preliminary as-built drawings

#### B. RELATED WORK SPECIFIED ELSEWHERE

1. Section 00 73 00: Supplementary Conditions

#### 1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
  - 1. Provide files and racks for storage of documents.
  - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI format with section numbers as provided herein.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

- D. Make documents and samples available at all times for inspection by the Engineer.
- E. As a prerequisite for monthly progress payments, the Contractor shall provide the currently updated "Record Documents" for review by the Engineer and Owner.

#### 1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by the Engineer.

#### 1.04 RECORDING

- A. Label each document. "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- C. Drawings: Legibly mark to record actual construction:
  - 1. Depths of various elements of foundation in relation to finish first floor datum.
  - 2. All underground piping with elevations and dimensions. Change to piping location. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements. Actual installed pipe materials, class, etc.
  - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
  - 4. Field changes of dimensional and detail.
  - 5. Changes made by Field Order or by Change Order.
  - 6. Details not on original contract drawings.

- 7. Equipment and piping relocations.
- 8. Major architectural and structural changes including relocation of doors, windows, etc.
- 9. Architectural schedule changes according to Contractor's records or shop drawings.
  - a. Contractor shall provide copies of all such recordings to the Contractor's surveyor for incorporation into the preliminary and final as-builts drawings.
- D. Specifications and Addenda: Legibly mark each section to record:
  - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
  - 2. Changes made by Field Order or by Change Order.
- E. Shop Drawings (after final review and approval): Provide four (4) sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

#### 1.05 SUBMITTAL

- A. Accompany <u>each</u> submittal with transmittal letter in duplicate, containing:
  - 1. Date
  - 2. Project title and number
  - 3. Contractor's name and address
  - 4. Title and number of each Record Document
  - 5. Signature of Contractor of his authorized representative
- B. Preliminary As-built Drawings: The Contractor shall submit to the Engineer two
  (2) paper copies of preliminary as-built drawings prepared and signed/sealed by the Contractor's surveyor with each monthly progress payment request. Preliminary

as-built drawings shall conform to the requirements of final as-built drawings and shall represent the completed work to date. Preliminary as-built drawings shall include all work which the Contractor is requesting to be paid for.

- C. Final As-built Drawings: Upon project closeout and as a prerequisite to the final pay request, the Contractor shall submit to the Engineer final as-built drawings Administrative Code, pursuant to Section 472.027 of the Florida Statutes. The Engineer shall supply the Contractor copies of AutoCAD files for the Contractor's use in the as-built drawing preparation. Final as-built drawings shall include all work which the Contractor is requesting to be paid for. The final as-built drawing submittal shall include:
  - 1. Two (2) sets of paper plans signed and sealed by a professional land surveyor licensed in the State of Florida and CD(s) or other media containing electronically S&S PDF and AutoCAD drawing files.
  - 2. AutoCAD drawing files shall include as-built information on layers separate from the original drawing layers and shall be named descriptively to represent the as-built features. (i.e. Layer "wat ab" and "wat ab txt" for water as-built line work and text, respectively.) Drawing entities are to be shown on the correct layer. All as-built entities shall have color and line type set "by-layer". Text sizes shall be relative to the plotted scale. Additional details or exploded views shall be include to accurately and fully represent the as-built conditions.
  - 3. Certification by surveyor that the as-built information shown is accurate and that all improvements shown were constructed within or on public rightsof-way, easements or property specifically owned by the Owner. Certification shall be to the Owner, Engineer and St. Johns River Water Management (if applicable.)
  - 4. No line work and text shall be erased from the original design (construction) drawings during the as-built drawing preparation. Original line work or text shall be circled if accurate or stricken (not erased) if not with the accurate information noted/shown. New line work and text shall be provided to

accurately show the as-built information for the constructed improvements. Revisions to design dimensions alone will not be permitted.

- 5. Pressure Pipeline and Utility Conduit Improvements: For utility improvement projects, horizontal locations of the constructed pipelines with respect to the right-of-way lines or other readily visible, permanent features at 100-foot minimum intervals and at critical locations such as road intersections shall be shown. For treatment plant and pump station improvements, horizontal locations shall be provided at 20-foot intervals. Vertical locations of the constructed pipelines by elevation of centerline of pipe for above ground/exposed pipe or with respect to finished grade over buried pipe shall be shown at 100 feet minimum intervals. (i.e. final cover) For underground piping, all valves, blow-offs, stub-outs, pigging stations, fire hydrants, backflow preventers and services shall be located horizontally in relation to readily visible, permanent features with three-way horizontal dimensions less than 100 feet, each. Three-way dimensions to all buried fittings on treatment plant and pump station improvement projects shall be provided. If adequate features are not available, a station and offset dimensioning system can be used if prior approval is obtained from the Engineer. For above ground/exposed pipe, as-built dimensions between fittings or flanges shall be provided. Separations between "sanitary hazards" to potable water and reclaimed water mains per FDEP shall be shown.
- 6. Gravity Pipeline Improvements: Show elevations for all inverts, manhole tops, inlet throats/weirs, grate tops, etc. Show size and type of each structure. As-built length, size and type of pipes between the structures shall be shown. All service laterals and cleanouts shall be located horizontally to readily visible, permanent features with three-way horizontal dimensions less than 100 feet, each. If adequate features are not available, a station and offset dimensioning system can be used if prior approval is obtained from the Engineer. A labeling and dimension table scheme is recommended for the three way or station/offset dimensioning. (i.e. constructed feature labeled as "A", permanent feature labeled as "B", "A"- "B" dimension shown in table for distance measured between the two. Use continuous labeling and complete single table per plan sheet.)

Separations between gravity "sanitary hazards" to potable water and reclaimed water mains per FDEP shall be shown.

- 7. Roadway Improvements: Elevation, size and location of swales, ditches, gutter flowlines, edge of pavement, and road crown on both sides of the road if applicable shall be provided at 100-foot minimum intervals and at critical areas such as intersections and inlets/flumes. As-built points of curvature, tangent and vertical intersection, along with radii of road alignment, intersecting streets and driveways and other alignment information shall be provided.
- 8. Stormwater Improvements: The limits, slopes and bottom depths of stormwater ponds, swales and other retention areas shall be provided. All stormwater piping information shall conform to the Gravity Pipeline Improvement requirements. Size, type, material, and elevations of all stormwater structures, including appurtenances such as weirs, orifices, skimmer plates, etc. shall be shown. As-built information shall conform to St. Johns River Water Management District requirements.
- 9. Treatment Facility Improvements: Location, size, number, and type of treatment equipment and structures shall be shown. Applicable requirements of as-built information listed herein for similar improvements shall be required.
- 10. Building Improvements: Finished floor elevations, ceiling heights, building locations, wall opening dimensions, equipment (electrical, mechanical, plumbing) locations, etc. shall be provided. Change of material shall be specifically noted as such.
- 11. Landscaping Improvements: Number, type, size, and general location of installed plant material shall be provided. Change of material shall be specifically noted as such. Location of irrigation meters, services, manual valves, automatic valves, controllers, rain shut off switches, etc. shall be shown. Changes to the designed irrigation system shall be shown.

- 12. Other Improvements: Changes from the original design of other improvements such as electrical, mechanical and structural improvements shall be noted as such on the as-built drawings with the size, number, type and location of the constructed/installed improvements noted.
- 13. Contractor may be required to reimburse the Owner for services rendered by the Engineer for review of multiple resubmittals.

PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

#### END OF SECTION

#### SECTION 02 06 14 GEOTECHNICAL DATA REPORT

#### ATTACHMENTS:

1. Geotechnical Evaluation Prepared by Universal Engineering Sciences dated May 14, 2025.



#### **GEOTECHNICAL EVALUATION**

Lift Station Improvements at 635 Violet Street South Daytona, Volusia County, Florida

> UES Project No. 0430.2300221.0000 UES Report No. 2035292

> > May 14, 2025

**Prepared For:** 

Mr. Kevin Lee Parker Mynchenberg & Associates, Inc. 1729 Ridgewood Avenue Holly Hill, Florida 32117

#### **Prepared By:**

**UES** 911 Beville Road, Suite 3 South Daytona, Florida 32119



Materials Testing Geotechnical Engineering Environmental Building Sciences & Safety Inspections & Code Compliance Virtual Design Consulting

May 14, 2025

Mr. Kevin Lee Parker Mynchenberg & Associates, Inc. 1729 Ridgewood Avenue Holly Hill, Florida 32117

Reference: GEOTECHNICAL EVALUATION Lift Station Improvements at 635 Violet Street South Daytona, Volusia County, Florida UES Project No. 0430.2300221.0000 and UES Report No. 2035292

Dear Mr. Lee:

UES Professional Solutions, LLC has completed the geotechnical evaluation for the subject project located in South Daytona, Florida. This report contains the results of our investigations, an engineering interpretation of these results with respect to the project characteristics described to us, and general recommendations for shallow foundation and lift station design.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UES Professional Solutions NO. 96709 STATE OF Cody D. Wilson, P.E. Geotechnical Department Marga Florida Registration No. 96709//////

Michael A. Navarra, E.I. Project Manager

CDW/MAN/cme

#### **1.0 INTRODUCTION**

#### 1.1 GENERAL

In this report we present the results of the subsurface evaluation for the proposed lift station in South Daytona, Florida. We have divided this report into the following sections:

- SECTION 2.0 SCOPE OF SERVICES
- SECTION 3.0 FINDINGS
- SECTION 4.0 FOUNDATION DESIGN RECOMMENDATIONS
- SECTION 5.0 LIFT STATION DESIGN RECCOMMENDATIONS
- SECTION 6.0 CONSTRUCTION RELATED SERVICES
- SECTION 7.0 LIMITATIONS

#### 2.0 SCOPE OF SERVICES

#### 2.1 PROJECT DESCRIPTION

Project information has been provided to us during correspondence with you. We were provided with the Lift Station Site Plan and Lift Station Plan. We understand the proposed project will consist of updating the existing lift station and supporting infrastructure at 635 Violet Street in South Daytona, Florida. Based on the plans provided to us by you, we understand the proposed lift station will have a top elevation of +8.80 and a bearing elevation of -30.00. We understand the proposed electrical building will consist of Concrete Masonry Unit (CMU) with steel reinforcement construction. We anticipate the maximum wall loads for the electrical building will not exceed 4 kips per linear foot. We anticipate less than one foot of fill will be placed within the structure footprint.

Our recommendations are based upon the above considerations. If any of this information is incorrect, or if you anticipate any changes, inform UES Professional Solutions, LLC so that we may review our recommendations.

#### 2.2 PURPOSE

The purposes of this investigation were:

- to investigate the general subsurface conditions at the site;
- to interpret and review the subsurface conditions with respect to the proposed construction; and
- provide general recommendations for lift station design.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES Professional Solutions, LLC would be pleased to perform these services, at your request.

Our investigation was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for surface expression of deep geological

conditions, such as sinkhole development related to karst activity. A deep geological evaluation requires a more extensive range of field services than performed in this study.

#### 2.3 FIELD INVESTIGATION

#### 2.3.1 Borings

The subsurface conditions adjacent to the proposed lift station area were investigated with one (1) Standard Penetration Test (SPT) boring, WW-1, advanced to a depth of approximately 60 feet below existing grade. We also performed two (2) SPT borings, B-1 and B-2, advanced to a depth of approximately 25 feet each below existing grade within the proposed electrical building. We performed the SPT borings according to the procedures of ASTM D-1586.

The borings were located by our field personnel using taped measurements from existing site features, and should be considered accurate only to the degree implied by the method used. The location of the borings are presented on the attached Boring Location Plan in Appendix A.

Samples obtained from the borings were transported to our laboratory for further evaluation. Samples of the soils encountered will be held in our laboratory for your inspection for 60 days unless we are notified otherwise.

#### 2.4 LABORATORY INVESTIGATION

The soil samples recovered from the soil boring were returned to our laboratory and then a UES engineer visually examined and reviewed the field descriptions and classified the soils using the Unified Classification System. Tests consisting of percent passing a No. 200 sieve and natural moisture content determinations were performed to aide in classification of the soils. Please see Appendix B for a description of the laboratory testing procedures.

#### 3.0 FINDINGS

#### 3.1 SUBSURFACE CONDITIONS

The boring location and detailed subsurface conditions are illustrated in Appendix A, Subsurface Profile. The classifications and descriptions shown on the profile are based upon visual and laboratory characterizations of the recovered soil samples. Also, see Appendix A: Key to Boring Log, for further explanation of the symbols and placement of data on the Subsurface Profile. The following discussion summarizes the soil conditions encountered.

The SPT borings generally indicated approximately 12-inches of topsoil underlain by intermittent layers of very loose to medium dense fine sand with trace silt (SP), fine sand with silt (SP-SM), clayey and very clayey fine sand (SC) and very soft and soft sandy clay (CL) to the deepest boring termination depth of approximately 60.0 feet below existing grade.

#### 3.2 GROUNDWATER

We recorded groundwater subsequent to drilling, at a depth of approximately 2.5 and 3.0 feet below the ground surface at our boring locations. It should be noted that groundwater may perch above the clayey soils after significant rainfall activity. Based on available published literature, existing site features, and the results of the borings, we estimate the normal seasonal high groundwater level to be approximately one foot above the measured levels. It should also be noted the estimated seasonal high water level does not provide any assurance that groundwater level will not exceed these estimated levels during any given year in the future. Should impediments to surface water drainage be present, or should rainfall intensity and duration, or total rainfall quantities, exceed the normally anticipated rainfall quantities, groundwater levels

might once again exceed our seasonal high estimates. The depths of the groundwater levels encountered at the boring locations are presented on the Subsurface Profiles.

#### 4.0 FOUNDATION DESIGN RECOMMENDATIONS

#### 4.1 GENERAL

The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. If the structural loadings, construction locations, or grading information change from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes.

Additionally, if subsurface conditions are encountered during construction, which were not encountered in the borings, report those conditions immediately to us for observation and recommendations.

#### 4.2 STRUCTURE FOUNDATIONS

Based on the results of our subsurface exploration, we consider the subsurface conditions at the site favorable for support of the proposed structure when constructed on a properly designed shallow foundation system. Provided the soils are prepared in accordance with the Site Preparation Section of this report, the following parameters may be used for foundation design.

#### 4.2.1 Bearing Pressure

The maximum allowable net soil bearing pressure for a shallow foundation should not exceed 2,000 pounds per square foot (p.s.f.). Net bearing pressure is defined as the soil bearing pressure at the base of the foundation in excess of the natural overburden pressure. The foundation should be designed based upon the maximum load that could be imposed by all loading conditions.

#### 4.2.2 Foundation Size

The minimum widths recommended for any isolated continuous wall footings is 18 inches. Even though the maximum allowable soil bearing pressure may not be achieved, this width recommendation should control the size of the foundations.

#### 4.2.3 Bearing Depth

The exterior foundation should bear at a depth of at least 18 inches below the exterior final grades and the interior footings should bear at a depth of at least 18 inches below the finish floor elevation to provide confinement to the bearing level soils. We recommend storm-water and surface water be diverted away from the building exterior, both during and after construction, to reduce the possibility of erosion beneath the exterior footings.

#### 4.2.4 Bearing Material

The foundation may bear on compacted structural fill. The bearing level soils, after compaction, should exhibit densities of at least 95 percent of the maximum dry density of the bearing soils as determined by ASTM D-1557 (Modified Proctor), to the depth described subsequently in the Site Preparation section of the report. In addition to compaction, the bearing soils must exhibit stability and be free of "pumping" conditions.

#### 4.2.5 Settlement Estimates

Post-construction settlement of the structure will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics of the bearing soils; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundations; (3) site preparation and earthwork construction techniques used by the contractor,

and (4) external factors, including but not limited to vibration from offsite sources and groundwater fluctuations beyond those normally anticipated for the naturally-occurring site and soil conditions which are present.

Our settlement estimates for the structure are based upon the use of successful adherence to the site preparation recommendations presented later in this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlement of the structures.

Due to the sandy nature of the surficial soils, following the compaction operations, we expect a significant portion of settlement to be elastic in nature. This settlement is expected to occur relatively quickly, upon application of the loads, during and immediately following construction.

Using the recommended maximum bearing pressure, the assumed maximum structural loads, and the field test data which we have correlated to the strength and compressibility characteristics of the subsurface soils, we estimate the total settlements of the structures to be approximately one inch or less.

Differential settlement results from differences in applied bearing pressures and the variations in the compressibility characteristics of the subsurface soils. Based on the subsurface conditions as determined by our borings, it is anticipated that differential settlements will be within tolerable limits.

#### 4.3 SITE PREPARATION FOR SHALLOW FOUNDATIONS

We recommend the following site preparation procedures for the building area:

- 1. Prior to construction, the location of existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of overlying structures.
- 2. Strip the proposed construction limits of all grass, roots, topsoil, concrete and other deleterious materials within and 5 feet beyond the perimeter of the proposed structures. Expect clearing and grubbing of 6 to 12 inches.
- 3. Compact the exposed surface using tracked dozer or vibratory equipment. We recommend that vibratory equipment be operated in static mode within 100 feet of any existing structures. The upper one foot of soils below the exposed surface within the building area should be improved to achieve a minimum compaction requirement of 95% of the Modified Proctor Test (ASTM D-1557). We recommend the compacted soils exhibit moisture content within 2 percent of the soils optimum moisture content as determined by the Modified Proctor Test (ASTM D-1557). Should the soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate before recompacting.
- 4. Test the compacted surface for compliance at a minimum of one location per 2,500 square feet of each building area, or at a minimum of 3 locations.
- 5. Place the fill material, as required. The fill should consist of "clean," fine sand with less than 5 percent soil fines. You may use fill materials with soil fines between 5 percent and 10 percent, but strict moisture control may be required. Place fill in uniform 10 to 12-inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified

Proctor maximum dry density. We recommend the compacted soils exhibit moisture content within 2 percent of the soils optimum moisture content as determined by the Modified Proctor Test (ASTM D-1557). If light compaction equipment is used, we recommend the lift thickness be reduced to 8 inch thick lifts.

- 6. Perform compliance tests within each lift of fill at a minimum of one location per lift per 2,500 square feet of each building area, or at a minimum of 3 locations.
- 7. Compact and test footing cuts for compaction to a depth of one foot below bearing level. We recommend that you test one out of every four (25 percent) column footings and perform one test per every 50 linear feet of wall footing. Compaction operations in confined areas, such as footing excavations, can best be performed with a lightweight vibratory sled or other hand-held compaction equipment.

#### **5.0 LIFT STATION DESIGN RECOMMENDATIONS**

#### 5.1 GENERAL

The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. If the construction location changes from the provided location, we request the opportunity to review and possibly amend our recommendations with respect to those changes.

Based on our understanding of the bearing depth on the order of 38.8 feet below existing grade, the structure base will bear within the medium dense sandy soils.

Because the fine sand with silt (SP-SM) significantly retains moisture, strict moisture control may be required during placement and compaction operations to avoid moisture related instability. The very clayey fine sand (SC) as encountered between approximately 23.5 and 28.5 feet below existing grade is not suitable for use as backfill soil.

Additionally, if subsurface conditions are encountered during construction which were not encountered in the boring, report those conditions immediately to us for observation and recommendations.

#### 5.2 LIFT STATION

It should be noted that dewatered conditions will need to be maintained to preclude pumping conditions. Pumping soils are unstable, and therefore not suitable for support of subsurface structures. Unstable soils, resulting from insufficient dewatering, could require removal and replacement with dry, compacted structural backfill soil. The replacement of unstable, in-place soil may add considerable expense to the project. Temporary groundwater dewatering should be the responsibility of the contractor.

We anticipate the buried lift station will exert little or no net downward pressure on the soils, rather, the structure may be subject to hydrostatic uplift pressure when the lift station is empty. Below grade structures should be designed to resist lateral earth pressures and hydrostatic uplift pressures appropriate for their depth below existing grade and wet season groundwater table.

The walls of the structure should be designed to resist at rest lateral earth pressures, with equivalent fluid densities above and below the water table being as follows:

Above Water Table - Equivalent Fluid Density55 pcfBelow Water Table - Equivalent Fluid Density90 pcf

The water table for wall design purposes should be assumed to be at the estimated seasonal high level.

<u>Foundation Preparation</u> - Based on our evaluation of the soil conditions encountered in this area, we offer the following recommendations for the proposed underground construction.

- 1. The proposed construction area should be dewatered as necessary and excavated to the required foundation depth. Excavation work will be required to meet OSHA Excavation Standard Subpart P regulations, Type C Soils. Either a braced sheet pile structure or an excavation with temporary side slopes cut back at 1.5 horizontal to 1.0 vertical can be implemented, depending on the specific project requirements. The side slope of 1.5 horizontal to 1.0 vertical is contingent upon the dewatering system adequately controlling slope seepage. Sheet piling should be designed according to OSHA sheeting and bracing requirements. We recommend a Florida registered Professional Engineer design the sheeting/bracing system.
- 2. A dewatering system will be required for the project. The water table should be maintained at least 2 feet below the depth of excavation required. The dewatering system should not be decommissioned until sufficient deadweight exists on the structure to prevent uplift or the uplift protection system as described below, if necessary, is in place.
- 3. Excavate to the planned foundation bearing level. Structural backfill required in the foundation excavation should be placed in loose lifts of 6 inches and compacted until a density of at least 95 percent of the soil's Modified Proctor maximum dry density is achieved. Compaction operations should be performed with hand-held equipment. The backfill should be placed and compacted in this manner until the foundation bearing level is achieved.

Should the foundation soils experience pumping and soil strength loss during the earthwork operations, work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate prior to further compaction.

4. Structural backfill which will be required around buried walls and below foundations (if stone is not used below foundations) should consist of inorganic, non-plastic sand having less than 10 percent clay and/or silt and a Unified Soil Classification of SP and/or SP-SM. We recommend the backfill exhibit moisture content within 2 percent of the optimum moisture content as determined by the modified proctor test (ASTM D1557). Backfill with clay/silt contents in excess of 5 percent likely will require strict moisture control to preclude instability problems. Care should be taken not to over compact the backfill (i.e., limit compaction to a maximum of 98 percent of the maximum density) in order to limit the lateral loads imparted to the proposed walls.

The soils encountered at the boring, with the exception of the very clayey fine sand (SC), are considered suitable for use as structural fill and backfill. It should be understood that soils excavated from below the water table may be excessively wet and may require stockpiling or spreading to dry prior to placement and compaction.

- 5. Perform compliance testing in the backfill at a minimum of one location for each 6-inch lift of backfill.
- 6. A representative of UES Professional Solutions, LLC should be retained to provide on-site inspection and testing of excavation compaction/filling operations so that proper

documentation of the required minimum compaction and compliance with the recommendations contained herein can be provided.

<u>Uplift Protection</u> - When the water level within below-grade structures is maintained at or above the surrounding groundwater level, no net buoyancy will occur to the structure. However, when these structures are drained for maintenance, or as water levels fluctuate within the lift station, a positive means of uplift protection may be necessary. Hydrostatic uplift forces can be resisted in several ways including:

- 1. Addition of dead weight to the structure.
- 2. Mobilizing the dead weight of the soil surrounding the structure through extension of footings outside the perimeter of the structure.
- 3. Use of a permanent gravity or mechanical dewatering system that is operated only when the structures are to be drained.
- 4. Use of uplift piles.

We anticipate that one or more of the noted methods may be required for this construction. At your request, we would be pleased to assist you in evaluating uplift protection requirements.

#### **6.0 CONSTRUCTION RELATED SERVICES**

We recommend the owner retain UES Professional Solutions, LLC to perform construction materials tests and observations on this project. Field tests and observations include verification of foundation subgrades by monitoring filling operations and performing quality assurance tests on the placement of compacted natural soils and structural fill. We can also perform concrete testing, pavement section testing, structural steel testing and other construction materials testing services.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

#### 7.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information about Your Geotechnical Engineering Report" appears in Appendix C, and will help explain the nature of geotechnical issues. Further, we present documents in Appendix C: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.







						GRAPHIC	SCALE
LEGEN	ID					0 15	30
•	APPROXIMATE	LOCATION	I OF STANDARD PENE	TRATION TEST (SPT)	BORING	(IN FE 1 INCH :	ET) ะ 30 ft.
		TITLE:	BORI	NG LOCATION PLA	.N		scale: 1" ≈ 30'
	UES PROJECT: GEOTECHNICAL EVALUATION 635 VIOLET STREET SOUTH DAYTONA, FLORIDA			PAGE/FIG. NO.: A-1			
		DRAWN BY:	MKL	DATE: 05/12/25	PROJECT NO .:	0430.2300221.0000	
		CHECKED BY:	BP	DATE: 05/12/25	REPORT NO .:	2035292	



# $\frac{1}{1} \frac{1}{1} \frac{1$

Fine SAND (SP)

Fine SAND with some to many SHELL fragments (SP)

Fine SAND with SILT (SP-SM)

SILTY fine SAND (SM)

CLAYEY fine SAND (SC)

CLAY (CL)

Topsoil (PT) ... some to many ORGANICS (PT), sometimes DEBRIS

#### NOTES:

- Measured Groundwater Level 24 (+)
- ⊻ Hours Subsequent to Time of Drilling (SP) Unified Soil Classification System
- EOB End of Boring
- Ν Penetr. Resistance, Blows/ft.
- NE Groundwater Not Encountered
- HA Hand Auger Method
- WOH Weight of Hammer
- Coefficient of Permeability, (ft/day) Κv
- -200 % Passing No. 200 Sieve MC % Moisture Content

UES	PROJECT:		GEOTI 6 SOUT	ECHNICAL E 35 VIOLET S TH DAYTONA	VALUATIO TREET A, FLORIDA	N
	DRAWN BY:	MKL	DATE:	05/14/25	PROJECT NO .:	0430.2300221.0000
	CHECKED BY:	RD	DATE:	05/11/25	REPORT NO .:	2035202

BP

05/14/25

_	- 25'		
	TITLE:	SUBSURFAC	E PROFILE
	SCALE:	NA (in feet)	PAGE/FIG. NO.: A-2





⊻	Measured Groundwater Level 24 ( Hours Subsequent to Time of Drilli
(SP)	Unified Soil Classification System
ÈOÉ	End of Boring
Ν	Penetr. Resistance, Blows/ft.
NE	Groundwater Not Encountered
HA	Hand Auger Method
WOH	Weight of Hammer
Kv	Coefficient of Permeability, (ft/day)
-200	% Passing No. 200 Sieve
MC	% Moisture Content





## **KEY TO BORING LOGS**

#### SYMBOLS AND ABBREVIATIONS

#### SYMBOL DESCRIPTION

N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
Þ	Sample from Auger Cuttings
$\square$	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
RQD	Rock Quality Designation
	Stabilized Groundwater Level
$\overline{\nabla}$	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
NP	Non-Plastic (Atterberg Limits Test)
К	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

#### **RELATIVE DENSITY**

(Sands and Gravels) Very loose - Less than 4 Blow/Foot Loose – 4 to 10 Blows/Foot Medium Dense - 11 to 30 Blows/Foot Dense - 31 to 50 Blows/Foot Very Dense - More than 50 Blows/Foot

#### CONSISTENCY

(Silts and Clays) Very Soft - Less than 2 Blows/Foot Soft – 2 to 4 Blows/Foot Firm - 5 to 8 Blows/Foot Stiff - 9 to 15 Blows/Foot Very Stiff - 16 to 30 Blows/Foot Hard - More than 30 Blows/Foot

#### **RELATIVE HARDNESS**

(Limestone) Soft - 100 Blows for more than 2 Inches Hard – 100 Blows for less than 2 Inches

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
SOILS e No. 200 sieve*	GRAVELS	CLEAN	GW	Well-graded gravels and gravel- sand mixtures, little or no fines
	50% or more of coarse fraction retained on	GRAVELS	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand- silt mixtures
AINED d on th	No. 4 sieve		GC	Clayey gravels and gravel- sand-clay mixtures
sE GR etaine	SANDS	CLEAN SANDS	SW**	Well-graded sands and gravelly sands, little or no fines
OARS 50% r	More than 50% of	passing No. 200 sieve	SP**	Poorly graded sands and gravelly sands, little or no fines
C than	coarse fraction passes No. 4 sieve	SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
More			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SIOLS 0% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
			MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
	SILTS A Liqu	ND CLAYS id limit	СН	Inorganic clays or clays of high plasticity, fat clays
	greater	than 50%	ОН	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils
*Based on the material passing the 3-inch (75 mm) sieve				

Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

#### **MODIFIERS**

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample Trace - 5% or less With Silt or With Clay - 6% to 11% Silty or Clayey – 12% to 30% Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample Trace – Less than 3% Few - 3% to 4% Some - 5% to 8%

Many - Greater than 8%

#### These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample

Trace - 5% or less Few - 6% to 12% Some - 13% to 30% Many - 31% to 50%





# Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

## Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one* — *not even you* — should apply this report for any purpose or project except the one originally contemplated.

#### **Read the Full Report**

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a lightindustrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot* accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

#### **Subsurface Conditions Can Change**

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

#### Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

#### A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmationdependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.* 

## A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

#### Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.* 

## Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, but preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/ or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

#### **Read Responsibility Provisions Closely**

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

#### **Environmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnicalengineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.* 

## Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.

### Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2015 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, or its contents, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document as a complement to a geotechnical-engineering report. Any other firm, individual, or other entity that so uses this document without being a GBA member could be commiting negligent or intentional (fraudulent) misrepresentation.

## **CONSTRAINTS & RESTRICTIONS**

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

#### WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

#### UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

#### **CHANGED CONDITIONS**

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

#### MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

#### CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

#### USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations. Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

#### STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

#### **OBSERVATIONS DURING DRILLING**

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

#### WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

#### LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

#### TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.



#### SECTION 03 30 00 CAST IN PLACE CONCRETE

#### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. The work included under this section consists of furnishing all materials, forms, transportation and equipment, and performing all necessary labor to do all the plain and reinforced concrete work shown on the Drawings, or incidental to the proper execution of the work, or as herein specified.
- B. Composition: Concrete shall be composed of cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce a plastic workable mixture in accordance with all requirements under this section suitable to the specific conditions of placement.

#### 1.02 SUBMITTALS

A. All materials specified shall be certified by the producer or manufacturer that the furnished material meets the specific requirements of the specifications. Concrete mix designs shall be submitted for approval prior to placement.

#### 1.03 CODES AND STANDARDS

A. ACI 301 "Specifications for Structural Concrete for Buildings", ACI 318" Building Code Requirements for Structural Concrete", ACI 347 "Recommended Practice for Concrete Formwork"; ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete"; comply with applicable provisions except as otherwise indicated.

#### 1.04 TESTING

- A. Air content shall be in accordance with American Society for Testing Materials Standard Methods C 173, one for each set of compressive strength specimens.
- B. Sampling of freshly mixed concrete shall be in accordance with ASTM C172.

- C. Slump: ASTM C-143
- D. Test results will be reported in writing to Engineer, Contractor, Owner and Concrete producer on same day tests are made.
- E. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.

#### PART 2 - MATERIALS AND EQUIPMENT

#### 2.01 PORTLAND CEMENT

A. Shall comply with the standard specifications for Portland Cement, A.S.T.M. designation C-150, Type II, or Type III (high-early), where indicated on drawings.

#### 2.02 CONCRETE AGGREGATE

- A. Shall conform to standard specifications for concrete aggregate, A.S.T.M. Designation C-33 or to ASTM C-330. Maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between reinforcing bars.
- B. Fine Aggregate Fine aggregate shall be clean, hard, strong, durable, uncoated particles of natural sand known as Lake Wales, Interlachen, or approved equal. The source, composition, quality and gradation of the fine aggregate shall be subject aid the approval of the Engineer. Samples of the sand shall be furnished, together with certified copies of the gradation and analysis from the recognized testing laboratory.
  - 1. The weight of extraneous or deleterious substances shall not exceed the following percentages:

Loss by Decantation	3%
Shale	1%
Clay Lumps	1%
Coal and Lignite	1%

2. The fine aggregate shall be reasonable well graded from coarse to fine and when tested by means of laboratory sieves shall meet the following requirements in percent of total weight:

Total Retained On	Percent Retained
No. 4 Sieve	0 - 5
No. 10 Sieve	3 - 30
No. 30 Sieve	30 - 70
No. 50 Sieve	65 - 95
No. 100 Sieve	95 - 100

- C. Deficiencies in the percentages of the fine aggregates passing the No. 50 and No. 100 Sieves may be remedied by the addition of pozzolanic or cementitious materials excepting Portland cement. Such materials must meet the approval of the Engineer.
- D. Coarse Aggregate.
  - 1. Coarse aggregate shall consist of hard, tough, durable components free from adherent coatings and vegetable matter, and shall not contain soft, friable, thin or elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall be properly graded from fine to coarse to produce concrete of desired strength, density, and workability. The source, composition, quality and gradation of the coarse aggregate shall be subject to the approval of the Engineers. Samples of the coarse aggregate shall be furnished together with certified copies of the gradation and analysis from a recognized testing laboratory.
  - 2. All coarse aggregate shall be washed and shall be free from disintegrated pieces, salt, alkali, vegetable matter and adherent coatings. The total percentage of all deleterious substances shall not exceed 5 percent by weight. The substances designated shall not be present in excess of the following amounts.

Loss by Decantation	1%
Clay Lumps or Other Soluble Materials	3%
Soft Fragments	5%

3. Where the cover over reinforcing is 2 inches or more, the maximum size of aggregate shall be 12 inches. Where the cover over reinforcing is less than 2 inches, the maximum size of aggregate shall be 3/4 inch. The maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between forms nor three-fourths of the minimum clear spacing between reinforcing bars. The grading of the coarse aggregate in the concrete shall be within the following limits.

#### Percent Passing

Maximum Size Square Mesh Screen	97 -	100%
2 Maximum Size Square Mesh Screen	40 -	70%
No. 4 Sieve	0 -	6%

#### 2.03 WATER

A. Water shall be clean and free from oil, acids, alkalis, organic materials or other injurious substances.

#### 2.04 REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed bars of USA manufacture.
- B. Welded Wire Fabric: ASTM A185, gauges, spacing and dimensions as indicated.
- C. Metal Bar Supports: CRSI MSP-1, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports, or otherwise approved by the Engineer. Use concrete supports for reinforcement in concrete placed on grade.
- D. Tie Wire: 16 gauge minimum, black, soft annealed.
- E. Coupler Splice Devices: Cadweld tensions couplers, capable of developing the ultimate strength of the bar as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal.
- F. Epoxy coated or FRP rebar shall be used for all marine applications.

#### 2.05 FORM WORK

- A. Lumber: Douglas Fir or Larch, No. 2 grade, seasoned and surfaced on four sides.
- B. Plywood: Plyform, Class 1, BB-Exterior type, mill oiled, and edge sealed, with thickness not less than 3/4 inch.
- C. Medium Density Overlay (MDO) Plywood Forms: PS-1, B-B High Density Concrete Form Overlay, Class I, unoiled.
  - 1. Butt form panels, make contact surface fully flush and seal butting holes with sponge form tape. Chamfer edges of beams and ceilings.
  - 2. Where MDO plywood is used to form beams, do not use MDO plywood that has been patched or damaged.
- D. Drip Forms: Varnished ponderosa pine or equally rigid non-staining plastic, 2inch-wide on each leg.
- E. Steel Forms. Uncoated steel, 3/16-inch minimum thickness, fabricated to close tolerances, protected only by the specified release agent, braced so as not to bend, dent, or dimple under wet concrete load, vibrator impact, and tool impact. Maintain steel form in rust-free condition by use of steel wood and light grinding, followed by coats of specified release agent. Use forms that can be adjusted into true alignment without stops or ridges.
- F. Glass Fiber Reinforced Plastic (FRP) Forms: Smooth coated forms, braced so as not to bend, dent or dimple under wet concrete loads, vibrator impact and tool impact, and at least 0.11 inch thick. Design forms for external bracing at piers and columns, without use of form ties.
- G. Plugged Cone Form Ties: Rod type, with ends or end fasteners which can be removed without spalling the concrete and which leave a hole equal in depth to the required reinforcement clearance. Form ties shall be of a design in which the hole left by the removed end or end fastener is easily filled to match the surface of the hardened concrete. Provide removable cones 13 inches in diameter by 12 inches

deep. Provide preformed mortar plugs to match the color of the concrete, recessed 3 inches, adhered with an approved two-part epoxy.

- H. Weep Hole Forms: PVC polyethylene, or ABS pipe, matching color of the concrete, 4 inch inside diameter, with outlet projecting 12 inches form wall and cutoff in a plane parallel to it.
- I. Circular and Elliptical Column Forms: Fabricate of two pieces, clamped watertight using gaskets and without horizontal joints. Install horizontal construction joints only where indicated or as directed by the Engineer.
- J. Beam Forms: Provide in one length without form joints and suitable for cambering up to 1/160 of span without distortion of profile or opening of seams.
- K. Forms of Hammerhead Pier Caps: Provide in one length with adjustable soffits, bulkheads and screens as necessary to accommodate different hammerhead beam configurations. Provide no construction joints in hammerhead pier caps. Where three or fewer identical hammerhead pier caps occur within a line section, steel braced HDO plywood forms may be substituted for steel forms if:
  - 1. Working drawings of formwork are submitted.
  - 2. Internal form ties are regularly spaced no less than 48 inches each way and are made watertight.
  - 3. Form ties have removable cones, which are filled to match concrete.
  - 4. Joints in panels are fully watertight.
  - 5. The resulting surface matches the appearance of steel formed hammerhead caps, with no visible discoloration due to form leakage.
- L. Styrofoam Board: Expanded polystyrene extruded into board form, closed cell, moisture resistant, capable of maintaining indicated clear space between concrete structures.

- M. Control Joint Filler: Use epoxy joint filler equal to BurkEpoxy Joint Filler to fill voids left by saw cuts and to resist against spalling caused by vehicle traffic in concrete slabs.
- N. Inserts: Galvanized cast steel or galvanized welded steel, complete with anchors to concrete and fittings such as bolts, wedges and straps. Provide hanger inserts spaced to match grid of suspended ceilings.
- O. Shoring: As designed and executed by Contractor to support all loads.
- P. Chamfer Strips: Polyvinyl strips designed to be nailed in the forms to provide a 3/4-inch chamfer at exposed edges of concrete members.
- Q. Form Release Agent: A blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms, and equal to Eucoslip, by the Euclid Chemical Company, or Release #1, by The Burke Company. Use a non-staining release agent that leaves the concrete with a paintable surface.

#### 2.06 ADMIXTURES

- A. Air Entraining Admixture: ASTM C260.
- B. Water Reducing and Retarding Admixture:
  - 1. Concrete Without Superplasticizer:
    - Water Reducing Admixtures: ASTM C494, Type A, equal to Eucon WR-75 by the Euclid Company, Pozzolith 200N by Master Builders, Plastocrete 161 by Sika Chemical Corporation, and containing no calcium chloride.
    - Water Reducing and Retarding Admixtures: ASTM C494, Type D, equal to Eucon Retarder-75 by the Euclid Company, Pozzolith 100 XR by Master Builders, Plastiment by Sika Chemical Corporation, and containing no calcium chloride.

- Accelerating Admixtures: ASTM C494, Type C or E, equal to Accelguard 80 by the Euclid Company, Darex Set Accelerator by W.R. Grace, and containing no calcium chloride.
- 2. Concrete with Superplasticizer:
  - a. Water Reducing, High Range Admixtures: ASTM C494, Type F or G, equal to Eucon 37 by the Euclid Company, Rheobild 716 by Master Builders, Daracem 100 by W.R. Grace, Sikament by Sika Chemical Corporation, and consisting of a second generation admixture, free of chlorides and alkalis (except for those attributable to water) composed of a synthesized sulfonated complex polymer, enabling the concrete to maintain its rheoplastic state in excess of two hours if necessary.
  - b. Manufacturer's Job Site Representation: Provide the services of a competent field service representative from the manufacturer of each of the admixtures selected for use to provide at the job site advice and consultation on the use of the admixture materials, including the effect on the concrete in place, including recommending maximum discharge time for superplasticizer method and procedure to induce superplasticizer into mixer, quantities of admixtures to be used if variations are required because of temperature/humidity, wind or other environmental considerations, and to be available on short call at any time requested by the Owner, Contractor, or concrete producer.
- 3. Concrete used in Marine Applications:
  - Micro Silica admixtures shall be used for concrete installed in marine and coastal applications. Concrete designs shall met the appropriate requirements of EN206-1, BS 8500 and BS 5075. Contractor shall provide plant certification for all mix designs used in marine and coastal applications.
#### 2.07 GROUT

- A. Nonshrink, Nonmetallic Grout: The Burke Company's Non-Ferrous, Non-Shrink Grout, Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Euclid NS Grout, or equal pre-mixed type.
- B. Nonshrink Metallic Grout: The Burke Company's Metallic Spec Grout, Master Builders Embeco 636 Grout pre-mixed type, or equal.
- C. Epoxy Grout: Sikadur 42 Grout-Pak, or equal, for grouting sleeves for anchor bolts, etc.
- D. Clarifier Basin Grout: Class B concrete of coarse aggregate shall pass the 3/4 inch sieve.

#### 2.08 MEMBRANE CURING COMPOUND.

Membrane curing compound shall be wax-free, pigmented, 100 percent resin base compound such as A.C. Horn's "Horncure 30 C", Hunt Process Corporation; Southern's "All-Resin", or equal.

#### 2.09 BONDING AGENT.

A. Bonding agent shall be Colma Fix, as manufactured by Sika Chemical Corporation, of Passaic, New Jersey or equal. To be considered equal, the material must be a two-component epoxy-polysulphide resin system, and it must have a demonstrated record of strong adhesion to both wet and dry concrete in either the hardened or the plastic state. It must also be of equal strength.

#### 2.10 ACCESSORIES

- Precast Concrete Block Supports for Reinforcing Bars: Comply with ACI 315.
   Provide blocks with No. 4 dowels bent 90° to support top bars.
- B. Membrane: 6 mil polyethylene film.

- C. Water Stops: Polyvinyl chloride meeting all requirements of U.S. Army Corps of Engineer's Specification CRD-C-572 and equal to Burke Water Stops as manufactured by The Burke Company. Provide flat dumbbell type and center bulb type, 9 inches x 3/8 inch at wall thickness of 12 inches or greater, and 6 inches x 3/8 inches at wall thickness less than 12 inches. Provide 6-inch split-ribbed with center bulb type at connections of new concrete structures with existing concrete. Provide water stops as indicated on the Drawings.
- D. Preformed Expansion Joint Filler:
  - 1. Bituminous type conforming to the requirements of ASTM D994.
  - 2. Nonextruding type, self-expanding cork, <sup>3</sup>/<sub>4</sub>-inch thick or as otherwise shown on the Drawings, conforming to the requirements of ASTM D1752, Type III, and compatible with the specified joint sealant compound.
- E. Joint Sealant: A multipart gray polyurethane sealant, meeting U.S. Federal Specification TT-S-00227E (3) Type 1, Class A self-leveling for horizontal joints, and Type II, Class A, non-sag for vertical joints, and recommended by the manufacturer for continuous immersion in water. Provide sealants as manufactured by Products Research and Chemical Corporation, Mameco International, The Burke Company, W.R. Meadows, or equal.
- F. Tongue and Groove Joint Forms: 24-gauge steel forms complete with steel stakes and splice plates, designed for joints not to receive a poured seal, and equal to Burke Keyed Kold Joint as manufactured by The Burke Company.
- G. Inserts: Galvanized steel to fit the proposed hanger or support.
- H. Mortar for Repair of Concrete: Same materials as used for concrete, except omit coarse aggregate and use not more than one-part cement to two and on-half parts sand by damp loose volume. Use no more mixing water than is necessary for handling and placing.
- I. Burlap Mats: Conform to AASHTO Specification M182.

- J. Epoxy Bonding Agent: Euco #452, BurkEpoxy MV, Sikadur Hi Mod, Concresive 1001-LPL, or equal.
- K. Powered Epoxy Coating for Anchor Bolts: Powdered epoxy resin as manufactured by the 3M Company, Scotchkote No. 213, Armstrong No. R349.

## 2.11 CONDUITS AND PIPES EMBEDDED IN CONCRETE

- A. Conduits, pipes and sleeves of any material not harmful to concrete shall be permitted to be embedded in concrete with approval of the engineer, provided they are not considered to replace structurally the displaced concrete.
- B. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent electrolytic action between aluminum and steel.
- C. Conduits and pipes, with their fittings, embedded within a column shall not displace more than 4% of the area of cross section on which strength is calculated or which is required for fire protections.
- D. Conduits, pipes, sleeves passing through a slab, wall or beam shall not impair significantly the strength of the construction.
- E. Except when plans for conduits and pipes are approved by the engineer, conduits and pipes embedded within a slab, wall, or beam shall satisfy the following:
  - 1. They shall not be larger in outside dimension than one-third overall thickness of slab, wall, or beam in which they are embedded.
  - 2. They shall not be spaced closer than three diameters or widths on center.

## 2.12 PIPES CONTAINING LIQUID, GAS, OR VAPOR

A. Pipes that will contain liquid, gas or vapor may be embedded in structural concrete under the following conditions:

- 1. Pipes and fittings shall be designed to resist effects of the material, pressure, and temperature to which they will be subjected.
- No liquid, gas, or vapor, except water not exceeding 90°F (32C) nor 50 psi (345 kPa) pressure, shall be placed in the pipes until the concrete has attained its design strength.
- 3. Concrete cover for pipes, conduits and fittings shall be not less than 12 inches (38 mm) for concrete exposed to earth or weather or in contact with ground.
- 4. Reinforcement with an area of not less than 0.002 times area of concrete section shall be provided normal to piping.
- 5. Piping and conduit shall be so fabricated and installed that cutting, bending or displacement of reinforced from its proper location will not be required.

# PART 3 - EXECUTION

## 3.01 PROPORTIONING

- A. The proportions of aggregate to cement shall be such as to produce a thoroughly plastic mixture which will work readily into the corners and angles of the forms and around the reinforcement but without permitting the materials to segregate or excess free water to collect on the surface. The percentage of sand shall not be less than thirty (30) nor more than fifty (50) percent of the total weight of the aggregate.
- B. The total content, including the surface water contained in the aggregate, shall not exceed 5.7 gallons per sack of cement. The slump shall not exceed four (4) inches. Air-entraining admixture shall be Darex AEA as manufactured by the Dewey and Almy Chemical Company.
- C. The amount of air entrained in the freshly mixed concrete shall not be less than three (3) percent nor more than six (6) percent. The minimum cement content in sacks per cubic yard of concrete shall not be less than six (6) sacks per cubic yard for Class "A" concrete.

- D. Concrete materials shall be accurately measured by weight. Measurement of materials for ready-mixed concrete shall conform to the "Standard Specifications for Ready-Mixed Concrete", (A.S.T.M. designation C-94).
  - 1. Class "A" concrete for all structures shall have minimum compressive strength of 4000 psi at 28 days.
  - 2. Class "B" concrete for sidewalks shall have minimum compressive strength of 3000 psi at 28 days.
  - 3. All concrete shall be Class "A" unless otherwise shown on the drawings.

#### 3.02 MIXING AND PLACING

- A. Concrete shall be mixed, conveyed and deposited in accordance with the "A.C.I. Building Code" (A.C.I. 318).
- B. Prior to placing any concrete, the Contractor shall submit for the Engineer's approval a design mix, calculated by a recognized testing laboratory, and using the approved aggregates to produce a workable mix of the desired strength, together with certified copies of 7 days and 28 day tests of cylinders taken from concrete made according to the design mix. The mixes shall be designed to secure concrete having a minimum compressive strength at age 28 days.
- C. Ready-mixed concrete delivered shall be accompanied by delivery tickets showing the following:
  - 1. Date and time leaving plant Additives (if any)
  - 2. Type of cement and weight
- Site arrival time

Site leaving time

- 3. Quantity of water and time added
- D. Concrete.
  - 1. Ready-mixed concrete shall be used. All mixing requirements specified herein shall be enforced, and the Owner's laboratory representative and the Engineer shall have free access to the mixing plant at all times.

- 2. Except for materials and/or procedures otherwise specified herein, ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C 94.
- 3. No water shall be added to the concrete after it leaves the plant except where part of the design water was purposely omitted at the plant, and then only as approved by the Engineer.
- E. Mixer Speed.
  - 1. Neither the speed of any mixer nor the quantity of material loaded into any mixer shall exceed the recommendations of the manufacturer.
  - 2. Excessive over-mixing, required additions of water to preserve the required consistency, shall be cause for rejection of the batch.
  - 3. Concrete shall not remain in a transit mixer or agitator truck more than 90 minutes after the water has been introduced, and not for more than 45 minutes if any approved retarding agent is not used.
  - 4. Minimum mixing time shall be 50 revolutions of drum at rated speed.
- F. Measurement.
  - 1. Equipment necessary to determine and control the actual amounts of all materials entering the concrete shall be provided by the concrete manufacturer.
  - 2. All materials shall be measured by weight, except that water may be measured by volume calculated at 8-1/3 pounds per gallon. One bag of cement will be considered as 94 pounds in weight.
- G. Mixes.
  - 1. Mix Design: Conform to ACI 318, Section 4.3. Submit data on consecutive tests and standard deviation.

2. Maximum Water-Cement Ratio:

.37 (lbs/lb) - Concrete with superplasticizer
.38 (lbs/lb) - Concrete in Marine Environments
.45 (lbs/lb) - Class A concrete without superplasticizer
.55 (lbs/lb) - Class B concrete without superplasticizer
.65 (lbs/lb) - Class C concrete without superplasticizer

- 3. Air Content: 5 percent plus or minus 1.5 percent (Class A and B).
- 4. Slump:4 inches plus or minus 1 inch for Class A and B without superplasticizer.

7 inches plus or minus 1 inch for Class A and B with superplasticizer. 8 inches plus or minus 1 inch for tremie concrete or as specified by details.

- H. Placing Concrete.
  - 1. All concrete shall be placed in clean, damp forms that are not hot to the touch.
  - 2. To prevent segregation, concrete shall be deposited as nearly as practicable in final position and not allowed to drop freely more than necessary and in no case more than five feet, except in an approved funnel or tremie. All concrete shall be placed during daylight unless otherwise authorized at least four hours in advance. Where the reinforcing steel above the top of the concrete being placed becomes coated with laitance or partially set-up concrete, all such concrete shall be removed from the reinforcing steel prior to placing concrete around the bars.
  - 3. Concrete shall be packed carefully and tightly around pipe and other items to secure maximum adhesion.
  - 4. Concrete shall be placed in layers not over 12 inches deep before compacting. Concrete shall be compacted by internal vibrating equipment supplemented by spading and hand-rodding between reinforcing steel and

form to eliminate air bubbles and honeycomb. Vibrators shall not be used to move the concrete laterally inside the forms. Duration of vibration shall be limited to the time necessary to provide satisfactory consolidation without causing segregation, not less than five and not more than 15 seconds per square foot of exposed top surface. The vibrator shall be constantly relocated and shall be placed in each specific spot only once for each layer. The Contractor shall take steps to assure that sufficient personnel are available to devote full time to operating vibrator, spading and rodding.

- 5. Wall concrete shall be placed in layers as indicated above, with the first lift preceded by a 1-inch minimum layer of 1:2-1/2 cement-sand grout, with a 6-inch to 8-inch slump, placed on existing concrete not more than 20 minutes before concrete placement. The surface of previously placed hardened concrete shall be clean and wet before grouting or shall be treated with a bonding agent as required. Puddles of water in horizontal recessed keys shall be avoided by the use of drain recesses to outside edge of concrete. Concrete in walls and deep beams shall be placed in lifts not to exceed three layers at 12 inches each for the full length of the pour before proceeding higher. The placing of concrete shall not be delayed more than 20 minutes between layers or lifts.
- 6. Slab forms shall be thoroughly cleaned after placing wall concrete below. Concrete in beams or walls shall be placed to bottom of floor slab. After concrete in walls below floor slab has been in place for approximately 30 minutes, the concrete for the floor slab and upper portion of the beam shall be placed and vibrated.
- 7. When concrete is conveyed by chutes, the equipment shall be of proper size and design to insure a continuous flow in the chute. The chutes shall be metal or metal lined, and the different portions shall have approximately the same slope. The slope shall not be less than one vertical to three horizontal or more than one vertical to two horizontal, and there shall be provision for a baffle at the discharge end of the chute to prevent segregation. If the vertical distance between the discharge end of the chute and the surface of the concrete is more than five feet, a spout shall be used. The lower end of the spout shall be kept as near the surface of the deposit as is practicable.

All chutes and spouts shall be thoroughly cleaned before and after each run. All debris and water shall be discharged outside the forms.

## 3.03 CURING AND PROTECTION

- A. Curing:
  - 1. Immediately after surface defects have been repaired, apply a spray coat of curing compound to all exposed surfaces, including slabs, walls, beams and columns in accordance with the manufacturer's recommendations. Protect exposed steel keyways and other embedded items from the curing compound. Water cure, as specified in paragraph B hereunder, all concrete surfaces that are to be exposed to wastewater, surfaces that are to be coated with a coal tar epoxy system, and concrete floors requiring a bond for special finishes.
  - 2. Do not apply compound during periods of rainfall. Should the film become damaged from any cause within the required curing period, immediately repair the damaged portions with additional compound. Upon removal of forms, immediately coat the newly exposed surfaces to provide a curing treatment equal to that provided for the surface.
  - 3. Curing and Sealing Compound: Use clear compound conforming to Federal Specification TT-C-800A, 30% solids content minimum, having test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq. cm. when applied at a coverage rate of 300 sq. ft per gallon, and equal to Super Floor Coat or Super Pliocure by The Euclid Chemical Company or Masterseal 66 by Master Builders. Furnish manufacturer's certification as required.
  - 4. Apply specified clear curing and sealing compound to all horizontal areas so noted on the Drawings or in the Specifications. Apply immediately after final finishing. Apply this compound to non-structural construction joints of slabs on grade to act as a bond breaker prior to placement of adjacent concrete.

- B. Water Curing Method: Cure all concrete that is to be water cured by either the wet burlap method, by continuous fogging or by covering with waterproof sheet.
  - Wet Burlap Method: Cover concrete surface with a double thickness of burlap, cotton mats, or other approved material, kept thoroughly saturated with water. Keep the forms wet until removed and upon removal, start the curing specified herein immediately. Cure the concrete for a period of 7 days for normal Portland cement or 4 days for high early strength cement. Do not submerge concrete poured in the dry until it has attained sufficient strength to adequately sustain the stress involved and do not subject it to flowing water across its surface until it has cured 4 days.
  - Continuous Fogging: Perform continuous fogging by fogging with a nozzle which so atomizes the flow of water that a mist, and not a spray, is formed. Fog the concrete surface regularly without allowing any part of the surface to become dry. Take all necessary precautions to prevent erosion of the concrete surface by the water.
  - 3. Covering with Waterproof Sheets: Keep the entire area to be cured continuously wet by fogging, as specified in the fogging paragraph above, for at least 18 hours and then immediately cover with waterproof curing sheet conforming to ASTM C171, waterproof paper and polyethylene film, free of holes or tears. Keep sheet fully flat, without wrinkles or air bubbles, held down tautly at all edges. Do not use this method on slabs which will be exposed to view.

## 3.04 PLACING REINFORCEMENT

- A. All reinforcement shall be detailed, fabricated and erected in accordance with the A.C.I. "Manual of Standard Practice for Detailing Reinforced Concrete Structure", (A.C.I. 315), including bar supports and spacers. At splices all reinforcing bars shall be lapped a minimum of twenty-four (24) bar diameters but not less than twelve (12) inches.
- B. The reinforcing shall be fabricated to the shapes and dimensions shown and shall be placed where indicated on the drawing. Before placing, all reinforced steel shall be thoroughly cleaned of rust, mill scale or coatings, which would reduce or destroy

the bond. Reinforcing bars shall conform to the requirements of the latest editions of the A.C.I. Code and the CRSI Manuals.

- Wire mesh, unless otherwise shown on the drawings or specified, shall be 6" x 6"
   No. 10 woven or electrically welded wire fabric conforming to the requirements of ASTM Designation A185, latest revision.
- D. Space chairs and bolsters in accordance with ACI 315 and 318 using height to furnish cover over reinforcing required. Chairs with plastic feet or stainless steel shall be used in all beams and elevated slabs. Chairs for other concrete adjacent to or on the ground may be pieces of concrete block or concrete brick compressed into subgrade with the rebars bearing directly on the pointed edge of the masonry supports, or chairs set on precast concrete pads compressed into the subgrade.
- E. When placed in the forms, reinforcement shall be clean and free of all loose rust, scale, dust, dirt, paint, oil or other foreign material, and shall be accurately and securely positioned both laterally and vertically before placing concrete. Minimum clearances between the steel and face of concrete shall be maintained as shown.
- F. The rebars shall be fastened together at <u>every intersection</u> or at intervals not greater than 24 bar diameters by wire ties or by some alternate method acceptable to the Engineer. In areas where large bars are closer together, the wire ties may be spaced not more than 30 bar diameters apart, rather than as specified above.

#### 3.05 FORMS

- A. Installation and erection shall be in accordance with ACI 347 and as specified hereinafter.
- B. Forms shall conform to shape, lines and dimensions of numbers indicated, and shall be sufficiently tight to prevent leakage of mortar. They shall not deflect under dead load weight of construction as a liquid or of construction load. Forms shall be properly braced or tied together so as to maintain position and shape within specified tolerances. Construct forms so that they can be removed steadily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and line.

C. Forms shall be of wood, metal, or other approved materials. Metal forms shall be of a type and manufacture acceptable to the Engineer. Plywood, fiberboard, or absorptive type form linings may be used where appropriate. Sectional forms shall produce a uniform surface and shall be assembled in a modular pattern. Pours will not be scheduled until all erection and bracing is complete. Walers, ties and braces shall be required for all forms.

Chamfer strips made from nominal dimensional 1" x 1" lumber cut on the diagonal shall be installed at the top of the forms on all exposed edges of walls, slabs, beams and other structures above grade.

- Drip edge shall be made from wood quarter round and installed where shown.
   Extruded plastic fillets shall be used where detailed. Circular structures shall be formed with special care, and attention to the appearance of the finished structure.
   Random location of fillers, non-modular sections, and excessive deviations from true circular segments shall be cause for rejection of the forms.
- E. The Contractor shall be fully responsible for the adequacy of formwork in its entirety. Forms shall support required loads and shall maintain their dimensional and surface correctness to produce members required by drawings.
- F. Slots, chases, recesses or other openings as shown on the drawings or as needed for the work of any other trades shall be boxed out.
- G. Box out for all temporary openings and build forms to seal them up when and as required.
- H. After sealing and immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form releasing agent, applied in compliance with the Manufacturer's instructions.
- I. Reused forms shall be thoroughly cleaned out of dirt, debris, concrete and foreign matter. Forms shall not be reused if they have developed defects which would affect their tightness and strength or desired surface finish. Used forms shall not be used for architectural concrete.

- J. Forms shall be removed in a manner that will prevent injury to concrete. Supporting forms or shoring shall not be removed until the members have acquired sufficient strength to support their weight and any load thereon.
- K. Removal shall be in sequence as approved by the Engineer. Unless test cylinders warrant another procedure, the forms shall not be removed from members prior to the time listed in the schedule hereinafter unless otherwise directed.
- L. Bonding to Existing Surfaces: Clean existing concrete surfaces that are to have new concrete bonded thereto of all grease, oil, dust, dirt and loose particles and coat with an epoxy bonding agent just prior to placing of the new concrete. Apply the bonding agent as recommended by the manufacturer and allow the agent to become tacky before the new concrete is placed. Do not allow the bonding agent to overlap or be spilled on the surfaces to be exposed after the work is completed.

#### 3.06 FORM REMOVAL

A. Maintain formwork in place for the following structural conditions until the concrete has attained the minimum percentage of indicated design compressive strength or for the period of time specified in the following table.

Note: Time periods in the table include all days except those in which the temperature falls below 40 degrees F.

			Minimum
		Normal	Compressive
Structural	Normal	High-Early	Strength for
Member or	Strength	Strength	Form Removal
Condition	<u>Concrete</u>	Concrete	(% Design Strength)
Cantilevers	12 days	7 days	90
Over 20 feet between supports	12 days	7 days	90
Stairway	10 days	5 days	80
Floor Slabs	5 days	3 days	70
Free standing walls, column and piers	5 days	3 days	70
Walls, piers columns, sides of beams, footing slabs on grade, an vertical surfaces	24-48 hours s ad	12-24 hours	70
Front face form of curbs	6-24 hours	6 hours	70

#### 3.07 CONCRETE FINISHINGS

- A. Repair of Surface Defects:
  - General: Repair surface defects, including tie holes immediately after form removal. Dampen the area to be patched and an area at least 6 inches wide surrounding it to prevent absorption of water from the patching mortar. Notify the Engineer prior to commencing operations.

- 2. Removal of Defective Concrete: Remove all honeycombed and other defective concrete down to sound concrete. Cut edges perpendicular to the surface or slightly under cut. Sand blast surfaces to receive repair.
- 3. Bonding Grout: Thoroughly dampen surfaces to be patched and apply a coat of bonding grout consisting of one-part cement to one part fine sand passing a No. 30 sieve and having the consistency of thick cream.
- 4. Placing Patching Mortar: After the bonding grout begins to lose its water sheen, apply a premixed patching mortar, thoroughly consolidating it into place and striking it off so as to leave the patch slightly higher than the surrounding surface. Leave mortar undisturbed for one hour to permit initial shrinkage and then finally finish.
- 5. Tie Holes: After being cleaned and thoroughly dampened, fill the tie holes solid with patching mortar.
- B. Concrete Finishes:
  - 1. Formed Surfaces: After removal of forms, chip off all irregular projections, grind flush with adjacent surfaces and finish concrete surfaces in accordance with the following schedule:

Finish	
<b>Designation</b>	Area Applied
F-1	Exterior walls below grade not exposed to water: Repair defective concrete, fill depressions deeper than 2 inch, and fill tie holes.
F-2	Exterior and interior walls exposed to water: Repair defective concrete, remove fins, fill depressions 3 inch or deeper, and fill tie holes.
F-3	Walls of structures of buildings exposed to view and underside of formed floors or slabs: In addition to Finish F-2, fill depressions and airholes in mortar. Dampen surfaces and then spread a slurry

consisting of one-part cement and one and one-half parts sand by damp loose volume on the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

- F-4 Tops of walls, beams and similar unformed surfaces occurring adjacent to formed surfaces: Strike smooth after concrete is placed and float to a texture reasonably consistent with that of formed surfaces.
  - 2. Slab Surfaces:
    - a. General: After concrete has been consolidated, finish all concrete slabs with a floated finish. After floating, trowel finish all concrete slabs, except for areas to receive roofing, insulation, tile or topping, and immediately light broom finish. Where a finish is not indicated, provide a troweled finish.

Finish	
<u>Designation</u>	Area Applied
S-1	Slabs and floors not water bearing: Smooth steel trowel finish.
S-2	Slabs and floors which are water bearing and slab surfaces on which mechanical equipment moves: Steel trowel finish free from trowel marks and all irregularities.
S-3	Slabs, floors and stair treads of structures or buildings exposed to view: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.
S-4	Slabs and floors at slopes greater than 10%: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.

- S-5 Exposed edges of slabs, floors and tops of walls: Finish with a 3inch radius edge if a chamfer is not indicated.
- C. Floated Finish: After concrete has been placed, consolidated, struck off and leveled, do not work the surface further until water sheen has disappeared and the surface has hardened sufficiently to permit floating. During the first floating, check the planeness of the slab with a 10-foot straightedge applied at no less than two angles. Cut down all high spots and fill all low spots to produce a surface having the required tolerance. Then refloat the slab to a uniform sandy texture.
- D. Light Broomed Finish: After floating, power trowel slabs to receive a light broomed finish to produce a smooth surface, relatively free of defects. Before the surface sets, pass a soft broom drag over the surface to produce a surface uniform in texture and appearance.
- E. Troweled Finish: After floating, power trowel slabs to receive a troweled finish to produce a smooth surface, relatively free of defects. Hand trowel after the surface has hardened sufficiently. When a ringing sound is produced as the trowel is moved over the surfaces, perform final troweling by hand to produce a surface which is thoroughly consolidated, free from trowel marks, uniform in texture and appearance and plane to a tolerance of 1/8 inch in 10 feet as determined by a 10 foot straightedge placed anywhere on the slab in any direction.
- F. Hardener Finish: Where indicated to receive a troweled hardener finish, water cure slabs without application of curing and sealing agent. When slab is at least 20 days old and thoroughly dry, apply the hardener in accordance with the manufacturer's recommendations. Where dry-shake hardener or slip resistant finish is required, apply the hardener or slip-resistant product prior to complete curing and finishing, in accordance with the requirements and recommendations of the product manufacturer.
- G. Saw Cut Joints: Cut joints that are to be saw cut not sooner than 2 hours after the concrete is poured and not later than 8 hours after the pour.

#### 3.07 TESTS

- A. Compressive strength tests shall be made by breaking standard 6-inch diameter by 12-inch high test specimens prepared, cured and broken in accordance with the American Society for Testing Materials Standard Methods C-31 and C-39, latest revision. Four specimen test cylinders shall be taken from each pour of five (5) cubic yards or more. One additional test shall be taken from each thirty (30) cubic yards or fraction thereof in each pour in excess of thirty (30) cubic yards.
- B. Test specimens shall be taken from manhole bottom pours of less than five (5) cubic yards as directed by the Engineer. Test specimens shall be taken in the presence of the Engineer. One cylinder from each pour shall be broken at seven (7) days, the remainder at twenty-eight (28) days. Additional test cylinders may be ordered for determining the characteristics of a new design mix or changes in equipment or methods, and under adverse weather or curing conditions.
- C. Slump test shall be made in accordance with ASTM C143, latest revision, and shall be made with each load and at time of cylinders.
- D. The Contractor shall supply all cylinder molds, slump cones, tools and labor for preparing specimen, and shall provide clean, moist sand or burlap for curing. Cylinder shall not be shipped to the testing laboratory until the third day following preparation and shall be protected from accidental damage at all times.
- E. The test cylinders shall be tested in a recognized commercial testing laboratory at the expense of the Contractor.

## 3.08 EXPANSION JOINTS, CONSTRUCTION JOINTS AND WATER STOPS

A. Expansion Joints shall be places as indicated on the drawings. Joint materials for surfaces exposed to water and sewage shall conform to ASTM D175, Preformed Joint Filler, non-extruding and resilient (bituminous type), thickness as shown on the drawings. Joint materials for isolation joints, slab-on-grade joints and wall joints not exposed to water and sewage shall conform to ASTM D994, preformed expansion joint filler for concrete (bituminous type), thickness as shown on the drawings.

- B. Construction Joints shall be located in accordance with a schedule of pours which shall be prepared and submitted by the Contractor. Vertical construction joints shall be held to the minimum number consistent with good standard practice.
- C. Water Stops. Material for water stops shall be 9-inch PVC multi-rib center-bulb type for expansion joints, and 1/4" x 4" and 1/8" x 4" structural steel sheets for construction joints. PVC joint material shall be as manufactured by The Burke Company, or approved equal.

## END OF SECTION

# SECTION 03 60 00 GROUTING

## PART 1 - GENERAL

#### 1.01 WORK INCLUDED

A. Provide all labor, materials, tools and equipment and perform all grouting as specified hereinafter and indicated on the Drawings.

#### 1.02 RELATED WORK

A. Section 03 30 00: Cast-In-Place Concrete

## 1.03 SUBMITTALS

- A. Submit manufacturer's literature for review on the following items:
  - 1. Non-shrink grout data including grout properties, mixing, surface preparation and installation instructions.

## 1.04 DELIVERY AND STORAGE

A. Deliver and store grouting materials in unbroken containers with seals and labels intact as packaged by the manufacturer.

## PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Non-shrink, Nonmetallic Grout: The Burke Company's Non-Ferrous, Non-Shrink Grout, Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Euclid NS Grout, or equal pre-mixed type.
- B. Non-shrink Metallic Grout: The Burke Company's Metallic Spec Grout, Master Builders Embeco 636 Grout pre-mixed type, or equal.

C. Epoxy Grout: Sikadur 42 Grout-Pak, or equal, for grouting sleeves for anchor bolts, etc.

## PART 3 - EXECUTION

## 3.01 PREPARATION

A. Clean all bonding surfaces or dust and oil.

## 3.02 INSTALLATION

- A. Non-shrink Grout:
  - 1. Use non-shrink, nonmetallic grout for grouting precast concrete wall panel connections, column base plates, anchor bolts, reinforcing bars, pipe sleeves, machinery supports and pump base plates. Use epoxy grout for anchor bolts, etc., where indicated on the Drawings.
  - 2. Mix and place non-shrink grout as recommended by the manufacturer.
  - 3. Mix grout as close to the work area as possible and transport quickly to its final position in a manner which will not permit segregation of materials.
  - 4. Cure non-shrink grout with water saturated burlap for at least three days or with an application of Super Rez Seal cure and seal compound applied immediately after grout placement.
  - 5. Do not operate machinery set on grout pads until the grout has cured for at least 24 hours.

## END OF SECTION

# SECTION 09 90 00 PAINTING AND COATING

# PART 1 – GENERAL

#### 1.01 Scope

- A. This specification defines the methods of surface preparation, coating systems, and methods of application for painting as outlined herein.
- B. The Contractor shall furnish all supervision, labor, tools, materials, equipment, scaffolding or other structures, and supervision required for the transportation, unloading, storage, and application of the paint and associated products covered by this specification.
- C. The work includes painting and finishing of interior and exterior exposed items above and below grade surfaces, such as structural steel, miscellaneous metals, ceilings, walls, floors, doors, frames, pipe, handrails, posts, fittings, valves, pumps, tanks, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the specification as stated herein.
- D. The following items will not be painted:
  - 1. Any code requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.
  - 2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.
  - 3. Aluminum handrails, walkways, windows, louvers, and grating unless otherwise specified herein.

- 4. Signs and nameplates.
- 5. Finish hardware.
- 6. Stainless steel angles, tubes, pipe, etc.
- 7. Products with polished chrome, aluminum, nickel, or stainless-steel finish.
- 8. Plastic switch plates and receptacle plates.
- 9. Flexible couplings, lubricated bearing surfaces, insulation and metal and plastic pipe interior.
- 10. Sprinkler heads.
- E. All work shall be done in strict accordance with this specification, the design drawings and the painting package, including manufacturer's printed instructions.
- F. The Contractor will obtain, at its own expense, all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules, and regulations promulgated by authorities having jurisdiction, which may bear on the work. This compliance will include Federal Public Law 91-596 more commonly known as the "Occupational Safety and Health Act of 1970."
- G. Wherever the word "Engineer" occurs in this specification, it shall apply to the authorized representative of Mead & Hunt. Where the word "Contractor" occurs in this specification, it shall apply to the Contractor performing any part of or all of this work.
- H. Surfaces to be painted: (Refer to 17.0 Coating Schedule for description of surfaces to be painted and their specified coating systems and colors).
- 1.02 Definitions
  - A. Field Painting is the painting of new or rebuilt items at the job site. Field painting shall be the responsibility of the Contractor.

- B. Shop Painting is the painting of new or rebuilt items in the shop prior to delivery to the jobsite.
- 1.03 Abbreviations
  - A. The abbreviations and definitions listed below, when used in this specification, shall have the following meanings:
    - 1. SSPC Society for Protective Coatings
    - 2. Exterior Outside, exposed to weather
    - 3. Interior Dry Inside, <u>not</u> subject to immersion service
    - 4. Interior Wet Inside, subject to immersion service
    - 5. ASTM American Society of Testing Materials
    - 6. NACE National Association of Corrosion Engineers
    - 7. NSF National Sanitation Foundation
    - 8. AWWA American Water Works Associates

## PART 2 - RESOLUTION OF CONFLICTS

- A. It shall be the responsibility of the Contractor to arrange a meeting prior to the start of painting, or flooring installation between the Contractors, the Paint Manufacturer whose products are to be used, and the Engineer. All aspects of surface preparation, application and coating systems as covered by this specification will be reviewed at this meeting.
- B. Clarification shall be requested promptly from the Engineer when instructions are lacking, conflicts occur in the specification, or the procedure seems improper or inappropriate for any reason.
- C. Copies of all manufacturer's instructions and recommendations shall be furnished to the Engineer by the Painting Contractor.

D. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and Engineer a minimum of three (3) times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the Engineer.

# PART 3 - INSPECTION OF SURFACES

- A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection by the Engineer. Any defects or deficiencies shall be corrected by the Contractor before application of any subsequent coating.
- B. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the Engineer.
- C. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of manufacturer's printed instructions shall be adhered to.
- D. Coating thickness shall be determined by the use of a properly calibrated "Nordson-
- E. Mikrotest" "Positest" Coating Thickness Gauge (or equal) for ferrous metal or an OG232 "Tooke" Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the "tooke" gauge is classified as a destructive test.

## PART 4 - EQUIPMENT

A. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practical from the compressor.

- B. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in first-class condition and shall comply with recommendations of the paint manufacturer.
- C. Contractor will provide free of charge to the Engineer a "Nordson-Mikrotest" or "Positest" dry film thickness gauge for ferrous metal and an OG232 "Tooke" gauge or equal for non-ferrous and cementitious surface, to e used to inspect coatings by the Engineer and Contractor. The gauges may be used by the Contractor and returned each day to the Engineer. Engineer will return gauges to Contractor at completion of job.

# PART 5 - MATERIALS

- A. All materials specified herein are manufactured by the TNEMEC Company, Inc., Sherwin Williams, Xypex Chemical Corporation, or Approved Equal. These products are specified to establish standards of quality and are approved for use on this project.
- B. Equivalent materials of other manufacturers may be substituted for approval by the Engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance and an independent laboratory certification that their product meets the performance criteria of the specified materials. Unless otherwise stated, the latest revision of identified specifications shall be used.
  - Abrasion Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load
  - 2. Adhesion Elcometer Adhesion Tester
  - 3. Exterior Exposure Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
  - 4. Hardness ASTM D3363
  - 5. Humidity ASTM D2247
  - 6. Salt Spray (Fog) ASTM B117

- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Engineer at least ten (10) days prior to the bid opening. Substitutions which decrease film thickness, number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.
- D. All coatings to be shop applied must meet the requirements for volatile organic compounds (VOC) of not more than 3.5 lbs/Gallon after thinning.
- E. Colors, where not specified, shall be selected by the Owner or their Representative.
- F. All coatings in contact with potable water need to be NSF Certified in accordance with ANSI/NSF Standard 61.

#### PART 6 - WORKMANSHIP AND MATERIALS

- A. Surface Preparation
  - The surface shall be cleaned as specified for the paint system being used. All cleaning shall be as outlined in the Steel Structures Painting Council's Surface Preparation Specification, unless otherwise noted. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.
- B. Standards for Surface Preparation

## 1. SSPC-SP1 Chemical and/or Solvent Cleaning

a. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter, and contaminants, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.

## 2. SSPC-SP2 Hand Tool Cleaning

a. Removal of loose rust, loose mill scale, and loose paint to a clean sound substrate by hand chipping, scraping, sanding, and wire brushing.

# 3. SSPC-SP3 Power Tool Cleaning

a. Removal of loose rust, loose mill scale, and loose paint to a clean sound substrate by power tool chipping, descaling, sanding, wire brushing, and grinding.

# 4. SSPC-SP4 Flame Cleaning

a. Dehydrating and removal of rust, loose mill scale, and some light mill scale by use of flame, followed by wire brushing.

# 5. SSPC-SP5 (NACE-1) White Metal Blast Cleaning

a. Complete removal of all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.

## 6. SSPC-SP6 (NACE-3) Commercial Grade Blast Cleaning

Complete removal of all dirt, rust scale, mill scale, foreign matter, and previous coatings, etc., leaving only shadows and/or streaks caused by rust stain and mill scale oxides. At least sixty-six percent (66%) of each square inch of surface area is to be free of all visible residues, except slight discoloration.

## 7. SSPC-SP7 (NACE-4) Brush-Off Blast Cleaning

a. Removal of rust scale, loose mill scale, loose rust, and loose coatings, leaving tightly bonded mill scale, rust and previous coatings. On concrete surfaces, brush-off blast cleaning shall remove all laitance, form oils, and solid contaminants. Blasting

should be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.

## 8. SSPC-SP8 Pickling

a. Complete removal of rust and mill scale by acid pickling, duplex pickling or electrolytic pickling (may reduce the resistance of the surface to corrosion, if not to be primed immediately).

## 9. SSPC-SP10 (NACE-2) Near-White Blast Cleaning

Removal of all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale, and small specks of previous coating. At least ninety-five percent (95%) of each square inch of surface area is to be free of all visible residues and the remainder shall be limited to slight discoloration.

## 10. SSPC-SP11-87 Power Tool Cleaning to Bare Metal

a. Complete removal of rust, rust scale, mill scale, foreign matter, and previous coatings, etc., to a standard as specified on a Commercial Grade Blast Cleaning (SSPC-SP6, NACE-3) by means of power tools that will provide the proper degree of cleaning and surface profile.

# 11. SSPC-SP13 (NACE-6) Surface Preparation of Concrete

- a. Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.
- C. Visual standards
  - 1. SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation Standards for Painting Steel Surfaces," and the National Association of

Corrosion Engineers, "Blasting Cleaning Visual Standards" TM-01-70 and TM-01-75 shall be considered as standards for proper surface preparation.

- 2. Oil, grease, soil, dust, etc., deposited on the surface preparation that has been completed shall be removed prior to painting according to SSPC-SP1 Solvent Cleaning.
- 3. Weld flux, weld spatter and excessive rust scale shall be removed by Power Tool Cleaning as per SSPC-SP11-87T.
- 4. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.
- 5. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Engineer.
- 6. All areas which require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be cleaned by thorough Power Tool as specified in SSPC-SP11-87T.
- 7. "Touch-up systems will be same as original specification except that approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also, strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the Engineer's attention; otherwise, Contractor assumes full responsibility.

#### PART 7 – PRE-TREATMENTS

A. When specified, the surface shall be pretreated in accordance with the specified pretreatment prior to application of the prime coat of paint.

#### PART 8 - STORAGE

A. Materials shall be delivered to the job site in the original packages with seals unbroken and with legible unmutilated labels attached. Packages shall not be opened until they are inspected by the Engineer and required for use. All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials stored by himself at the job site. Empty coating cans shall be required to be neatly stacked in an area designated by the Engineer and removed from the job site on a schedule determined by the Engineer. Engineer may request a notarized statement from Contractor detailing all materials used on the project.

## PART 9 - PREPARATION OF MATERIALS

- A. Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions; thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs. All mixing shall be done in accordance with SSPC Vol. 1, Chapter 4, "Practical Aspects, Use and Application of Paints" and/or with manufacturer's recommendations.
- B. Catalysts or thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer's instruction.

## PART 10 - APPLICATION

- A. Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless otherwise allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50°F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.
- B. No coatings shall be applied unless surface temperature is a minimum of 5°F above dew point; temperature must be maintained during curing.

## **DEW POINT CALCULATION CHART**

#### **Ambient Air Temperature – Fahrenheit**

Relative												
Humidity	20	30	40	50	60	70	80	90	100	110	120	
90%	18	28	37	47	57	67	77	87	97	107	117	
85%	17	26	36	45	55	65	76	84	95	103	113	
80%	16	25	34	44	54	63	73	82	93	102	110	
75%	15	24	33	42	52	62	71	80	91	100	108	
70%	13	22	31	40	50	60	68	78	88	96	105	
65%	12	20	29	38	47	57	66	76	85	93	103	
60%	11	29	27	36	45	55	64	73	83	92	101	
55%	9	17	25	34	43	53	61	70	80	89	98	
50%	6	15	23	31	40	50	59	67	77	86	94	
45%	4	13	21	29	37	47	56	64	73	82	91	
40%	1	11	18	26	35	43	52	61	69	78	87	
35%	-2	8	16	23	31	40	48	57	65	74	83	
30%	-6	4	13	20	28	36	44	52	61	69	77	

#### SURFACE TEMPERATURE AT WHICH CONDENSATION OCCURS

## C. Dew Point

 Temperature at which moisture will condense on surface. No coatings should be applied unless surface temperature is a minimum of 5°F above this point. Temperature must be maintained during curing.

- D. Example
  - If air temperature is 70°F and relative humidity is 65%, the dew point is 57°F. No coating should be applied unless surface temperature is 62°F minimum.
- E. No coatings shall be applied unless the relative humidity is below eighty-five percent (85%).
- F. Suitable enclosures to permit painting during inclement weather may be used if provisions are made to control atmospheric conditions artificially inside the enclosure, within limits suitable for painting throughout the painting operations.
- G. Field Painting in the immediate vicinity of, or on, energized electrical and rotating equipment, and equipment and/or pipes in service shall not be performed without the approval of the Engineer.
- H. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.
- I. The Contractor's scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect buildings and equipment. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.
- J. Painting shall not be performed on insulated pipe within three (3) feet of insulation operations or on insulation where covering and surface coat have not had time to set and dry. Painting shall not be performed on uninsulated pipe within one (1) foot of any type of connection until the connection has been made, except as directed by the Engineer.
- K. The prime coat shall be applied immediately following surface preparation and in no case later than the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.

- L. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.
- M. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.
- N. Finish colors shall be in accordance with the COLOR SCHEDULE and shall be factory mixed (i.e., there shall be no tinting by the Contractor, unless authorized by the Engineer).
- O. All edges and weld seams in immersion service shall receive a "stripe coat" (applied by brush) of the 1<sup>st</sup> coat prior to application of the full 1<sup>st</sup> coat.
- P. All open seams in the roof area of tanks shall be filled after application of the topcoat with a flexible caulking such as Sika Flex 1A.

## PART 11 - WORKMANSHIP

- A. The Contractor must show proof that all employees associated with this project shall have been employed by the Contractor for a period not less than six (6) months.
- B. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work, which shows carelessness, lack of skill, or is defective in the opinion of the Engineer, shall be corrected at the expense of the Contractor.
- C. The Contractor shall provide the names of at least six (6) other projects of similar size and scope that they have successfully completed under their current company name.
- D. Application of Paint

#### 1. BY BRUSH AND/OR ROLLERS

- a. Top quality, properly styled brushes and rollers shall be used.Rollers with a baked phenohl core shall be utilized.
- b. The brushing or rolling shall be done so that a smooth coat as nearly uniform in thickness as possible is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.
- c. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.
- d. It may require two (2) coats to achieve the specified dry film thickness if application is by brush and roller.

# 2. AIR, AIRLESS, OR HOT SPRAY

- a. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied and shall be equipped with suitable pressure regulators and gauges.
- b. Paint shall be applied in a uniform layer, with a fifty percent (50%) overlap pattern. All runs and sags should be brushed out immediately or the paint shall be removed and the surface resprayed.
- c. High build coatings should be applied by a crosshatch method of spray application to ensure proper film thickness of the coating.
- d. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as authorized by the manufacturer.
- e. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.

- f. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.
- g. The first coat on concrete surfaces in immersion service should be sprayed and backrolled.

## PART 12 - PROTECTION AND CLEAN-UP

- A. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, materials of other crafts, equipment, vehicles, fixtures, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.
- B. At the option of the Engineer during the course of this project, the Contractor will contain all spent abrasives, old paint chips, paint overspray and debris by means suitable to the Engineer, including but not limited to, full shrouding of the area.
- C. If shrouding is required, the Contractor must provide a complete design of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs.
- D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed or smeared on all surfaces, including glass, light fixtures, hardware, equipment, painted, and unpainted surfaces.
- E. After completion of all painting, the Contractor shall remove from job site all painting equipment, surplus materials, and debris resulting from this work.
- F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the jobsite in accordance with Local, State, and Federal requirements as outlined by the Environmental Protection Agency.
- G. A notarized statement shall be presented to the Engineer that all hazardous materials have been disposed of properly including but not limited to: Name of
disposal company, disposal site, listing of hazardous materials, weights of all materials, cost per pound and EPA registration number.

# PART 13 - TOUCH-UP MATERIALS

A. The Contractor shall provide at the end of the project at least one gallon of each generic topcoat in each color as specified by the Engineer for future touch-up. Two gallons may be required for two component materials.

# PART 14 - ON-SITE INSPECTION

A. During the course of this project the Engineer will reserve the option of incorporating the services of a qualified inspection service. The inspection service will be responsible for assuring the proper execution of this specification by the successful Contractor.

# PART 15 - COATING SYSTEM SCHEDULE

- A. STEEL STRUCTURAL, TANKS, PIPES, AND EQUIPMENT
  - 1. EXTERIOR EXPOSURE (NON-IMMERSION)

# A.1 System No. 73-1 Epoxy/High Build Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT-Mils</u>
<u><math>1^{\text{st}}</math> Coat:</u> 66-1255 Epoxoline Primer	3.0 - 4.0
$2^{nd}$ Coat: 66-Color Hi-Build Epoxoline	2.0 - 3.0
<u>3rd Coat:</u> 73-Endura-Shield	2.0 - 3.0
	7.0 -10.0
Minimu	m 8.0 Mils

**NOTE:** This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and gloss retention of conventional paints. Second coat to be same color or close to finish color. Specify Series 1074 Endura-Shield for a gloss finish.

Specify Series 161 in lieu of the 66 for faster recoats or lower temperature curing.

#### A.2 System No. 73-2 High Build Urethane For Marginally Cleaned Surfaces or Topcoating Existing Systems.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning or SSPC-SP3 Power Tool Cleaning Feather all edges.

		DFT-Mils
Shop Coat:	Manufacturer Standard Primer	1.5 - 2.0
	(or existing coating)	
<u>Tie Coat:</u>	135 Chembuild	3.0 - 5.0
Topcoat:	73-Color Endura-Shield	2.0 - 3.0
		6.5-10.0
	Minim	um 7.5 Mils

NOTE: This system can be used over factory finish paint or over nonsandblasted steel and offer the high performance of a urethane coating. Specify Series 1074 Endura-Shield for gloss finish. A test patch is always recommended to insure proper application.

#### A.3 System No. 82-1 Silicone Alkyd Enamel – Gloss

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	DFT-Mils
1 <sup>st</sup> Coat: 37H-77 Chem-Prime H.S.	2.0 - 3.5
2 <sup>nd</sup> Coat: 23-Color Enduratone	1.5 - 2.5
3 <sup>rd</sup> Coat: 82-Color Silicone Alkyd Enamel	1.0 - 2.5
	4.5 - 8.5
Minimur	n 5.5 Mils

# A.4 System 90-97 Zinc/Epoxy/Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

		<u>DFT-Mils</u>
Primer:	90-97 Tneme-Zinc	2.5 - 3.5
2 <sup>nd</sup> Coat:	66-Color Hi-Build Epoxoline	2.0 - 3.0
3 <sup>rd</sup> Coat:	73 Endura-Shield III	2.0 - 3.0
		6.5 – 9.5
	Minimum	8.0 Mils

**<u>NOTE</u>**: This system offers the added corrosion protection of a zinc rich primer. Series 90-97 Tneme-Zinc is an organic zinc-rich primer that can be used for field touch up of a zinc primer or for touch up of galvanized surfaces that are damaged. You can substitute Series 91-H<sub>2</sub>O Hydrozinc for the 90-97. You can substitute Series 1074 for the Series 73 if a gloss finish is desired.

A.5 <u>Syste</u>	em No. 3	0-1 DTM A	Acrylic Overco	<u>oat System</u>
Surface Preparation: Pressure Clean @ 3500 PSI			PSI	
		Spot SP2,	SP3, SP6, or S	SP7
		Feather al	l edges.	
				DFT-Mils
Spot Primer:	135 Ch	embuild		2.0 - 4.0
2 <sup>nd</sup> Coat:	30 Spra	a-Saf EN		2.0 - 4.0
3rd Coat:	30 Spra	-Saf EN		2.0 - 4.0
			Total	4.0 - 8.0
			Total	6.0 – 12.0 (Spots)

**NOTE:** This is an excellent coating system to overcoat existing unknown coating systems with limited surface preparation, using a non-stressful coating with excellent color and gloss retention. This coating should be spray applied and has excellent dry fall properties. The brush and roller version of Series 30 with a SG finish is the Series 29 Tufcryl. A test patch is always recommended to assure proper adhesion.

#### B. INTERIOR EXPOSURE (NON-IMMERSION)

# B.1 System No. N69-1 High Solids Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

1 <sup>st</sup> Coat:	N69-Color Hi-Build Epoxoline II	5.0 - 7.0
2 <sup>nd</sup> Coat:	N69-Color Hi-Build Epoxoline II	<u>5.0 - 7.0</u>
		10.0 -14.0
	Minimu	um 12.0 Mils

**NOTE:** This coating will provide maximum protection. It offers chemical and corrosion resistance for long-term protection against salt spray, moisture, corrosive fumes, and chemical attack. Series N69 is a polyamidoamine cured epoxy. Primer coat must be touched-up before 2<sup>nd</sup> coat is applied.

DFT Mils

#### B.2 System No. 66-2 Polyamide Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	DFT-Mils
66-Color Hi-Build Epoxoline	3.0 - 5.0
66-Color Hi-Build Epoxoline	4.0 - 6.0
	7.0 -11.0
Min	nimum 9.0 Mils
	66-Color Hi-Build Epoxoline 66-Color Hi-Build Epoxoline Mir

**NOTE:** This system will provide chemical and corrosion resistance against abrasion, moisture, corrosion fumes, chemical contact, and immersion in non-potable water. Primer coat must be touched-up before 2<sup>nd</sup> coat is applied. Substitute Series 161 for low temperature cure or quick recoats.

# B.3 <u>System No. 66-6 High Build Epoxy (Over OEM Finishes)</u> Surface Preparation: Spot SSPC-SP6 Commercial Blast Cleaning or SSPC-SP11 Power Tool Cleaning To Bare Metal

		<u>DFT-Mils</u>
1st Coat:	Manufacturer's Standard	1.0 - 2.0
	(or existing coating)	
2 <sup>nd</sup> Coat:	135 Chembuild	3.0 - 5.0

3 <sup>rd</sup> Coat:	66-Color Hi-Build Epoxoline	3.0 - 5.0
		6.0–10.0
	Minimum	7.0 Mils

**<u>NOTE</u>**: This system is to be used over standard manufacturer's primer to offer a high-performance epoxy finish. Excellent for areas of rust not able to be completely cleaned.

# B.4 System No. 23-1 Alkyd Enamel – Semi-Gloss

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	Ī	DFT-Mils
<u>1<sup>st</sup> Coat:</u> 37H-77 Chem-Prime H.S.		2.0 - 3.5
2 <sup>nd</sup> Coat: 23-Color Enduratone		1.5 - 2.5
<u>3<sup>rd</sup> Coat:</u> 23-Color Enduratone		<u>1.5 – 2.5</u>
		5.0 - 8.5
	Minimum	6.0 Mils

# C. IMMERSION

# C.1 <u>System No. N69-2 High Solids High Build Epoxy (Non-Potable</u> <u>Water)</u>

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

		DFT-Mils
Stripe Coat:	N69-Color Hi-Build Epoxoline II	3.0 - 5.0
	by brush and roller to all weld	
	Seams and plate edges	
1 <sup>st</sup> Coat:	N69-Color Hi-Build Epoxoline II	5.0 - 7.0
2 <sup>nd</sup> Coat:	N69-Color Hi-Build Epoxoline II	5.0 - 7.0
		10.0-14.0
		(Excluding stripe coat)
	Minimum	12.0 Mils

**NOTE:** This system provides maximum protection in immersion service.

Scarify the surface before topcoating if the Series N69 has been exteriorexposed for 60 days or longer. If primer coat is damaged, it must be touched-up before  $2^{nd}$  coat is applied.

# C.2 <u>System No. 66-2 High Build Epoxy (Non-Potable Water)</u> <u>Surface Preparation:</u> SSPC-SP10 Near White Blast Cleaning

		DFT-Mils
Stripe Coat:	66-Color to all weld seams	2.0 - 4.0
	and plate edges	
1 <sup>st</sup> Coat:	66-Color Hi-Build Epoxoline	3.0 - 5.0
2nd Coat:	66-Color Hi-Build Epoxoline	3.0 - 5.0
3rd Coat:	66-Color Hi-Build Epoxoline	3.0 - 5.0
		9.0-15.0
		(Excluding stripe coat)
	Minimum	11.0 Mils

**NOTE:** This system will provide chemical and corrosion resistance for protection against abrasion, moisture, corrosive fumes, chemical contact, and immersion. Primer coat must be touched-up before  $2^{nd}$  coat is applied. Scarify the surface before top coating if the Series 66 has been exterior-exposed for 60 days or longer. Substitute Series 161 for low temperature cure or quick recoats.

# C.3 <u>System No. 20-1 Epoxy-Polyamide (Potable Water)</u>

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

		DFT-Mils
Stripe Coat:	20-1255 Pota-Pox (Beige)	2.0 - 4.0
	to all weld seams and plate edges	
1 <sup>st</sup> Coat:	20-15BL Pota-Pox	3.0 - 5.0
	(Tank White)	
2 <sup>nd</sup> Coat:	20-1255 Pota-Pox (Beige)	4.0 - 6.0
3rd Coat:	20-15BL Pota-Pox	
	(Tank White)	4.0 - 6.0
		11.0-17.0

(Excluding stripe coat) Minimum 12.0 Mils

<u>Caulk:</u> Seal all open roof seams with a flexible NSF Certified caulking such as Sika Flex 1A

**NOTE:** This system meets American Water Works Association AWWA D 102 Inside Paint System Number 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoats.

# C.4 System No. N140 High Solids Epoxy (Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

		DFT-Mils
Stripe Coat:	N140-15BL Pota-Pox Plus	3.0 - 5.0
	(by brush and roller to all weld	
	seams and plate edges)	
1 <sup>st</sup> Coat:	N140-1255 Pota-Pox Plus (Beige)	6.0 - 8.0
2 <sup>nd</sup> Coat:	N140-15BL Pota-Pox Plus	
	(Tank White)	6.0 - 8.0
		12.0 -16.0
	(H	Excluding stripe coat)
	Minimum	14.0 Mils

**<u>NOTE</u>**: Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61.

C.5 <u>System No. 46-30 Coal Tar-Epoxy (Non-Potable Water)</u> <u>Surface Preparation:</u> SSPC-SP10 Near White Blast Cleaning\*

		<b>DFT-Mils</b>
One Coat:	46H-413 Hi-Build Tneme-Tar	16.0 - 20.0

**<u>NOTE</u>**: May be applied in a two-coat application. Review critical recoat time if utilized.

\*SSPC-SP6 Commercial Blast Cleaning may be used for non-immersion service.

# C.6 <u>System No. 91-H<sub>2</sub>O Zinc/Epoxy (Potable Water)</u> Surface Preparation: SSPC-SP10 Near White Metal Blast

	DFT-Mils
Stripe Coat: 91-H <sub>2</sub> O Hydrozinc 2000	2.5 - 3.5
(by brush & roller to all weld	
seams and plate edges.)	
<u>1<sup>st</sup> Coat:</u> 91- H <sub>2</sub> O Hydrozinc 2000	2.5 - 3.5
<u>2<sup>nd</sup> Coat:</u> 20-1255 Pota-Pox (Beige)	4.0 - 6.0
<u>3<sup>rd</sup> Coat:</u> 20-15BL Pota-Pox (Tank White)	4.0 - 6.0
	10.5 -15.5
Minimum	12.0 Mils

<u>Caulk</u>: Seal all open roof seems with a flexible NSF Certified caulking such as Sika-Flex 1A.

**<u>NOTE</u>**: Can substitute Series N140, or FC20 for Series 20 if preferred. Meets AWWA D102-97 Inside Coating System No. 3.

# 15.2 OVERHEAD METAL DECKING, JOIST

# D. <u>INTERIOR EXPOSURE</u>

# D.1 System No. 115-1 Uni-Bond DF

<u>Surface Preparation:</u> Surfaces must be dry, clean, and free of oil, grease, and other contaminants. Allow concrete to cure 28 days. Galvanized metal decking must be scarified.

		DFT-Mils
Coating:	115-Color Uni-Bond DF	2.0 - 4.0

**<u>NOTE</u>**: This system should be used on ceiling areas where a one-coat system is desired. Can be applied over steel, galvanized, and aluminum decking, joist, beams, conduits, and concrete.

# E. <u>EXTERIOR EXPOSURE</u>

# E.1 System No. 135-5 Epoxy/DTM Acrylic

<u>Surface Preparation:</u> Pressure clean to remove all dirt, oil, grease, chemicals, and foreign contaminants. Remove loose paint and all rust by hand and power tool cleaning (SSPC-SP 2 & 3). Feather all edges.

			Dry Film-Mills	
Spot Primer:	135 Chembuild		3.0 - 5.0	
1 <sup>st</sup> Coat:	30 Spra-Saf EN		2.0 - 4.0	
2 <sup>nd</sup> Coat:	30 Spra-Saf EN		2.0 - 4.0	
		TOTAL	4.0 – 8.0 (For (2) Coats	)

**<u>NOTE</u>**: This system can be applied over a wide variety of coatings and factory finishes. It can also be applied direct to galvanized aluminum decking, joists, conduits, and tight rust.

# 15.3 <u>MILL COATED STEEL PIPE</u>

# F. <u>EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)</u>

# F.1 System No. 66-3 Epoxy-Polyamide

<u>Surface Preparation:</u> Surface shall be clean and dry. Scarify by Brush Blasting if surface is hard and glossy.

	<b>DFT-Mils</b>
<u>1<sup>st</sup> Coat:</u> 66-Color Hi-Build Epoxoline	3.0 - 4.0
<u>2<sup>nd</sup> Coat:</u> 66-Color Hi-Build Epoxoline	4.0 - 6.0
* <u>3<sup>rd</sup> Coat:</u> 73 Endura-Shield	(2.0 - 3.0)
	(9.0-13.0)

Minimums 11.0 Mils for 3 coats

**Ъ Л''** 

T.1.1

\*Optional topcoat for exterior exposure

**<u>NOTE</u>:** This system can be applied directly to mill coated steel pipe without sandblasting for use in non-immersion. There may be some bleed through with the  $1^{\text{st}}$  coat. Do not apply over glossy varnish type mill coatings without thorough scarification.

# 15.4 <u>GALVANIZED STEEL – PIPE AND MISCELLANEOUS FABRICATIONS</u>

#### G. EXTERIOR/ (NON-IMMERSION)

# G.1 System No. 73-2 Epoxy/High Build Urethane

<u>Surface Preparation:</u> SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

		<u>DFT-Mils</u>
<u>1<sup>st</sup> Coat:</u>	66-Color Hi-Build Epoxoline	2.0 - 4.0
2 <sup>nd</sup> Coat:	73-Color Endura-Shield	2.0 - 4.0
		4.0 - 8.0
	Minimum	5.0 Mils

**NOTE:** Series 66 has excellent adhesion to galvanized steel. This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and gloss retention of conventional paints. First coat to be same color as or close to the finish color. Specify Series 1074 Endura-Shield for gloss finish.

# H. INTERIOR EXPOSURE (NON IMMERSION)

# H.1 System No. 66-6 Polyamide Epoxy

<u>Surface Preparation:</u> SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

		DF I -MIIS
1 <sup>st</sup> Coat:	66-Color Hi-Build Epoxoline	2.0 - 4.0
2 <sup>nd</sup> Coat:	66-Color Hi-Build Epoxoline	2.0 - 4.0
		4.0 - 8.0
	Minimum	5.0 Mils

# I. <u>IMMERSION (POTABLE WATER)</u>

# I.1 System No. 20-1 Epoxy-Polyamide (Potable Water)

<u>Surface Preparation:</u> Solvent Clean Per SSPC-SP1 & Abrasive Blast per SSPC-SP7

			DFT-Mils
1 <sup>st</sup> Coat:	20-1255 Pota-Pox Primer		4.0 - 6.0
2 <sup>nd</sup> Coat:	20-15BL Pota-Pox Finish		4.0 - 6.0
			8.0-12.0
		Minimum	10.0 Mils

**<u>NOTE</u>**: Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoat.

# 15.5 <u>CHAIN-LINK FENCES</u>

#### J. <u>GALVANIZED STEEL & NON-FERROUS METAL</u>

# J.1 System No. 6-2 Oil Based Enamel

<u>Surface Preparation:</u> Surface shall be clean and dry

			<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	80 Galv-Gard		2.5 - 4.0
2 <sup>nd</sup> Coat:	80 Galv-Gard		2.5 - 4.0
			5.0 - 8.0
		Minimum	5.0 Mils

# 15.6 CONCRETE

# K. <u>EXTERIOR – ABOVE GRADE</u>

# K.1 <u>System No. 180-1 High Build Acrylic Emulsion – Smooth</u> Surface Preparation: Surface shall be clean and dry.

			DFT-Mils
1 <sup>st</sup> Coat:	180-Color W.B. Tneme-Crete		4.0 - 6.0*
2 <sup>nd</sup> Coat:	180-Color W.B. Tneme-Crete		$4.0 - 6.0^{*}$
			8.0-12.0 Mils
	Ν	Minimum	10.0 Mils

\*This coating should be spray applied to achieve the recommended DFT. Application by roller would possibly require additional coats to achieve the recommended DFT for the system.

**<u>NOTE</u>**: Series 180 is a high build decorative acrylic coating in a smooth finish. Substitute Series 181 if a sand texture finish if desired.

# K.2 System No. 6-1 Acrylic Emulsion

Surface Preparation: Surface must be clean and dry.

			DFT-Mils
1 <sup>st</sup> Coat:	6-Color Tneme-Cryl		2.0 - 3.0
2 <sup>nd</sup> Coat:	6-Color Tneme-Cryl		2.0 - 3.0
			4.0 - 6.0
		Minimum	5.0 Mils

**NOTE:** If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the  $2^{nd}$  coat @ 1.5 - 2.0 mils DFT.

DFT\_Mile

# K.3 <u>System No. 156-1 Modified Acrylic Elastomer</u>

Surface Preparation: Surface must be clean and dry.

1 <sup>st</sup> Coat:	156-Color Enviro-Crete	4.0 - 8.0

2 <sup>nd</sup> Coat:	156-Color Enviro-Crete		4.0 - 8.0
			8.0-16.0
		Minimum	10.0 Mils

**<u>NOTE</u>:** If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 1.0 - 2.5 mils DFT prior to the application of Series 156 Enviro-Crete.

# K.4 System No. 100 Concrete Stain

<u>Surface Preparation</u>: The surface must be clean, dry, sound, and free of cracks, and paint.

	<u>SF/Gal/Ct</u>
Sealer: Chemprobe Prime A Pell H <sub>2</sub> O	65-200
Concrete Stain: Two coats of Chemprobe	75-200
Conformal Stain	

# L. <u>EXTERIOR – BELOW GRADE</u>

# L.1 System No. 46-61 Coal Tar Pitch Solution

<u>Surface Preparation:</u> Surface must be clean and dry. Allow new concrete to cure at least 28 days.

		DFT-Mils
<u>1<sup>st</sup> Coat:</u> 46-465 H.B. Tnemec	ol	8.0 - 12.0
2 <sup>nd</sup> Coat: 46-465 H.B. Tnemec	ol	<u>8.0 – 12.0</u>
		16.0 - 24.0
	Minimum	16.0 Mils

# L.2 System No. 46-31 Coal Tar Epoxy

<u>Surface Preparation:</u> Surface shall be clean and dry. Allow New concrete to cure at least 28 days.

		DFT-Mils
One Coat:	46H-413 Hi-Build Tneme-Tar	14.0-20.0

# L.3 System No. 100-1 Crystalline Waterproofing

<u>Surface Preparation:</u> Surface to be clean and opened up by Brush Blasting, Acid Etching, or Water Blasting w/Turbo Tips. Surface must be pre-wetted prior to application.

<u>1<sup>st</sup> Coat:</u> XYPEX Concentrate @ (1.5 #/SY) <u>2<sup>nd</sup> Coat:</u> XYPEX Modified @ (1.5 #/SY)

**NOTE:** This system can be applied to concrete that is still wet or hasn't developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure. Application shall be per XYPEX specification manual.

# M. INTERIOR EXPOSURE (NON-IMMERSION)

# M.1 System No. 6-1 Acrylic Emulsion (Interior/Exterior)

<u>Surface Preparation:</u> Surface shall be clean and dry. Allow concrete to cure for 28 days.

		<b>DFT-Mils</b>
<u>1<sup>st</sup> Coat:</u> 6-Color Tneme-Cryl		2.0 - 3.0
<u>2<sup>nd</sup> Coat:</u> 6-Color Tneme-Cryl		2.0 - 3.0
		4.0 - 6.0
	Minimum	5.0 Mils

**<u>NOTE</u>:** This system will provide a decorative coating with good exterior durability, color retention, and a high vapor transmission rate. For Semi-Gloss finish, substitute Series 29 Tuf-Cryl for the  $2^{nd}$  coat at 1.5 - 2.0 mils DFT. Apply both the Series 6 & 29 in the same color.

# M.2 System No. 66-4 Epoxy-Polyamide (Interior)

<u>Surface Preparation:</u> Surfaces shall be clean and dry. Allow concrete to cure for 28 days.

		DF I -IVIIIS
1 <sup>st</sup> Coat:	66-Color Hi-Build Epoxoline	3.0 - 5.0

2 <sup>nd</sup> Coat: 66-Color Hi-Build Epoxoline	4.0 - 6.0
	7.0–11.0
Minimum	9.0 Mils

# M.3 System No. 84-1 High Solids Glazed Epoxy (Interior)

<u>Surface Preparation:</u> Surfaces shall be clean and dry. Allow concrete to cure for 28 days.

DET MIL

			DF T-Mils
1 <sup>st</sup> Coat:	84-Color Ceramlon II		6.0 - 10.0
2 <sup>nd</sup> Coat:	84-Color Ceramlon II		<u>6.0 - 10.0</u>
			12.0 - 20.0
		Minimum	14.0 Mils

# M.4 System No. 113-2 Acrylic Epoxy Semi-Gloss

Surface Preparation: Surface must be clean and dry.

	DFT-Mils
<u>1<sup>st</sup> Coat:</u> 113-Color Tneme-Tufcoat	4.0 - 6.0
<u>2<sup>nd</sup> Coat:</u> 113-Color Tneme-Tufcoat	4.0 - 6.0
	8.0 - 12.0
Minimum	8.0 Mils

**<u>NOTE</u>**: Substitute Series 114 Tneme-Tufcoat for gloss finish. Multiple coats may be required if application is by roller.

# N. <u>IMMERSION – POTABLE & NON-POTABLE WATER</u>

# N.1 System No. 66-4 Epoxy-Polyamide (Non-Potable Water)

<u>Surface Preparation:</u> Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

		DF I -MIIIS
<u>1<sup>st</sup> Coat:</u> 66-	Color Hi-Build Epoxoline	4.0 - 6.0
2 <sup>nd</sup> Coat: 66-	Color Hi-Build Epoxoline	4.0 - 6.0
		8.0-12.0
	Minimum	10.0 Mils

**<u>NOTE</u>**: Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. First coat should be spray applied and backrolled.

# N.2 System No. 104-5 High Solids Epoxy (Non-Potable Water)

<u>Surface Preparation:</u> Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

		<u>DFT-Mils</u>
1 <sup>st</sup> Coat:	104-1255 H.S. Epoxy Primer	6.0 - 10.0
2 <sup>nd</sup> Coat:	104-Color H.S. Epoxy	<u>6.0 - 10.0</u>
		12.0 - 20.0
	Minimum	14.0 Mils

**<u>NOTE</u>**: Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. First coat should be spray applied and backrolled.

# N.3 <u>System No. 46-31 Coal Tar-Epoxy (Non-Potable Water)</u> <u>Surface Preparation:</u> Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

		<u>DFT-Mils</u>
One Coat:	46H-413 Hi-Build Tneme-Tar	14.0 - 20.0

**NOTE:** May be applied in a two-coat application. Review critical recoat time if utilized. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer.

# N.4 <u>System No. 20-2 Epoxy-Polyamide (Potable Water)</u> <u>Surface Preparation:</u> Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

			DFT-Mils
1 <sup>st</sup> Coat:	20-1255 Pota-Pox		4.0 - 6.0
2 <sup>nd</sup> Coat:	20-15BL Pota-Pox Finish		4.0 - 6.0
			8.0-12.0
		Minimum	10.0 Mils

**<u>NOTE</u>**: This system meets American Water Works Association AWWA D 102Inside System No. 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). Substitute Series FC20 for low temperature cure or quick recoats.

# N.5 System No. N140-2 Epoxy-Polyamidoamine (Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

<b>DFT-Mils</b>
6.0 - 8.0
6.0 - 8.0
12.0-16.0
14.0 Mils

**NOTE:** Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). First coat should be sprayed and backrolled.

# N.6 System No. 264-1 Elastomeric Polyurethane

<u>Surface Preparation:</u> Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13 (Surface Preparation of Concrete)

	<b>DFT-Mils</b>
Primer: 20-15BL (Tank White)	5.0 Mils
Coating: 264 Elasto-Shield (Black)	<u>60.0</u> Mils ±
	65.0 Mils

**<u>NOTE</u>:** This system is NSF Certified for Potable Water. This flexible liner can be used to rehab tanks with leaks. Multiple passes may be required to achieve the desired thickness that can range from 50-100 mils. See Elasto-Shield Application Guide for detailed instructions.

# O. <u>INTERIOR EXPOSURE (NON-IMMERSION)</u> <u>OVER EXISTING COATINGS</u>

# O.1 System No. 6-1 Acrylic Emulsion

Surface Preparation: Surface must be clean and dry.

			DFT-Mils
1 <sup>st</sup> Coat:	6-Color Tneme-Cryl		2.0 - 3.0
2 <sup>nd</sup> Coat:	6-Color Tneme-Cryl		<u>2.0 - 3.0</u>
			4.0 - 6.0
		Minimum	5.0 Mils

**<u>NOTE</u>:** If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the  $2^{nd}$  Coat @ 1.5 - 2.0 mils DFT.

**DFT-Mils** 

#### O.2 <u>System No. 113-1 Acrylic-Epoxy Semi-Gloss</u> Surface Dranamation: Surface must be clean and dra

Surface Preparation: Surface must be clean and dry.

1 <sup>st</sup> Coat:	113-Color Tneme-Tufcoat	2.0 - 3.0

2 <sup>nd</sup> Coat:	113-Color Tneme-Tufcoat		2.0 - 3.0
			4.0 - 6.0
		Minimum	5.0 Mils

**NOTE:** This system will provide high performance and can be applied directly over existing coatings without lifting. Can be used when low odor is required during application. Specify Series 114 Tneme-Tufcoat for Gloss Finish. This coating can be spray applied in a single coat at 4.0 - 6.0 mils DFT.

# 15.7 <u>CONCRETE FLOORS</u>

# P. <u>EPOXY FLOOR COATING</u>

# P.1 System No. 205-1 Epoxy-Polyamide

<u>Surface Preparation:</u> Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

		<u>DFT-Mils</u>
205 Terra-Tread FC		3.0 - 5.0
205 Terra-Tread FC		3.0 - 5.0
		6.0–10.0
	Minimum	6.0 Mils
	205 Terra-Tread FC 205 Terra-Tread FC	205 Terra-Tread FC 205 Terra-Tread FC Minimum

**NOTE:** This system will provide a durable, longwearing coating that bonds tightly to concrete and stands up under heavy foot traffic, frequent cleaning, and spillage of water, oil, grease, or chemical. For floors exposed to the sun, add a  $3^{rd}$  coat of Themec Series 291 CRU at 2.0 - 3.0 mils DFT.

**<u>NOTE</u>**: For a skid resistant finish broadcast 50 mesh dry washed silica sand into the  $1^{st}$  coat.

P.2 <u>System No. 287-1 Waterborne Epoxy-Amine</u> <u>Surface Preparation:</u> Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

			DFT-Mils
1 <sup>st</sup> Coat:	287-Color Enviro-Tread		2.0 - 4.0
2 <sup>nd</sup> Coat:	287-Color Enviro-Tread		2.0 - 4.0
			4.0 - 8.0
		Minimum	5.0 Mils

**<u>NOTE</u>**: For a non-skid finish, add 287-300C skid resistance sand into the first coat. For floors exposed to the sun add a  $3^{rd}$  coat of Themec Series 291-CRU at 2.0 – 3.0 mils DFT.

# P.3 System No. 291-12 Epoxy/Urethane

<u>Surface Preparation:</u> Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

	DFT-Mils
<u>1<sup>st</sup> Coat:</u> 66-Color Hi-Build Epoxoline	2.0 - 3.0
<u>2<sup>nd</sup> Coat:</u> 66-Color Hi-Build Epoxoline	2.0 - 3.0
<u>3<sup>rd</sup> Coat:</u> 291-Color CRU	2.0 - 3.0
	6.0 - 9.0
Minimum	7.0 Mils

**<u>NOTE</u>**: This system offers a hard, chemically resistant floor coating with excellent flow properties and color and gloss retention.

# P.4 System No. 280-1 High Build Polyamine-Epoxy Glaze Floor

<u>Surface Preparation:</u> Allow concrete to cure 28 days. Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

			<u>DFT-Mils</u>
1st Coat:	201 Epoxoprime		6.0 - 8.0
2 <sup>nd</sup> Coat:	280 Tneme-Glaze		6.0 - 8.0
3rd Coat:	280 Tneme-Glaze		6.0 - 8.0
			18.0 - 24.0
		Minimum	18 Mils

Please refer to manufacturer's Installation Guide and Technical Data for proper installation.

# P.5 System No. 237/281 Double Broadcast Flooring (Non-Slip)

<u>Surface Preparation:</u> Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

			<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	201 Epoxoprime		6.0 - 8.0
2 <sup>nd</sup> Coat:	237 Power-Tread		1/8" (2 cts. @
			1/16" each)
3rd Coat:	280 Tneme-Glaze		<u>8.0 – 12.0</u>
		Minimum	<sup>1</sup> ⁄4"+

Please refer to manufacturer's Installation Guide and Technical Data for proper installation.

# P.6 <u>System No. 222/284 Multi-Color Quartz Broadcast Floor and Cove</u> <u>Base</u>

<u>Surface Preparation:</u> Abrasive blast cleaning (Refer to Tnemec Surface Preparation and Installation Guide).

		<b>DFT-Mils</b>
1 <sup>st</sup> Coat: 222 Deco-Tread		1/8" (2 cts. @
		1/16" each)
<u>2<sup>nd</sup> Coat:</u> 284 Deco-Clear		<u>8.0-10.0</u>
	Total	1/8" +

# 15.8 **POROUS MASONRY**

# Q. <u>EXTERIOR/INTERIOR EXPOSURE</u>

Q.1 <u>System No. 180-2 Acrylic Emulsion – Smooth</u> <u>Surface Preparation:</u> Surface shall be clean and dry.

	<b>DFT-Mils</b>
Block Filler: 54-562 Modified Epoxy	80 SF/Gal
Masonry Filler	
1 <sup>st</sup> Coat: 180-Color W.B. Tneme-Crete	4.0 - 8.0
2 <sup>nd</sup> Coat: 180-Color W.B. Tneme-Crete	4.0 - 8.0
	8.0 -16.0*

\*Total DFT of topcoats only

**<u>NOTE</u>**: Also available in Series 181 in a sand finish. The Series 180 has to be spray applied to achieve recommended dry film thickness application; by roller would require additional coats.

#### Q.2 <u>System No. 6-2 Acrylic Emulsion, Low Sheen</u> Surface Droportion: Surface shell be clean and dru

Surface Preparation: Surface shall be clean and dry.

	DFT-Mils
Block Filler: 54-562 Modified Epoxy	80 SF Gal
Masonry Filler	
<u>1<sup>st</sup> Coat:</u> 6-Color Tneme-Cryl	2.0 - 3.0
<u><math>2^{nd}</math> Coat:</u> 6-Color Tneme-Cryl	2.0 - 3.0
	*4.0 - 6.0

\*Total dry film thickness of topcoats only.

**<u>NOTE</u>**: This system will fill the block and provide a sealed surface. For semi-gloss finish, use Series 29 Tufcryl (SG) for the  $2^{nd}$  coat @ 1.5 - 2.0 mils DFT.

# Q.3 System No. 66-15 Epoxy-Polyamide (Interior)

Surface Preparation: Surface shall be clean and dry.

	<u>DFT-Mils</u>
Block Filler: 54-660 Epoxy Masonry Filler	100 SF Gal
1 <sup>st</sup> Coat: 66-Color Hi-Build Epoxoline	4.0 - 6.0

2 <sup>nd</sup> Coat:	66-Color Hi-Build Epoxoline	4.0 - 6.0
		*8.0–12.0

\*Total dry film thickness of topcoats only.

**<u>NOTE</u>**: Block filler is a polyamide epoxy designed for high moisture.

# Q.4 <u>System No. 104-6 High Solids Epoxy (Interior Only)</u> Surface Preparation: Surface to be clean and dry.

			<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	104-Color H.S. Epoxy		6.0 - 10.0
2 <sup>nd</sup> Coat:	104-Color H.S. Epoxy		<u>6.0 – 10.0</u>
			12.0 - 20.0
		Minimum	14.0 Mils

**<u>NOTE</u>**: The surface will be tile-like for easy cleaning and will provide protection against chemical attack, corrosive fumes, and high humidity and wash down. Spray and backroll first coat to fill porosity.

# Q.5 <u>System No. 113-1 Acrylic-Epoxy Semi-Gloss (Interior Only)</u> <u>Surface Preparation:</u> Surface must be clean and dry.

	DFT-Mils
Block Filler: 54-562 Modified Epoxy	80 SF/Gal
Masonry Filler	
<u>1<sup>st</sup> Coat:</u> 113-Color Tneme-Tufcoat	4.0 - 6.0
<u>2<sup>nd</sup> Coat:</u> 113-Color Tneme-Tufcoat	4.0 - 6.0
	8.0 - 12.0

**<u>NOTE</u>**: Series 113 can be spray applied @ 4.0 - 6.0 mils DFT. Application by brush and roller will require additional coats.

**<u>NOTE</u>**: Series 113 Theme-Tufcoat has very low odor and can be used when painting in occupied areas. Specify Series 114 Theme-Tufcoat for a gloss finish.

# Q.6 System No. 156-1 Modified Acrylic Elastomer (Exterior)

Surface Preparation: Surface must be clean and dry.

		<u>DFT-Mils</u>
Block Filler: 54-562 Modified		80 SF/Gal
Masonry Filler		
<u>1<sup>st</sup> Coat:</u> 156-Color Enviro-Crete		4.0 - 8.0
2 <sup>nd</sup> Coat: 156-Color Enviro-Crete		4.0 - 8.0
		8.0–16.0
	Minimum	10.0 Mils
	(For $2^{nd}$ & $3^{rd}$ C	Coats)

**<u>NOTE</u>:** If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC 151 Elasto-Grip at 1.0 - 2.5 mils DFT in place of the 54-562 block filler.

# 15.9 <u>GYPSUM WALLBOARD</u>

# R. <u>INTERIOR EXPOSURE</u>

# R.1 System No. 113-5 Acrylic-Epoxy

Surface Preparation: Surface must be clean and dry.

			DFT-Mils
1 <sup>st</sup> Coat:	151 PVA Sealer		1.0 - 2.0
2 <sup>nd</sup> Coat:	113 H.B. Tneme-Tufcoat		2.0 - 3.0
3 <sup>rd</sup> Coat:	113 H.B. Tneme-Tufcoat		2.0 - 3.0
			5.0 - 8.0
		Minimum	6.0 Mils

**<u>NOTE</u>**: Series 113 can be spray applied in a single coat at 4.0 - 6.0 mils

DFT.

Substitute Series 114 if a gloss finish is desired.

# R.2 System No. 66-22 Hi-Build Epoxoline

Surface Preparation: Surface must be clean and dry.

		DFT-Mils
1 <sup>st</sup> Coat:	151 PVA Sealer	1.0 - 2.0
2 <sup>nd</sup> Coat:	66-Color Hi-Build Epoxoline*	4.0 - 6.0
		5.0 - 8.0
	Minimum	5.0 Mils +

**NOTE:** \*Two coats may be required if applied by roller.

# R.3 <u>System No. 6-1 Acrylic Emulsion, Low Sheen</u> (Interior / Exterior Exposure) Surface Preparation: Surface must be clean and dr

Surface Preparation: Surface must be clean and dry.

	DFT-Mils
	2.0 - 3.0
	<u>2.0 - 3.0</u>
	4.0 - 6.0
Minimum	5.0 Mils
	Minimum

**<u>NOTE</u>**: This system is designed for mild use areas like office walls, laboratory ceilings, stairwells, etc. For semi-gloss finish, use Series 29 Tufcryl at 1.5 - 2.0 mils DFT.

# 15.10 <u>WOOD</u>

# S. <u>EXTERIOR/INTERIOR EXPOSURE</u>

# S.1 System No. 23-4 Alkyd Semi-Gloss

Surface Preparation: Surface shall be clean and dry.

		<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	36-603 Undercoater	2.5 - 3.5
2 <sup>nd</sup> Coat:	23 Enduratone	1.5 - 3.5

3rd Coat:	23 Enduratone		<u>1.5 – 3.5</u>
			5.5-10.5
		Minimum	6.0 Mils

**NOTE:** Specify Series 2H Hi-Build Tneme-Gloss for High Gloss finish.

# S.2 System No. 6-5 Acrylic Latex

Surface Preparation: Surface shall be clean and dry.

			DFT-Mils
1 <sup>st</sup> Coat:	36 Undercoater		2.0 - 3.5
2 <sup>nd</sup> Coat:	6-Color Tneme-Cryl		2.0 - 3.0
3 <sup>rd</sup> Coat:	6-Color Tneme-Cryl		<u>2.0 - 3.0</u>
			6.0 – 9.5
		Minimum	7.5 Mils

**<u>NOTE</u>**: Substitute Series 29 Tufcryl for the third coat at 1.5 - 2.0 mils DFT if semi-gloss finish is desired.

# 15.11 <u>PVC PIPE</u>

# T. EXTERIOR OR INTERIOR

# T.1 System No. 73-23 Epoxy-Polyamide

<u>Surface Preparation:</u> Solvent clean per SSPC-SP1 & Scarify by Brush Blast or Hand Sanding.

		<u>DFT-Mils</u>
1 <sup>st</sup> Coat: 66-Color Hi-Build Epoxolin	e	2.0 - 3.0
2 <sup>nd</sup> Coat: 73 Endura-Shield		<u>2.0 - 3.0</u>
		4.0 - 6.0
I	Minimum	5.0 Mils

# 15.12 INSULATED PIPE

# U. INTERIOR EXPOSURE

# U.1 System No. 6-1 Acrylic Emulsion, Low Sheen

Surface Preparation: Surface shall be clean and dry.

			<b>DFT-Mils</b>
1st Coat:	6-Color Tneme-Cryl		2.0 - 3.0
2nd Coat:	6-Color Tneme-Cryl		2.0 - 3.0
			4.0 - 6.0
		Minimum	5.0 Mils

**NOTE:** For semi-gloss finish, use Series 29 Tufcryl for the 2<sup>nd</sup> coat.

# 15.13 <u>HIGH HEAT COATING</u>

# V. <u>EXTERIOR/INTERIOR EXPOSURE</u>

# V.1 <u>System No. 39-2 Silicone Aluminum (1200° F Maximum)</u> <u>Surface Preparation:</u> SSPC-SP10 Near White Blast Cleaning – 1.0 Mil Surface Profile

 $1^{st}$  Coat:
 39-1261 Silicone Aluminum
 1.0 - 1.5 

  $2^{nd}$  Coat:
 39-1261 Silicone Aluminum
 1.0 - 1.5 

 2.0 - 3.0 Minimum
 2.0 Mils

NOTE: Coating must be heat cured @ 400°F for 1 hour.

# V.2 <u>System No. 39-4 Silicone Aluminum (600° F Maximum)</u> <u>Surface Preparation:</u> SSPC-SP10 Near White Blast Cleaning – 1.0 Mil Surface Profile

		<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	39-661 Silicone Aluminum	1.0 - 1.5
2 <sup>nd</sup> Coat:	39-661 Silicone Aluminum	1.0 - 1.5
		2.0 - 3.0
	Min	imum 2.0 Mils

NOTE: Coating must be heat cured @ 400°F for 1 hour.

# V.3 <u>System No. 90E-92 Inorganic Zinc (750°F Max)</u> <u>Surface Preparation:</u> SSPC-SP10 Near White Metal Blast Cleaning

		Ī	<b>)FT-Mils</b>
Coating:	90E-02 Tneme-Zinc		2.0 - 3.5

**<u>NOTE</u>**: Coating will have a greenish gray color but will not require curing at elevated temperatures.

# 15.14 <u>SURFACES EXPOSED TO H<sub>2</sub>S/H<sub>2</sub>SO<sub>4</sub> (SEVERE EXPOSURE/IMMERSION)</u> W. <u>CEMENTITIOUS SURFACES</u>

# W.1 System No. 120-1 Vinyl Ester (Concrete)

<u>Surface Preparation:</u> Abrasive blast clean per SSPC-SP13 to remove all laitance, fines, and contamination.

			DF I -IVIIIS
1 <sup>st</sup> Coat:	120-5002 Vinester Primer		$6.0 - 10.0^{*}$
2 <sup>nd</sup> Coat:	120-5003 Vinester F&S		As Required**
3rd Coat:	120-5002 Vinester Primer		12.0 - 18.0
4 <sup>th</sup> Coat:	120-5001 Vinester Topcoat		12.0 - 18.0
			30.0 - 46.0
		A 61 1	260161

# Minimum 36.0 Mils +

DET Mile

# **NOTES:**

\*First coat to be applied by roller application or spray applied followed by backrolling.

\*\*All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

# X. <u>FERROUS METAL SURFACES</u>

# X.1 System No. 120-2 Vinyl Ester (Steel)

<u>Surface Preparation:</u> SSPC-SP5 White Metal Blast Cleaning (3.0 Mil Profile)

			<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	120-5002 Vinester Primer		12.0 - 18.0
2 <sup>nd</sup> Coat:	120-5001 Vinester Topcoat		<u>12.0 – 18.0</u>
			24.0 - 36.0
		Minimum	30.0 Mils

**<u>NOTE</u>**: Application of a stripe coat to all weld seams and plate edges is recommended.

# 15.15 EXTERIOR OF PRESTRESSED CONCRETE TANKS

# Z.1 System No. 156-3 (New Tanks)

<u>Surface Preparation:</u> Surface to be clean and dry.

			<b>DFT-Mils</b>
1 <sup>st</sup> Coat:	156-Color Envirocrete		4.0 - 6.0
2 <sup>nd</sup> Coat:	156-Color Envirocrete		4.0 - 6.0
			8.0 - 12.0
		Minimum	10.0 Mils

# Z.2 System No. 180-3 (New Tanks)

<u>Surface Preparation:</u> Surface to be clean and dry.

<u>DFT-Mils</u>
1/16"
2.0 - 4.0
<u>2.0 - 4.0</u>
1/16"+

Z.3System No. 6-6 (New Tanks)Surface Preparation:Surfaces to be clean and dry.

	DFT-Mils
<u>1<sup>st</sup> Coat:</u> Thoroseal or equal	1/16"
<u>2<sup>nd</sup> Coat:</u> 6-Tneme-Cryl	2.0 - 3.0
<u>3<sup>rd</sup> Coat:</u> 6 Tneme-Cryl	<u>2.0 - 3.0</u>
	1/16"+

# Z.4 System No. 156-4 Existing Tanks (Previously Painted)

<u>Surface Preparation:</u> Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).

			DF I -MIIS
1 <sup>st</sup> Coat:	151 Elasto-Grip		1.0 - 2.5
Stripe Coa	t: Stripe all hairline crac	ks with a	3.0 - 5.0
Brushed co	oat of Series 156 Envirod	crete	
Topcoat:	156-Envirocrete		4.0 - 6.0
		(Cracks)	8.0 - 13.5
		(Other)	5.0 - 8.5

# Z.5 System 180-4 Existing Tanks (Previously Painted)

<u>Surface Preparation:</u> Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).

			<b>DFT-Mils</b>
Stripe Coat:	180 W.B. Tneme-Crete		2.0 - 4.0
	Applied by roller to all		
	Visible cracks		
1 <sup>st</sup> Coat:	180 W.B. Tneme-Crete		2.0 - 4.0
2 <sup>nd</sup> Coat:	180 W.B. Tneme-Crete		<u>2.0 - 4.0</u>
			4.0 - 8.0
		Minimum	5.0 mils (2 coats)

**<u>NOTE</u>**: May be spray applied in a single coat at 4.0 - 8.0 mils.

# 15.16 SECONDARY CONTAINMENT AREAS

# AA.1 System No. 61-4 Epoxy Polyamide (For Fuel Oils)

<u>Surface Preparation:</u> Surface shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

DFT-Mils
4.0 - 6.0
4.0 - 6.0
8.0 - 12.0
10.0 Mils

**<u>NOTE</u>:** This system will provide excellent resistance to most chemicals including petrochemicals. Use Themec Series 63-1500 between coats as a filler and surfacer wherever it is required.

#### AA.2 System No. 61-1 Amine Epoxy (For Caustics)

<u>Surface Preparation:</u> Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP6 (Brush Off Blast).

		DFT-Mils
Primer:	61-5002 Tneme-Liner (Beige)	8.0 - 12.0
Topcoat:	61-5001 Tneme-Liner (Gray)	8.0 - 12.0
		16.0 - 24.0

**<u>NOTE</u>**: This system offers superior chemical resistance to a wide range of chemicals. Use Tnemec Series 63-1500 between coats as a filler and surfacer wherever it is required.

#### AA.3 System 262-1 Flexible Polyurethane

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete

to cure

for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

			<b>DFT-Mils</b>
Primer:	66 Hi-Build Epoxoline		5 Mils
Coating:	262 Elasto-Shield (Black)		<u>50 Mils</u>
		Total	55 Mils

**<u>NOTE</u>**: Multiple passes may be required to achieve recommended film

thickness. See Elasto-Shield Application Guide for additional instructions. This product is only available in black. Repair all cracks, bugholes, and spalled areas with Series 265 Elasto-Shield TG prior to application of Series 262.

**DFT-Mils** 

# AA.4 System No. 120-3 Vinyl Ester (For Acids)

Surface Preparation: Abrasive blast clean per SSPC-SP13.

120-5003 Vinester F & S	as Required
120-5002 Vinester Primer	15.0 - 18.0
120-5001 Vinester Topcoat	<u>15.0 - 18.0</u>
	30.0 - 36.0
Minimum	30.0 Mils
	120-5003 Vinester F & S 120-5002 Vinester Primer 120-5001 Vinester Topcoat Minimum

<u>NOTES</u>: Use 120-5003 Vinester F & S to fill all cracks, bugholes, and other surface voids, and smooth all rough areas.

# AA.5 System No. 275 Fiber Reinforced Novolac Epoxy

<u>Surface Preparation:</u> Allow new concrete to cure 28 days. Abrasive blast clean per SSPC-SP13.

<u>Filler Surfacer:</u> Fill all voids with Tnemec Series 201 Epoxoprime mixed with fumed silica.

Prime Coat: Tnemec Series 201 Epoxoprime @ 6.0 - 8.0 mils DFT.

<u>Body Coat:</u> Tnemec Series 275 Stranlok (Fiber Reinforced Novolac Epoxy) applied by spray or trowel at 30-35 mils DFT.

<u>Topcoat:</u> Tnemec Series 282 Tneme-Glaze (Novolac Epoxy) applied at 6.0 – 8.0 mils DFT.

# 15.17 CLEAR WATER REPELLENT FOR CONCRETE, MASONRY & BRICK

# BB.1 Silane/Siloxane Sealer (Water Based)

<u>Surface Preparation:</u> Allow new concrete to cure 28 days. Clean surfaces to be sealed by abrasive blasting or waterblasting.

# **COATING: BRICK, CONCRETE**

Chemprobe PRIME A PELL H<sub>2</sub>O . . . . . 125-200 SF/GAL

# SPLIT FACED OR POROUS MASONRY

Chemprobe PRIME A PELL H<sub>2</sub>O. . . . . . 65-100 SF/GAL

# BB.2Silane/Siloxane Sealer w/Concrete StainSealer:Chemprobe Prime A Pell H2O65-200 SF/GalConcrete Stain:Two Coats of Chemprobe75-200 SF/Gal/CtConformal StainControl Stain75-200 SF/Gal/Ct

# 15.18 MANHOLES, WET WELLS & LIFT STATIONS

# CC.1 System No. 120-1 Vinyl Ester

<u>Surface Preparation:</u> Abrasive blast clean to remove all laitance, fines, and contamination.

DFT-Mils

1 <sup>st</sup> Coat:	120-5002 Vinester Primer		$6.0 - 10.0^{*}$
2 <sup>nd</sup> Coat:	120-5003 Vinester F&S		As required**
3 <sup>rd</sup> Coat:	120-5002 Vinester Primer		12.0 - 18.0
4 <sup>th</sup> Coat:	120-5001 Vinester Topcoat		12.0 - 18.0
			30.0 - 46.0
	Ν	linimum	36.0 Mils +

\*First coat to be applied by roller application or spray applied followed by backrolling.

\*\*All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

# CC.2 System No. 100-1 Crystalline Waterproofing

<u>Surface Preparation:</u> Surface to be clean and roughened by Brush Blasting, Acid Etching, or High Pressure Water Blasting (3500 PSI) with turbo tips.

<u>1<sup>st</sup> Coat:</u> XYPEX Concentrate @  $(1.5\#/SY) - 1/16" \pm 2^{nd}$  Coat: XYPEX Modified @  $(1.5\#/SY) - 1/16" \pm$ 

**<u>NOTE</u>**: This system can be applied to concrete that is still wet or hasn't developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure.

# 15.19 <u>CANAL PIPE CROSSINGS</u>

# DD.1 <u>System 90-97 Zinc/Epoxy/Urethane for New Pipe or Pipe Requiring</u> <u>Removal of Existing Coatings</u>

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

		DFT-Mils
Primer:	90-97 Tneme-Zinc	2.5 - 3.5
2 <sup>nd</sup> Coat:	66-Color Hi-Build Epoxoline	2.0 - 3.0
<u>3rd Coat:</u>	73-Color Endura-Shield	2.0 - 3.0
		6.5 – 9.5
	Minimum	8.0 Mils

# DD.2 <u>System No. 135-2 High Build, High Gloss Urethane for Marginally</u> <u>Cleaned Surfaces or Topcoating Over Existing Systems</u>

<u>Surface Preparation:</u> High Pressure Water Blast (Min 3500 PSI) or Solvent Clean (SSPC-SP1) and Spot Hand and Power Tool Clean (SSPC-SP2 & 3) or Brush Blast (SSPC-SP7). Existing coatings must be clean, dry, and tightly adhering prior to application of coatings.

		<b>DFT-Mils</b>
Spot Primer:	135 Chembuild	3.0 – 4.0 (Spots)
<u>Tie Coat:</u>	135 Chembuild	3.0 - 4.0
2 <sup>nd</sup> Coat:	73-Color Endura-Shield	2.0 - 3.0
		5.0 - 7.0
	Minimu	m 5.0 Mils

**<u>NOTE</u>**: A test Patch is always recommended to insure proper adhesion to existing coatings without lifting of existing coatings.

# 15.20 <u>REPAINTING OF METAL BUILDING PANELS</u>

# EE.1 <u>Exterior of Metal Building Panels</u>

<u>Surface Preparation:</u> Pressure clean (3000 PSI) and spot SP2 & 3 Hand and Power Tool Cleaning.

DFT\_Mile

Spot Primer: 135 Chembuild		3.0 - 5.0
<u>1<sup>st</sup> Coat:</u> 30 Spra-Saf EN		2.0 - 4.0
<u>2<sup>nd</sup> Coat:</u> 30 Spra-Saf EN		2.0 - 4.0
		4.0 - 8.0
	Minimum	4.0 Mils

**NOTE:** Test patch is strongly recommended.

# EE.2 <u>Exterior Miscellaneous Metal Trim</u>

<u>Surface Preparation:</u> Pressure clean (3000 PSI) or solvent clean per SSPC-SP1. Spot SP2 & 3 Hand & Power Tool Cleaning.

			DFT-Mils
Spot Primer:	135 Chembuild		2.0 - 4.0
Tie Coat:	135 Chembuild		2.0 - 4.0
Topcoat:	73 Endura-Shield		2.0 - 3.0
		Total	4.0 - 7.0

NOTE: Test patch is strongly recommended.

# **COATING SCHEDULE**

SYSTEM #	SUBSTRATE & SURFACE SERVICE PREPARATION		COAT (SERIES #/ DFT-MILS)			
			1 <sup>ST</sup> CT	2 <sup>ND</sup> CT	3 <sup>RD</sup> CT	<b>4</b> <sup>TH</sup> <b>CT</b>
C.5	Carbon Steel and Pipe, (immersion and below grade)	SSPC-SP10	46-413 (8.0-10.0)	46-413 (8.0-10.0)		
F.1	Above grade Pipe	Surface shall be clean and dry	66 (3.0-4.0)	66 (4.0-6.0)	73 (2.0-3.0)	
Q.1	Electrical Building Exterior Walls	Surface shall be clean and dry	54-562 (80 sf/gal)	180 (4.0-8.0)	180 (4.0-8.0)	
K.1	Electrical Building Interior Walls and Floor	Surface shall be clean and dry	180 (4.0-6.0)	180 (4.0-6.0)		

# END OF SECTION
# SECTION 23 11 00 FUEL TANK AND PIPING

#### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK:

- A. Provide a rectangular aboveground concrete fuel storage tank system. The tank shall be constructed in accordance with Underwriters Laboratories, Inc. (UL) Standard 2085, Protected Aboveground Storage Tanks for Flammable and Combustible Liquids. The tank system shall be listed for ballistics protection in accordance with UL Standard 752, Levels 5, 6 and 8.
- B. All work of this section shall be governed by all provisions of the general, supplementary and special conditions of these specifications and the drawings.
- C. Submit manufacturer's data for review before any work commences.
- D. RELATED WORK DESCRIBED ELSEWHERE:
  - 1. Section 09 90 00: Painting and Coating

#### PART 2 - PRODUCTS

2.01 Provide valves and specialties as specified under additional Sections of this Specification.

#### 2.02 PIPE

- A. The following schedule covers materials unless otherwise specified under a particular System Section.
  - 1. Material:
    - a. Black steel pipe, Schedule 40, ASTM A53, A120
    - b. Copper tube, Type L, hard drawn, ASTM B88.

- c. Brass pipe or tube.
- d. Copper tube, Type L, soft temper, ASTM B88
- e. All flexible joints shall be U.S. labeled.
- 2.03 Fittings: Make joints and connections permanent and watertight.
  - A. Threaded Steel Pipe Malleable iron 150 lb. banded, black steel to match pipe.
  - B. Copper Tube (Hard Drawn): Wrought or cast brass solder joint.
  - C. Copper Tube (Soft Temper): Flare.
- 2.04 Fuel Transfer Pump:
  - B. Unit shall be U.S. labeled for diesel service.
  - C. Submersible, direct drive 1/3 horsepower explosion proof construction.
  - D. Pump shall have check valve, air eliminator, expansion relief valve, siphon nozzle and venturi, siphon check valve and pressure test screw.
  - E. The entire pumping unit shall be removable from standard manway provided on tank.
- 2.05 Fuel Storage Vessel:
  - A. The tank shall be of double wall construction and provide secondary containment of the primary storage tank contents by an impervious steel outer wall. The welded steel tanks provided shall meet all requirements of UL-142, "Steel Above Ground Tanks for Flammable and Combustible Liquids". All tanks shall be inspected and tested for leakage before being shipped from the factory as completely assembled vessels. Capacities, dimensions, and construction details shall be in accordance with those shown on the plan sheets and applicable UL-142 requirements. Tanks shall be constructed of commercial or structural grade carbon steel or of Type 304 or 316 stainless steel, as indicated.
  - B. All welded joints, vent openings and tank connections shall be of a type and size concurrent with UL-142 specifications. Tank supports, straps, vents, drains, and

level indication. Devices will be allowed for by the tank manufacturer and the required shop drawings must detail the location, size, and shape of all items.

- C. Secondary Containment and Corrosion Protection: The tank shall be of double wall construction and provide secondary containment of the primary storage tank contents by an impervious steel outer wall. The tank shall be rectangular in shape and listed per UL Standard 142 and designed for possible future relocation. Welds shall be continuous on all sides and exterior seams, conforming to the American Welding Society Standard for continuous weld. The primary steel tank shall be pressure tested at 5 psig (at 15 psig for NYC) for a minimum of 24 hours. All openings shall be from the top only. The tank shall be supplied with emergency vents for the primary and secondary tanks.
- D. Concrete Encasement: A vaulted concrete enclosure shall encase and must protect both the primary and secondary containment steel tanks. The concrete encasement shall be 6" thick with a minimum design strength of 4000 psi. The concrete design shall include the following for long-term durability: air entrainment, waterreducing admixture, and steel reinforcement. Concrete placement shall be a visually verifiable monolithic (seamless) pour to ensure the absence of voids on all sides and beneath the steel tank. The double wall steel tank shall be pressurized to 5 psig during concrete encasement to allow for expansion and contraction of the tank.

The vault enclosure shall have non-corrosive concrete support legs of unitized monolithic construction raising the concrete enclosure a minimum of 3" above the ground to meet visual inspection requirements. Steel supports will not be permitted. A mid-level seam or other cold joint construction which could compromise the liquid tightness (secondary containment) and fire protection capability of the vault is not permitted.

E. Fire Resistance: The tank system shall be designed and tested to provide 2 hour fire protection for the primary tank as per UL 2085 2-hour furnace fire test and 2 hour simulated pool fire test. The average maximum rise in temperature of the primary tank during the test shall not exceed 260° F and the maximum temperature of any single point on the primary tank shall not exceed 400° F. No steel members shall penetrate the walls or floor of the concrete encasement to assure isolation from pool fire heat.

- F. Leak Monitoring: A thru-tank leak detection monitoring tube terminating between the primary tank and the secondary containment tank shall be provided to monitor any leaks from the primary tank.
- G. Spill/Overfill Containment: The tank system shall include a UL listed 7 or 15 gallon spill/overfill container manufactured as an integral part of the primary tank, surrounding the fill pipe, and protected by 2 hour fire rating of the enclosure. The spill/overfill container shall include a stick port and normally closed drain valve to release spilled product into the main tank. Exterior steel shall be stainless steel or anti-oxidant powder coated to inhibit rust. Overfill containment systems that are designed to release spilled product into the interstitial area will not be accepted.
- H. Overfill Protection: Overfill protection shall be provided by the following methods:a) direct reading level gauge visible from fill pipe access; b) valve rated for pressurized delivery located within fill pipe to close automatically at 95% full level; and c) high level alarm.
- I. Exterior Finish: The tank system exterior shall be a low maintenance architectural coating or exposed aggregate concrete finish. Models with fiber clad or painted steel exterior tanks will not be accepted.

## PART 3 – EXECUTION

## 3.01 GENERAL:

A. The design drawings are generally diagrammatic. They do not show every bend, offset, elbow or other fitting which may be required in the piping for installation in the space allotted. Careful coordination of the work is necessary to avoid conflicts.

## 3.02 ABOVE GROUND STORAGE TANKS:

- A. Tanks shall have the capacity and dimensions of those shown on the drawings or described in the specifications.
- B. The tank system shall be installed in strict accordance with the manufacturer's recommendations, industry standards, and applicable fire and environmental codes. All state and local permits shall be obtained prior to installation. The tank system

shall be handled, lifted, stored and installed in accordance with the manufacturer's instructions on a reinforced concrete base slab designed to support the fully loaded tank. Protective bollards shall be installed where required by state and local codes. Tanks shall be marked on all sides with warning signs and product identification as required by applicable codes.

- C. Tank foundation shall be smooth and level; two (2) layers of 30# roofing felt shall be installed between the tank base and concrete foundation.
- D. Grounding conductors shall be connected to the two (2) bolts on the tank system for lightening protection in accordance with NFPA 780 and all electrical work shall be in accordance with applicable codes.

## 3.03 JOINTING PIPE:

- A. Threaded Pipe Ream all pipe after cutting and before threading. Use non-hardening pipe compound "Tite-Seal", or equal, on male threads only.
- B. Copper Tube: Ream all pipe after cutting, clean and tin end to be soldered.
- C. Provide nipples of same material and weight as pipe used. Provide extra strong nipples when length of unthreaded part of standard weight nipple is less than 1 <sup>1</sup>/<sub>2</sub>".
- 3.04 Screw bushings are prohibited, except where available space prevents use of reducing couplings. Pipe reductions on horizontal piping shall be made with eccentric reducers. Top of piping shall be flat for venting. The bottom of vent and return lines shall be flat for drainage.

#### 3.05 EQUIPMENT CONNECTIONS:

- A. Make connections between any piece of equipment and any piping system in this Section of the specifications by mean of unions, flange joints or other fittings which permit equipment to be disconnected and removed for maintenance.
- B. Install valves or cocks in supply lines to each piece of equipment on supply side of union connections.
- 3.06 TESTS:
  - A. Apply a pressure test to all parts of the system before the piping is concealed and before equipment is connected. Use a hydrostatic pressure of not less than 100 psig, applied to the system for a period of four hours. There shall be no leaks at any point in the system at this pressure.
  - B. Level concealed work uncovered until required tests have been completed, but if necessary, make tests on portions of the work and those portions of the work may be concealed after being inspected and approved. Make repairs of defects that are discovered as a result of inspection or tests with new materials. Caulking of screwed joints, cracks or holes will not be accepted. Repeat tests after defects have been eliminated.
  - C. Complete all field testing prior to insulation, wrapping and/or backfill.

## 3.07 PIPE PROTECTIONS:

- A. Paint all piping underground with two coats of asphaltic paint. (Manual wiping is not acceptable).
- B. Wrap fuel pipe that touches metal or is exposed to masonry with a layer of 6 mil polyethylene film.
- C. Spirally wrap all pipe lines embedded in concrete with two layers of 30 lb. felt.
- 3.08 Underground piping shall have a minimum cover of 24".

- 3.09 Place color coded 6" wide 0.004" thickness polyethylene printed plastic identification tape directly above all underground piping systems approximately 12" below finished grade. Tapes shall be continuously printed with "CAUTION" in large bold letters. Printed second line with type of service below. Orange tape is to be used for fuel lines.
- 3.10 Installing contractor shall have valid Specialty Tank Contractor License.

# END OF SECTION

#### SECTION 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DESCRIPTION

- A. Work to be performed under the sections of Division 26 includes all labor, materials, and equipment required to install complete electrical systems as described in these specifications and as shown on the drawings. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.
- B. Before submitting a bid, the Contractor shall examine the drawings and specifications, visit the work site, and be informed of local conditions, all federal, state and local ordinances, regulations and all other pertinent items which may affect cost, schedule, and completion of this project.
- C. Drawings accompanying these specifications are a part of these specifications. Drawings are intended to show general arrangement, design, and extent of work and are diagrammatic. Drawings are not intended to show exact locations except where dimensions are shown. Any substantial differences existing between drawings and conditions in the field shall be submitted to the Engineer for consideration before proceeding with work. Electrical work is shown on plans using standard industry symbols.
- D. Before ordering materials or doing work, the Contractor shall verify all measurements pertaining to work scope and assume installation responsibility for complete and fully functional electrical systems.

E. The electrical work included in all other divisions of this specification and related documents is the responsibility of the contractor performing the division 26 work unless specifically noted otherwise.

# 1.3 REFERENCED STANDARDS

- A. Abbreviations of standards organizations referenced in this and other sections are as follows:
  - ANSI American National Standards Institute
  - ASTM American Society for Testing and Materials
  - EPA Environmental Protection Agency
  - ETL Electrical Testing Laboratories, Inc.
  - IBC International Building Code
  - IEEE Institute of Electrical and Electronics Engineers
  - IES Illuminating Engineering Society
  - ISA Instrument Society of America
  - NBS National Bureau of Standards
  - NEC National Electric Code
  - NECA National Electrical Contractors Association
  - NEMA National Electrical Manufacturers Association
  - NESC National Electrical Safety Code
  - NFPA National Fire Protection Association
  - UL Underwriters Laboratories Inc.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, subject to approval by the Engineer, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled. The Contractor shall not modify new equipment in such a way as to nullify the Testing Laboratories label. All equipment and materials shall be used or installed in accordance with any instruction included in the listing by the laboratory.

## 1.5 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. ATS: Acceptance Testing Specifications.
- C. CPT: Control power transformer.
- D. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- E. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- F. Duct Bank: Two or more ducts installed in parallel, with or without additional casing materials and or multiple duct bank.
- G. EMI: Electromagnetic interference.
- H. EMT: Electrical metallic tubing.
- I. Ethernet: Local area network based on IEEE 802.3 standards.
- J. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- K. FMG: Factory Mutual Group
- L. GFCI: Ground-Fault Circuit Interrupter.
- M. GRC: Galvanized rigid steel conduit.
- N. IBC: International Building Code.
- O. IMC: Intermediate metal conduit.
- P. I/O: Input/output.
- Q. IP: Internet protocol.
- R. Jacket: A continuous nonmetallic outer covering for conductors or cables.

- S. LAN: Local area network; sometimes plural as "LANs."
- T. LCD: Liquid crystal display.
- U. LED: Light-emitting diode.
- V. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or remote-control, signaling and power-limited circuits.
- W. MCCB: Molded-case circuit breaker.
- X. MCP: Motor-circuit protector.
- Y. Modbus TCP/IP: An open protocol for exchange of process data.
- Z. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
- AA. MOV: Metal-oxide varistor; an electronic component with a significant nonohmic current-voltage characteristic.
- BB. NC: Normally closed.
- CC. NETA ATS: Acceptance Testing Specification.
- DD. NO: Normally open.
- EE. OCPD: Overcurrent protective device.
- FF. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- GG. PID: Control action, proportional plus integral plus derivative.
- HH. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- II. PT: Potential transformer.
- JJ. PWM: Pulse-width modulated.
- KK. RFI: Radio-frequency interference.
- LL. RMC: Rigid metal conduit.
- MM. RS-232: A TIA standard for asynchronous serial data communications between terminal devices.
- NN. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A
- OO. SCCR: Short-circuit current rating.
- PP. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- QQ. Sheath: A continuous metallic covering for conductors or cables.
- RR. SPD: Surge protective device.
- SS. SPDT: Single pole, double throw.

- TT. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.
- UU. TVSS: Transient voltage surge suppressor.
- VV. UTP: Unshielded twisted pair.
- WW. VFD: Variable frequency drive or motor controller.
- XX. VPN: Virtual private network.
- YY. WAN: Wide area network.

## 1.6 **REGULATORY REQUIREMENTS**

- A. All work and materials are to conform in every detail to applicable rules and requirements of local codes and regulations, the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, and current manufacturing standards (including NEMA) and any additional local modifications enacted by the Local Authority Having Jurisdiction. Contractor shall be responsible to verify what if any local modifications are in place or enacted by the Local Authority Having Jurisdiction.
- B. All work shall be installed in accordance with NECA standards of installation.
- C. All work shall conform where applicable to the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA), Part 1910, "Occupational Safety and Health Standards." This shall include any local or state modifications enacted by the Authority having Jurisdiction.

## 1.7 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner. The Owner may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal Owner schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

- 1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
- 2. Indicate method of providing temporary electric service.
- 3. Do not proceed with interruption of electric service without Owner's written permission.
- C. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

## 1.8 TEMPORARY CONSTRUCTION POWER

- A. Provide temporary lighting and construction power for the project. Pay the usage charges to the serving utility for electric service associated with temporary lighting and power for construction.
- 1.9 OMISSIONS
- A. The Contractor shall call to the attention of the Engineer any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

#### 1.10 SUBMITTALS

- A. Refer to Division 01 for Submittal requirements.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- C. On request, the Contractor shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc. to clarify intent of construction or operations.
- D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

E. The submittals must be approved before fabrication.

# 1.11 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet Project conditions, including changes to work specified in other Sections. Obtain written permission of Engineer before proceeding.
- C. Tools, materials, and equipment shall be confined to areas designated by the Owner.

# 1.12 WORK SEQUENCE AND SCHEDULING

A. See the General Conditions of the Contract, Scheduling and Coordination of Work, and Time for Completion of the Project, and General Requirements, Mutual Responsibility for additional requirements.

# 1.13 WORK BY OTHER TRADES

- A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.
- B. Electrical details on drawings for equipment to be provided by others is based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment provided by others.

# 1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions for additional requirements.
- 1.15 TRAINING

- A. Instruct Owner's personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video record all training sessions. Use the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.
- B. The requirement for recording training sessions may be deleted on some projects but not the requirement for the training itself.
- C. Refer to other sections in Division 26 for specific section and equipment training requirements.

#### 1.16 RECORD DRAWINGS

- A. A set of prints shall be kept at the job site upon which all changes and deviations from the original design are to be recorded daily. All changes shall be clearly marked. These drawings shall indicate as a minimum, all changes made to the drawings, changes in circuiting, equipment location, accurate locations of embedded conduit, and all other significant changes and deviations from the original design.
- B. The daily record of changes shall be the responsibility of the Contractor's field representative. No arbitrary mark-ups will be permitted.
- C. The record drawing set shall be made available and may be audited periodically by the Owners' construction representative to assure the changes are being recorded.
- D. At the completion of the project, the Contractor shall submit the marked-up record drawings to the Owner prior to request for final payment.

#### PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Reference applicable sections within Division 26.

## PART 3 - EXECUTION

#### 3.1 WORK INCLUDED

- A. The scope of work shall include all work, including all labor, materials and equipment, testing required to install a complete electrical system as indicated in the project Manual. The Project Manual consists of the bidding documents, the contract, specifications, contract drawings and all subsequent addenda and modifications. The contractor shall furnish and install all necessary materials, apparatus and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. All work items shown on the drawings is within the scope of work and shall be provided as indicated. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.
- C. In general, the specifications indicate the requirements and quality for products required and the executions for those products. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.
- D. If there is any discrepancy between the drawings and the specifications, it is the contractor's responsibility to notify the Engineer for resolution, prior to procuring equipment or starting work.
- E. Coordinate and verify all equipment being supplied by equipment supplier and other trades. Verify equipment size, motor HP, dimensions, locations, etc. as all are subject to change.
- F. Contractor shall verify all door swings and the location of all cabinets, diffusers, HVAC, plumping, process and building equipment before installing electrical equipment, fixtures, outlets and conduit.
- G. All permits and inspection fees required to complete the work shall be paid for by the Contractor unless noted otherwise.
- H. All electrical equipment and fixtures shall be installed in complete accordance with the manufacturers' recommendations.

I. Contractor shall provide all motor connections as shown on the drawings and as specified herein.

# 3.2 CONCRETE

A. All concrete work required for the proper installation of electrical equipment including transformer, switchgear and motor control center pads and other equipment pads shall be provided by the Contractor and shall conform to specifications in Division 3.

# 3.3 SITE WORK

A. The Contractor shall provide excavation and backfill for all electrical underground work as indicated on the drawings and as required. The Contractor shall perform this work and provide compaction as specified in Division 2. Finish grading and final restoration shall be by the General Contractor.

# 3.4 CONFIRMATION OF ELECTRIC SERVICE

- A. Consult with Electric Utility to verify service information specified herein and shown on drawings before submitting bid.
- B. The electrical service application shall be initiated by the Electrical Contractor.

# 3.5 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
- C. ELECTRICAL CONTRACTOR to pay all charges for permits or licenses.
- D. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
- E. Pay all charges arising out of required inspections by an authorized body.

- F. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
- G. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

# 3.6 METERING

- A. Consult with Electric Utility regarding service entrance requirements and metering equipment.
- B. Install metering equipment and empty conduit for metering conductors to meet standards and requirements of Electric Utility.

# 3.7 SERVICE INSTALLATION

- A. The service installation shall comply with the latest applicable standards of the utility.
  Refer to the current electrical service installation manuals.
- B. The Contractor shall meet with the electric utility prior to rough-in to review and coordinate the installation of the electrical service and verify existing conditions and special requirements.

## 3.8 COORDINATION

- A. The Contractor shall cooperate with other trades and the Owner's construction representative in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with another trades work shall be removed or relocated at the installing contractor's expense.

# 3.9 HOUSEKEEPING AND CLEAN UP

A. Refer to Division 1, General Requirements, and Cleaning for additional requirements.

# END OF SECTION

## SECTION 26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

- 2.1 CONDUCTORS AND CABLES
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpha Wire.
  - 2. General Cable Technologies Corporation.
  - 3. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for type THHN-THWN-2.
- D. Conductor sizes shown on drawings are based on 75 Degree C copper.

- E. All conductors shall be rated 600 volts.
- F. Branch circuit wire sizes not shown on the drawings shall be #12 AWG minimum.

#### 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Hubbell Power Systems, Inc.
  - 2. Ideal Industries, Inc.
  - 3. Ilsco; a branch of Bardes Corporation.
  - 4. 3M; Electrical Markets Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
  - 1. Split Bolt Connectors: Not acceptable.
  - 2. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
  - 3. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
  - 4. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.
  - 5. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
  - 6. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.

## 2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### PART 3 - EXECUTION

- 3.1 CONDUCTOR MATERIAL APPLICATIONS
- A. Feeders: Copper, Stranded conductor.
- B. Branch Circuits: Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

#### 3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway.

## 3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Feeder and branch circuit routing is shown diagrammatically on the drawings and is approximate unless dimensioned. Route feeders and branch circuits as required to meet project conditions.

- B. All 120 and 277 volt branch circuits shall have a dedicated neutral conductor. The neutral conductor shall be considered current-carrying conductor for wire derating. The use of multi-wire branch circuits with a common neutral is **not** permitted.
- C. All power wiring shall be installed in conduit unless specifically indicated otherwise.
- D. Conceal feeders and branch circuits in finished walls, ceilings, and floors, unless otherwise indicated.
- E. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- F. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- G. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- H. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- I. Install exposed feeders and branch circuits parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- J. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- K. Support feeders and branch circuits according to Division 26 Section "Hangers and Supports for Electrical Systems."
- L. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- M. Complete cable tray systems installation according to Division 26 Section "Cable Trays for Electrical Systems" prior to installing conductors and cables.

#### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

## 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53
  "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

## 3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 3. Perform insulation-resistance test, with respect to ground and adjacent conductors, on each conductor of power feeders 100 amperes or greater. Applied potential shall be 1000 volts dc for 600 volt rated cable. Test duration shall be one minute. Insulating-resistance values should not be less than 50 megohms.

- 4. Any conductors that fail the above-mentioned tests shall be replaced and those new conductors shall be tested and meet the requirements mentioned above.
- B. Test and Inspection Reports: Prepare a written report to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

# END OF SECTION

## SECTION 26 05 23 CONTROL-VOLTAGE ELECTRICAL POWER CABLES

#### PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Low-voltage control cabling.
  - 2. Control-circuit conductors.
  - 3. Identification products.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 PERFORMANCE REQUIREMENTS

A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

- 1. Flame Travel Distance: 60 inches (1520 mm) or less.
- 2. Peak Optical Smoke Density: 0.5 or less.
- 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

# 2.3 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
  - 1. One-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with UL 1685.

## 2.4 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Encore Wire Corporation.
  - 2. General Cable Technologies Corporation.
  - 3. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Test cables on receipt at Project site.
  - 1. Test each cable for open and short circuits.

## 3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
  - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
  - 2. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.

## 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C Series of standards.
  - 2. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  - 3. Cables may not be spliced.
  - 4. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

- 5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
- 6. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. Installation of Control-Circuit Conductors:
  - Install wiring in raceways. Comply with requirements specified in Section 26 05
    33 "Raceways and Boxes for Electrical Systems."

# 3.4 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
  - 1. Class 1 remote-control and signal circuits; No 14 AWG.
  - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

## 3.5 GROUNDING

A. For low-voltage control wiring and cabling, comply with requirements in Section 26 05
 26 "Grounding and Bonding for Electrical Systems."

## 3.6 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

## 3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

- 2. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
  - a. Test instruments shall meet or exceed applicable requirements in TIA-568 C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

# END OF SECTION

#### SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
  - 1. Underground distribution grounding.
  - 2. Foundation steel electrodes.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Grounding arrangements and connections for separately derived systems.
- B. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

## PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.
  - 2. ERICO International Corporation.
  - 3. Harger Lightning and Grounding.

#### 2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### 2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

#### 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

#### 2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

#### PART 3 - EXECUTION

#### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.

#### 3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

#### 3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

#### 3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 12 inches (300 mm) below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

#### 3.5 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

- 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
- 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- 3. Test completed grounding system at each location where a maximum groundresistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.
  - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

## END OF SECTION

#### 26 05 26 - 5

## SECTION 26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL (Not Applicable)

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Steel slotted channel systems. Include Product Data for components.
  - 2. Nonmetallic slotted channel systems. Include Product Data for components.
  - 3. Equipment supports.
### 1.5 INFORMATIONAL SUBMITTALS

A. No submittal required.

## 1.6 QUALITY ASSURANCE

Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### 1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

# PART 2 - PRODUCTS

- 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS
- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Unistrut; Tyco International, Ltd.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Supports installed in process or washdown areas shall be schedule 40 ASTM type 316 stainless steel with ASTM type 316 stainless steel welded endcaps and end plates and polished finish. Stainless steel screws, nuts and bolts shall be ASTM type 316N2-33.
- C. Stainless steel supports, fittings and hardware shall be ASTM type 316 with polished finish. Stainless steel screws, nuts, and bolts shall be ASTM type 316N2-33.
- D. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

- E. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Hilti Inc.
      - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 3) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used. Plastic type expansion anchors are unacceptable.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Hilti Inc.
      - 3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

# PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. All supports installed outside, exposed to the weather, or inside in wet or damp areas shall utilize corrosion resistant supports, fittings, hardware, conduit clamps and all accessories.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

## 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

# 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Anchor equipment to concrete base.
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

# END OF SECTION

### SECTION 26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Nonmetallic conduits and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Boxes, enclosures, and cabinets.
- B. Related Requirements:
  - 1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes, and underground utility construction.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### 1.4 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### PART 2 - PRODUCTS

- 2.1 METAL CONDUITS AND FITTINGS
- A. Metal Conduit:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Electri-Flex Company.
  - d. Southwire Company.
  - e. Thomas & Betts Corporation; A Member of the ABB Group.
  - f. Western Tube and Conduit Corporation.
  - g. Wheatland Tube Company.
- 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 3. RMC: Comply with ANSI C80.1 and UL 6.
- 4. ARC: Comply with ANSI C80.5 and UL 6A.
- 5. IMC: Comply with ANSI C80.6 and UL 1242.
- 6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - a. Comply with NEMA RN 1.
  - b. Coating Thickness: 0.040 inch (1 mm), minimum.
- 7. EMT: Comply with ANSI C80.3 and UL 797.
- 8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- 9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- Stainless Steel Conduit: Polished schedule 10 tubing in 20 foot lengths maximum, 1 inch diameter minimum.
- B. Metal Fittings:
  - 1. Comply with NEMA FB 1 and UL 514B.

- 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 3. Fittings, General: Listed and labeled for type of conduit, location, and use.
- 4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203.
- 5. Fittings for EMT:
  - a. Material: Steel.
  - b. Type: Setscrew.

### 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. CANTEX, Inc.
    - d. Electri-Flex Company.
    - e. Kraloy
    - f. Lamson & Sessions; Carlong Electrical Products.
    - g. Thomas & Betts Corporation; A Member of the ABB Group.
  - 2. ENT: Comply with NEMA TC 13 and UL 1653.
  - 3. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  - 4. LFNC: Comply with UL 1660.
  - 5. RTRC: Comply with UL 2515A and NEMA TC 14.
- B. Nonmetallic Fittings:
  - 1. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

- 3. Fittings for LFNC: Comply with UL 514B.
- 4. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. MonoSystems, Inc.
  - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, type as indicated on the drawings, and sized according to NFPA 70.
- C. Material and Construction of Stainless Steel Wireway: Sized and shaped as indicated, 14 gauge minimum, type 304 stainless steel with stainless steel covers, NEMA 4X.
  - 1. Flanges shall be 10-gauge stainless steel minimum.
  - 2. Wireway shall be constructed with continuously welded seams and with no holes or knockouts.
  - 3. All covers and flanges shall utilize solid oil-resistant gasket covers and shall be hinged with extended screw clamps.
  - 4. Connectors shall be flanged.
  - 5. Fittings shall be lay-in type with removable top.
- D. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Hinged type unless otherwise indicated.
- F. Finish: ANSI 61 Gray for steel wireways and brushed stainless steel for stainless steel wireways.

### 2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Crouse-Hinds, an Eaton business.
  - 2. EGS/Appleton Electric.
  - 3. Hoffman; a brand of Pentair Equipment Protection.
  - 4. Hubbell Incorporated.
  - 5. Kraloy.
  - 6. Thomas & Betts Corporation; A Member of the ABB Group.
  - 7. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, deep-type, ferrous alloy, Type FD, with gasketed cover, threaded hubs.
- E. Sheet Metal Pull and Junction Boxes: NEMA OS 1, galvanized steel.
- F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- G. Telecommunications and Security Device Box Dimensions: 4 11/16 inches square by 2-1/8 inches deep unless noted otherwise.
- H. Gangable boxes are prohibited.
- I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, type as shown on the drawings, with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

#### PART 3 - EXECUTION

#### 3.1 RACEWAY SIZING

- A. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to NEC. (Latest Edition). Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the National Electrical Code (to include enlarged conductor's due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.
- B. Minimum (Unless noted otherwise) Raceway Size 3/4-inch (21 mm) trade size.
- C. Minimum Raceway Size Telecommunication and Security Conduit: 1 inch, unless noted otherwise in documents.
- D. Minimum Raceway Size Control Conduit: 3/4-inch, unless noted otherwise in documents.
- E. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

### 3.2 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: RMC.
  - 2. Concealed Conduit, Aboveground: RMC.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. Aluminum Conduits: Use Stainless Steel fittings, unless otherwise indicated.
  - 4. Rigid Nonmetallic Conduit: Use PVC fittings, unless otherwise indicated.

- 5. Stainless Steel Conduit: Use Stainless Steel fittings, unless otherwise indicated. Flexible conduit connections from stainless steel boxes shall utilize Ocal-Blue PVC coated connectors with sealing O-rings.
- 6. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
- 7. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

## 3.3 BOXES AND ENCLOSURES APPLICATIONS

- A. Boxes and Enclosures:
  - 1. NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.
  - 2. Dirty locations: NEMA 250, Type 12, powder coated steel.
  - 3. Process Areas: NEMA 250 Type 4X, Stainless Steel.
  - 4. Hazardous Locations: All boxes and enclosures installed in hazardous locations shall be suitable for locations as defined by NEC Article 500.

### 3.4 INSTALLATION

- Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. In general, conduits shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.
- D. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, rough through jack with pitch pocket. Coordinate roof penetrations with others.

- E. Conduit runs shall be routed as shown on the large-scale drawings. Conduit routing on drawings scaled ¼" =1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information provided in the contract documents, in accordance with manufacturer's written instructions, applicable coded, NECA 1 and NECA 101 and coordinated with other contractors.
- F. Complete raceway installation before starting conductor installation.
- G. Install temporary closures to prevent foreign matter from entering raceways.
- H. Unused openings in boxes and fittings shall be plugged with suitable devices rated for the proper environment.
- 1. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- J. Arrange stub-ups so curved portions of bends are not visible above finished slab. Where rigid non-metallic conduit (RNC) conduit is used below grade, in slab, below slab, etc., a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits the earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.
- K. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction and within 12 inches of enclosures to which attached to.
- L. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- M. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- N. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

- O. Contractor shall be responsible for all openings required in masonry or exterior walls under this division. A qualified mason at the expense of this contractor shall repair all openings to match existing conditions.
- P. Stainless Steel Conduit:
  - 1. Stainless steel conduit sections shall be purge welded, polished, and de-burred.
  - Transitions from stainless steel conduits to other conduit systems shall occur at NEMA 4X stainless steel boxes. Stainless steel conduit shall be purge welded to stainless steel boxes and weld polished and de-burred. Weld at exterior connection and soliflex inside.
- Q. Process Areas:
  - 1. All raceway systems installed in all process areas shall utilize wet location rated conduit, fittings and connection devices. All hardware and supports shall be corrosion resistant.
  - 2. In process and other wet and corrosive areas, all conduit shall be surface mounted on or below ceiling level. Conduit shall be routed around the perimeter of the room and stacked in a vertical configuration (not horizontal) and shall not be routed over open vats or over openings in enclosed vats.
  - 3. All conduits, fittings, boxes and other raceway components shall either be mounted flush with the surface of the wall or other mounting structure and caulked all around or mounted such to leave a one (1) inch clear space between the raceway and the mounting surface.
  - 4. All conduit entry into boxes in process areas shall be through the side or bottom with a condensation drip tee mounted at the lowest point in the conduit.
  - 5. All conduit installed outside exposed to the weather and in wet locations shall utilize sealing locknuts and bushings.
  - 6. Provide polished stainless-steel escutcheon plates to provide smooth cleanable surfaces at wall penetrations. Affix plate securely to surface and caulk around plate.
  - 7. USDA approved caulk shall be provided for all conduit supports, boxes, penetrations and other required conditions in all process areas.

### 3.5 CONDUIT TERMINATIONS

- A. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- B. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

- C. Join raceways with fittings designed and approved for that purpose and make joints tight.
- D. When raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
- E. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- G. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- H. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- J. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- L. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- M. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

- 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
- 2. Where an underground service raceway enters a building or structure.
- 3. Conduit extending from interior to exterior of building.
- 4. Conduit extending into pressurized duct and equipment.
- 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
- 6. Where otherwise required by NFPA 70.
- N. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- O. Expansion fittings shall be installed across expansion joints in structures and concrete construction where such joints are shown on the architectural and structural drawings.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

### 3.6 BOX INSTALLATION

- A. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- B. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch by 24 inch access doors.
- C. Electrical box locations shown on drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- D. No outlet shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
- E. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

- F. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- H. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- I. Locate boxes so that cover or plate will not span different building finishes.
- J. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- K. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- L. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

### 3.7 **PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

### END OF SECTION

### SECTION 26 05 43 UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

### A. Section Includes:

- 1. Metal conduits and fittings, including RMC.
- 2. Rigid nonmetallic duct.
- 3. Duct accessories.
- 4. Precast concrete handholes.
- 5. Polymer concrete handholes and boxes with polymer concrete cover.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include duct-bank materials, including spacers and miscellaneous components.
  - 2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
  - 3. Include accessories for handholes.
  - 4. Include underground-line warning tape.
- B. Shop Drawings:
  - 1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
    - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
    - b. Include duct entry provisions, including locations and duct sizes.
    - c. Include cover design.
    - d. Include grounding details.
    - e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

### 1.4 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is 36 inches (900 mm) below ground surface unless a higher water table is noted on Drawings.

## PART 2 - PRODUCTS

- 2.1 METAL CONDUIT AND FITTINGS
- A. RMC: Comply with ANSI C80.1 and UL 6.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Tube & Conduit; a part of Atkore International.
  - 2. Thomas & Betts Corporation; A Member of the ABB Group.
  - 3. Wheatland Tube Company.
- 2.2 RIGID NONMETALLIC DUCT
- A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Tube and Conduit; a part of Atkore International.
  - 2. CANTEX INC.
  - 3. Kraloy.
  - 4. Thomas & Betts Corporation; A Member of the ABB Group.
- C. Solvents and Adhesives: As recommended by conduit manufacturer.
  - 1. VOC Content: 510 g/L or less for PVC conduit and fittings.

### 2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 26 05 53 "Identification for Electrical Systems."

- 2.4 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER
- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armorcast Products Company.
  - 2. Oldcastle Enclosure Solutions.
  - 3. Quazite: Hubbell Power Systems, Inc.
- C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- D. Color: Gray.
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, as indicated for each service.
- I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.
- 2.5 SOURCE QUALITY CONTROL
- A. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  - 1. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  - 2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

#### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.
- C. Clear and grub vegetation to be removed and protect vegetation to remain. Remove and stockpile topsoil for reapplication.
- 3.2 UNDERGROUND DUCT APPLICATION
- A. Duct for Electrical Feeders 600 V and Less: Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths and Roadways: Type EPC-40 PVC RNC, encased in reinforced concrete.
- D. Stub-ups: Concrete-encased RNC.
- 3.3 UNDERGROUND ENCLOSURE APPLICATION
- A. Handholes and Boxes for 600 V and Less:
  - Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
  - 2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 structural load rating.
  - Units Subject to Light-Duty Pedestrian Traffic Only: Polymer concrete units, SCTE 77, Tier 8.

4. Cover design load shall not exceed the design load of the handhole or box.

## 3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 31 23 00 "Excavation and Fill", but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures.

# 3.5 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.
  - Duct shall have maximum of two 90-degree bends or the total of all bends shall be no more 180 degrees between pull points.
- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- H. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.
- I. Concrete-Encased Ducts and Duct Bank:
  - 1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 31 23 00 "Excavation and Fill" for pipes less than 6 inches (150 mm) in nominal diameter.
  - 2. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
  - 3. Depth: Install so top of duct envelope is at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
  - 4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
  - 5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
  - 6. Minimum Space between Duct: 3 inches (75 mm) between edge of duct and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and communications ducts.
  - 7. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.

- 8. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
- 9. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
- 10. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between duct of like services, and 4 inches (100 mm) between power and communications ducts.
- 11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
  - a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written instructions or use other specific measures to prevent expansion-contraction damage.
  - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
- 12. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 03 30 00 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.
- J. Direct-Buried Duct and Duct Bank:
  - 1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 31 23 00 "Excavation and Fill" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
  - 2. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.

- 3. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.
- 4. Set elevation of bottom of duct bank below frost line.
- 5. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
- 6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
- 7. Install duct with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and communications duct.
- 8. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
- 9. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 23 00 "Excavation and Fill" for installation of backfill materials.
  - a. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
  - b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.

K. Underground-Line Warning Tape: Bury conducting underground line specified in Section 26 05 53 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concreteencased duct and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of ductbank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

### 3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line, below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

- 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 03 30 00 "Cast-in-Place Concrete," with a troweled finish.
- 2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

## 3.7 GROUNDING

 Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

# 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
  - Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

### 3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
  - 1. Sweep floor, removing dirt and debris.
  - 2. Remove foreign material.

# END OF SECTION

### SECTION 26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Underground-line warning tape.
  - 5. Warning labels and signs.
  - 6. Equipment identification labels.
  - 7. Miscellaneous identification products.
- 1.3 ACTION SUBMITTALS
- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- 1.4 QUALITY ASSURANCE
- A. Comply with ANSI A13.1.

- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

### 1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

### PART 2 - PRODUCTS

### 2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.

- 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
- 2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS
- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemicalresistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.

- E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

# 2.3 CONDUCTOR IDENTIFICATION MATERIALS

- Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

### 2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:

- 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
- 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
- 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
  - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
  - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.
- 2.5 WARNING LABELS AND SIGNS
- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Metal-Backed, Butyrate Warning Signs:
  - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
  - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
  - 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- D. Warning label and sign shall include, but are not limited to, the following legends:

- 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

### 2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- 2.7 CABLE TIES
- General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black.

### 2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

### PART 3 - EXECUTION

- 3.1 INSTALLATION
- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

- 1. Outdoors: UV-stabilized nylon.
- 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.
- 3.2 IDENTIFICATION SCHEDULE
- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.

- 3) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.
- F. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
  - 1. Limit use of underground-line warning tape to direct-buried cables.
  - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

- I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Outdoor Equipment: Engraved, laminated acrylic or melamine label 4 inches (100 mm) high.
    - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Equipment to Be Labeled:
    - a. Enclosures and electrical cabinets.
    - b. Access doors and panels for concealed electrical items.
    - c. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - d. Enclosed switches.
    - e. Enclosed circuit breakers.
    - f. Enclosed controllers.
- g. Push-button stations.
- h. Contactors.
- i. Remote-controlled switches, dimmer modules, and control devices.
- j. Monitoring and control equipment.

# END OF SECTION

# SECTION 31 22 00 GRADING

## PART 1 - GENERAL

### 1.01 Work Includes

A. Excavation and embankment necessary for grading the site shall be considered to include that required for roads, walks, culvert installations, and drainage ditches and channels.

### PART 2 - EXECUTION

### 2.01 Preparation

- A. After the removal of topsoil, the then existing surface is to be excavated or filled to the elevations and slopes indicated on the Drawings, or as directed by the Engineer. Additional fill, if required, and is not available elsewhere, shall be excavated from borrow areas selected by the Contractor, but subject to the approval of the Engineer. Unless otherwise provided, all borrow pits shall be located entirely outside the limits of the site.
- B. On areas where roadway pavement is to be placed, the subgrade therefore shall be no more than 0.10 foot above or below the established grade; in other areas, the finished grade shall be not more than 0.15 foot above or below the established grade.
- C. Where rock is encountered at road subgrade or finished grade in areas other than roads, it shall be removed for a depth of six (6) inches below such subgrade or finished grade elevation.
- D. Subgrades and shoulders for the access and service roads shall be constructed to the lines and grades indicated, and in conformance with the applicable requirements of the "Standard Specifications" for the Florida State Department of Transportation.

## 2.02 Embankment

- A. On hillsides in which the existing slope is steeper than four to one, the Engineer may require the surface to be plowed to provide binding of the embankment with the original ground. When, in the opinion of the Engineer, existing slopes are excessive, the Engineer may require the original ground to be cut into the steps or berms.
- B. All materials removed from classes of excavation, which are determined as suitable by the Engineer, shall be used in the formation of embankments. Excavated material which is not required for embankments shall be disposed of by the Contractor, at his responsibility and expense, outside the limits of the site, unless the Engineer gives notice of some point of disposal within the site. No material shall be disposed of in any flood channel area.
- C. Earth or other friable materials shall be placed in successive horizontal layers of loose material not more than nine (9) inches in depth, spread uniformly by use of graders or other approved devices, and rolled until thoroughly compacted with an approved three (3) wheel power roller weighing not less than ten (10) tons. The Engineer may permit the Contractor to use approved sheep-foot tamping rollers. Embankments at points inaccessible to the roller shall be made in horizontal layers of loose material not exceeding six (6) inches in depth and thoroughly compacted by mechanical tampers.
- D. Where rock only is available, it shall be placed in loose layers not exceeding two (2) feet in depth and rolled as provided above. Rock fills shall only be considered as such where the earth or other finer materials is uniformly distributed and is considerably less than sufficient to fill the voids and interstices; otherwise it shall be considered and placed as earth fill. The top layer of rock fills shall not exceed eight (8) inches in depth, and the interstices shall be thoroughly filled with small spall, shale, gravel, or other similar approved material and thoroughly compacted. This top layer of rock shall be kept at least eight (8) inches below the elevation of subgrade for payments, and finished grade elsewhere, with the balance of the fill formed by topsoil or other approved material, as required.
- E. No roots, leaves, grass, or any form of vegetation shall be placed or allowed to remain in filled or graded areas.

- F. The Contractor shall be responsible for the stability of all embankments and shall replace all sections which, in the opinion of the Engineer, have been damaged or displaced due to carelessness or neglect on the part of the Contractor due to natural causes, such as storms.
- G. During grading operations, cuts and fills shall be kept shaped and drained at all times.

## END OF SECTION

# SECTION 31 23 00 EXCAVATION AND FILL

## PART 1 - GENERAL

#### 1.01 SCOPE

- A. The work covered by this section and required by this Contract includes the completion of all excavation, backfilling and embankment to the lines and grades indicated by the drawings, as further specified below, and necessary to the following operations:
  - 1. Stripping, storing and replacing topsoil;
  - 2. Excavation and backfill for pipe trenches;
  - 3. Excavation and embankment for road, grading and drainage of the site;
  - 4. Excavation and backfill for buildings and structures; and
  - 5. Borrow excavation.

### 1.02 CHARACTER OF MATERIAL.

A. The Contractor must satisfy himself regarding the character and amount of loam, clay, sand, quicksand, muck, gravel, rock, water and all other material to be encountered in the work to be performed.

### 1.03 DESCRIPTION

A. The Contractor shall excavate, protect and backfill all foundations, trenches, tunnels and other excavations that may be necessary for completing the work to be done under this Contract. All excavation shall be in open cuts, except where and to such extent as the Engineer may authorize or direct that the same be done in tunnel, or where such is specified in the Special Requirements or Contract drawings. Trenches may, in general, be excavated and backfilled either by machinery, or by hand as the Contractor may elect; provided, however, that the Engineer shall be empowered, wherever he shall decide that such necessity exists, to direct that hand 31 23 00-1

excavation by employed; and, provided, further that backfilling by hand shall be done to the extent hereinafter specified. The Contractor shall have not claim for extra compensation due to the fact that hand, instead of machine, excavation may be necessary from any cause whatever.

- B. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the lines and grades or depths indicated by the drawings, as specified herein, or as directed by the Engineer. Embankments shall be prepared in accordance with the Specifications, and as necessary to bring the ground surface to the subgrade elevation for roads and to finished grade elevations for other areas as shown on the drawings, or directed by the Engineer. All excavated material not required for backfill or embankment shall be removed and wasted or otherwise disposed of as directed or specified.
- C. The term "subgrade" as used herein shall have the meaning given below:
  - 1. The bed of a trench prepared as specified to receive pipes or other conduits;
  - 2. The area upon which the lower surface of roadway paving, walks, gutters, or curb rests;
  - 3. The surface of excavation or embankment areas prepared to receive topsoil; and
  - 4. The areas upon which rest the planned bottom of footings, foundations, or slabs.

## PART 2 - MATERIALS

- 2.01 TOPSOIL
  - A. Stripping. The area from which topsoil is to be stripped and the locations where it is to be stored shall be as shown on the drawings or as specified below. The topsoil shall be stripped to a depth of not less than six inches (6"). On all areas where any type of grading is to be performed, including the areas within the lines of buildings and structures, the topsoil shall be carefully removed and spread either on areas

already graded or prepared for topsoil, or in stockpiles conveniently located to the areas which are later to receive application of topsoil.

B. Spreading. On areas intended to receive topsoil, the compacted subgrade shall be scarified to a depth of two inches (2") for bonding topsoil with subsoil. The topsoil shall then be evenly spread, compacted and graded to the finished elevations shown on the drawings or as specified by the Engineer. Compaction shall be effected by a single pass of an approved roller.

## 2.02 REMOVAL AND STORAGE OF MATERIAL

- A. In locations where the working space is limited, the material excavated from the first one hundred feet (100') of any trench, or from such additional length as may be required, shall upon order of the Engineer, be removed at the Contractor's own cost and expense, as soon as excavated. The materials subsequently excavated shall be used to refill the trench. In no case will the Contractor be allowed to cast excavated material beyond curb of right-of-way lines, or on sidewalks or lawns, and the failure or refusal of the Contractor to comply with this requirement shall be sufficient cause for the Engineer to stop all work under the Contract.
- B. In case more material is excavated from any trench than can be backfilled over the completed sewer or can be stored within the limits of the right-of-way, leaving space for the traffic and drainage as herein provided, the excess material shall be removed to some convenient place, provided by the Contractor. The Contractor shall at his own cost and expense bring back as much of the material so removed, as may be required to properly backfill the trench, if of the proper kind; or, if so directed by the Engineer, the Contractor shall, at his own cost and expense, furnish such other suitable material as may be necessary.
- C. When it is necessary to haul soft or wet material over the streets, the Contractor shall provide suitable tight vehicles, or a pattern approved by the Engineer for this purpose.

# 2.03 SHEETING, BRACING AND SHORING

A. The Contractor shall furnish the material for, and do all timber shoring, bracing and sheeting necessary to perform and protect the excavation, and as required by the

Engineer to protect the work, other structures, the public, and the Contractor's employees. If trench protection is necessary, per OSHA requirements, the Contractor shall account for the anticipated expense in the appropriate bid item, or in the unit cost for pipe installed, or a combination of both. If the Engineer deems that sheeting, bracing, or shoring is necessary, it shall be supplied by the Contractor at no additional expense to the Owner. Such sheeting, etc. may be removed as the work progresses, but where, in the opinion of the Engineer, damage may result through removal; it shall be left in place with payment therefore made as hereinafter provided. The right of the Engineer to order sheeting, etc. left in place shall not render the issuance of such order obligatory on the part of the Engineer.

- B. All sheeting, etc. shall be arranged so that it may be withdrawn, as the trenches are backfilled, without injury to the pipe and its appurtenances, and without injury to or settlement of adjacent structures and pavements. All voids caused by withdrawal shall be immediately filled with sand or other satisfactory material and compacted by ramming or other method satisfactory to the Engineer.
- C. No timber sheeting, bracing or shoring shall be left within 18 inches (18") of any natural ground surfaces or within 12 inches (12") of the subgrade of any rigid or flexible type pavement, or railroad roadbed. In any trench shoring system, no vertical member shall remain directly over the pipe and no horizontal member shall remain within 12 inches (12") of any pipe. After backfilling is started, no sheeting shall extend below the horizontal diameter of the pipe without the Engineer's approval. Sheeting left in place shall be cut off at such point as the Engineer may order, and the portions cut off shall be removed from the work.
- D. If the Engineer determines that the material furnished is not of proper size or quality, or not properly placed, the Contractor shall furnish and place other and satisfactory material in an acceptable manner, and shall not be entitled to additional compensation for such corrective work.

### PART III - EXECUTION

### 3.01 ORDER OF WORK

- A. The Contractor shall submit a progress schedule as specified in Article 2.40 and shall carry on his work in strict accordance therewith. Deviations from the progress schedule may be made only with the approval of the Engineer.
- B. Manholes shall be constructed either at the same time as the main sewer or immediately after its completion.
- 3.02 SEWER LINES AND GRADES. Sewer lines and grades shall be laid out and maintained during construction in the following manner.
  - A. Prior to the commencement of trench excavation, the Contractor shall prepare and submit to the Engineer for approval, detailed cut sheets provided by the Contractor's surveyor. The surveyor shall be registered in the State of Florida. Cut sheet shall show; the beginning and ending of manholes; the distance between manholes; the grade, size and type of line, the depth of cut; etc. The form of cut sheets shall be satisfactory to the Engineer. All expense for the preparation of cut sheets shall be borne by the contractor and be included in the unit price per foot of pipe. Cut sheets must be approved by the Engineer in writing before pipe laying operations may be permitted. It shall be the responsibility of the Contractor to prepare cut sheets far enough in advance of his anticipated trenching schedule so that avoidable delay in the work will not occur.
  - B. Before beginning the excavation for any run of main sewer, the Contractor's forces, under the direction of the Engineer, shall:
    - 1. Set control points for line and grade as given on the Drawings or as otherwise determined by the Engineer. In unpaved or unsurfaced areas, these points shall be placed on the top of stakes securely driven into the ground. In paved areas, there may be spikes driven into the paving or crosses cut into the paving, and in either case, enclosed in a painted circle. Stakes or points shall be sufficiently offset from the centerline so as to be undisturbed during the excavation and pipe laying operations. The offset

shall be on the side of the centerline opposite to that on which excavation will be thrown.

- 2. As the rough excavation is completed, the Contractor's surveyor shall place grade or batter boards of finished, straight lumber across the trench opposite each stake or point. The grade boards shall be securely supported so as not to be subject to accidental displacement. The top of each board shall be leveled and set at the same distance above the sewer invert. A nail shall then be driven into the top of each board on the centerline of the sewer and each nail connected by a string line pulled taut.
- 3. The preparation of the final subgrade and the pipe laying shall then proceed in the manner specified herein, beginning at the manhole having the lower invert and working upgrade and using the string line as control for maintaining sewer grade and horizontal alignment. A straight wooden pole suitably marked and with a right-angled offset at the bottom to project past the bell of the pipe and rest upon the pipe invert, shall be used to check the vertical distance from string line to invert.
- C. The use of laser beams shall be acceptable as a method of controlling pipe alignment and grade.

## 3.03 WIDTH AND DEPTH OF TRENCHES

- A. From the subgrade elevation to an elevation at least 12 inches (12") above the top of the outside barrel of the pipe, the banks of trenches in all cases shall be excavated to vertical lines, and the trenches shall be not less than 12 inches (12") nor more than 16 inches (16") wider nor more than eight inches (8") in width is provided on each side of the barrel of the pipe. If sheeting is required, the foregoing dimensions shall be applicable to the inside faces of the sheeting.
- B. From a point twelve inches (12") above the top of the outside barrel of the pipe to the surface, the banks of trenches in all streets, roads or highways, paved or unpaved, shall be kept as nearly vertical as possible, and in no case shall the width of trench at the top exceed the outside diameter of the pipe plus 40 inches (40"). If the specified maximum width of trench cannot otherwise be maintained, the Contractor shall install temporary sheeting at his own cost and expense. Where

sewers are to be constructed on rights-of-way or easements in open country, the specified maximum width of trench at the top may be exceeded only if the construction is kept entirely within the limits of the easements or rights-of-way and can be carried on without damage to adjoining property.

C. Except at locations where excavation of rock or unsuitable material is required, care shall be taken not to excavate below the depths specified, when rock is encountered, it shall be removed to a depth six inches (6") below the outside bottom of the pipe at the barrel. When the material encountered at subgrade is unstable, it shall be removed from under the pipe and on each side of the pipe for a distance of one (1) diameter of the pipe. Such rock or unsuitable material excavation below subgrade shall be backfilled with moist clay, sand, bankrun gravel, or other suitable material compacted to the satisfaction of the Engineer, and the bed thus formed shaped as required above. In rock excavation, if trenches are shattered by blasting below the lines of excavation specified herein, the trench shall be refilled to subgrade with sand, well tamped earth, or concrete, if required by the Engineer, at the Contractor's expense. If earth trenches are excavated beyond the specified depths, they shall be backfilled to the proper grade with suitable, thoroughly tamped material at the expense of the Contractor.

### 3.04 PREPARATION OF FOUNDATION

- A. In earth trenches, the bottom thereof shall be carefully rounded to fit the lower ninety degrees (90°) of the circumference of the pipe, i.e., so that one-fourth (1/4) of the external circumference of the pipe will rest firmly on the undisturbed soil. Bell-holes shall be excavated to ensure that the barrel of the pipe will rest for its entire length upon the trench bottom.
- B. Bell-holes shall be properly cut to provide free support of the pipe barrel and shall be directed by the Engineer. All irregularities and cavities, either in earth or rock excavation, in the bottom of trenches or tunnels, shall be filled up to a level which will support ninety degrees (90°) of the lower pipe circumference with selected material free from large gravel, rocks and stones, firmly compacted before pipe lines are laid therein.
- C. Where, in the opinion of the Engineer, the ground does not afford a sufficiently firm foundation, the Contractor shall construct a timber foundation, or shall

excavate the trench to such increased depth as may be directed, and then shall bring up the bottom of the trench to the required level and form with such material and in such manner as the Engineer may direct.

## 3.05 CONCRETE CRADLE AND ENCASEMENT

- A. The profiles generally indicate the approximate vertical limits where concrete cradle and encasement are necessary to support the anticipated loads on completed sewers for the widths of trench as required for each size and class of pipe, based on the crushing strength of the pipe.
- B. The Contractor is warned that if the trench widths or clearances between pipe and trench walls or face of sheeting, as specified above, are exceeded, he will be required to furnish in all locations at his own expense either concrete cradle or encasement as directed by the Engineer.
- C. It is anticipated that subsurface conditions may require a cradle for a portion of the project to provide an adequate foundation, even though the ultimate anticipated load on the pipe is less than the minimum crushing strength for sand bearing. The Contractor shall place the cradle or encasement at the location, and of the materials, as directed and required by the Engineer. The Contractor will not be paid for any cradle beyond the required widths of trench.
- D. All excavation made beyond the required limits shall be at the Contractor's expense.

## 3.06 LENGTH OF OPEN TRENCH

A. The Engineer shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling, but in no case, except when leakage tests are required by the Engineer, shall these amounts exceed three hundred feet (300') and one hundred feet (100'), respectively. Trench excavation shall be fully completed, except for the shaping of the bottom of the trench, at least 20 feet (20') in advance of the pipe placement and shall be kept free from obstructions, except that at the close of work at night, or at the discontinuance of work, the pipe laying may be completed to within five feet (5') of the end of the open trench.

- B. The Engineer shall be empowered, at any time, to require the refilling of open trenches over completed pipe lines, if, in his judgment, such action is necessary, and the Contractor shall thereby have no claim for extra compensation even though to accomplish said refilling, he is compelled temporarily to stop excavation or other work at any place.
- C. If the work is stopped on any trench, for any reason except by order of the Engineer, and the excavation is left open for an unreasonable length of time (in the opinion of the Engineer) in advance of construction, the Contractor shall, if so directed, refill such trench at his own cost and shall not again open said trench until he is ready to complete the structure therein.

## 3.07 ACCOMMODATION OF TRAFFIC

- A. Streets shall not be unnecessarily obstructed and, unless the Engineer, in writing, shall authorize the complete closing of the street, the Contractor shall take such measures at his own expense as may be necessary to keep the street or road open and safe for traffic.
- B. The Contractor shall construct and maintain without extra compensation such adequate and proper bridges over excavations as may be necessary or as directed for the safe accommodation of pedestrians or vehicles. The Contractor shall furnish and erect without cost to the Owner substantial barricades at crossings of trenches, or along the trench, to protect the traveling public.
- C. The Contractor shall not obstruct fire hydrants.
- D. The roadway on one side of the line of work shall be kept open at all times.
- E. The streets, crosswalks and sidewalks shall be kept clean, clear and free for the passage of vehicles or pedestrians, unless otherwise authorized in writing by the Engineer. A straight and continuous passageway on sidewalks and over crosswalks, at least three feet (3') in width, shall be preserved free from all obstruction.
- F. Where deemed necessary, such additional passageway as may be directed shall be maintained free from obstructions.

G. In narrow or congested streets or alleys, when so directed, the Contractor shall complete his work up to a point designated by the Engineer before opening the work ahead, in order to give access to garages and other places. The Contractor shall in all cases so arrange his work as to cause the least inconvenience to property owners consistent with the proper precaution of the work as determined by the Engineer.

## 3.08 ACCOMMODATION OF DRAINAGE

- A. Gutters, sewers, drains and ditches shall be kept open at all times for surface drainage. No damming or ponding of water in gutters or other waterways will be permitted, except where stream crossings are necessary and then only to an extent which the engineer shall consider necessary. The Contractor will be responsible for all clean-up to existing utilities caused by their activities.
- B. The Contractor shall not direct any flow of water across or over pavements except through approved pipes or properly constructed troughs and he shall, when so required at his own expense and cost, provide pipes or troughs of such sizes and lengths as may be required and place the same as directed.
- C. The grading in the vicinity of sewer trenches shall be controlled so that the ground surface is properly pitched to prevent water running into trenches.

## 3.09 PUMPING

- A. The Contractor shall keep all excavations free from water, at his own expense, while structural work is in progress, and to such extent as may be necessary while excavation work along is being carried on.
- B. The Contractor shall build all dams and other devices necessary for this purpose, including lowering the water table below trench bottom by well points and pumping, and provide and operate pumps of sufficient capacity for dewatering the excavations.
- C. He shall provide for the disposal of the water removed from excavation in such manner as shall not cause injury to the public health, to public or private property, to the work of other Contractors, to any portion of the work completed or in

progress, or produce any impediment to the use of the highways, roads, lanes, and streets by the public.

D. Any dewatering required shall be performed at the Contractor's expense. Payment for dewatering shall be included in the Contractor's bid prices for pipe or other structures requiring dewatering for installation. If holes made for installation of well points are installed in a roadway, shoulder, or under a structure, these holes shall be filled with lean grout prior to backfill and compaction. Any permits needed for dewatering shall be obtained and paid for by the contractor.

## 3.10 EMBANKMENT

- A. Where embankment is necessary to support the foundations of the pipe or structure, it shall be made to the height, width and slopes shown on the drawings, or as directed. The entire embankment, or such portion thereof as may be deemed necessary by the Engineer, shall be made prior to the construction of the sewer, structure, or the foundation thereof, at such time and in such order as the Engineer may direct; and the embankment, sewer, or structure, and appurtenances, which may be laid thereon or therein, shall be maintained by the Contractor, at his own cost and expense, until the completion of the period of one (1) year from and after the date of the Certificate of Completion and Acceptance.
- B. After carefully grubbing and clearing the ground, removing all loose rock and stone, and all muck and improper material, to such a depth as the Engineer may determine, the embankment shall be built up of good loam, gravel or sand, or other selected and approved material, free from all stone above four inches (4") diameter, and not containing in any place a proportion of stones exceeding one (1) part stone to three (3) parts earth.
- C. In cast material which is unsatisfactory for the foundation of any embankment is encountered, said material shall be removed to such depth, and for such length and width as may be directed by the Engineer. Payment for the removal of material unfit for the foundation of an embankment will be made at the price bid or stipulated per cubic yard for excavation below subgrade.
- D. The material for embankment shall be deposited in layers of not more than nine inches (9") in thickness; each layer shall be separately compacted by heavy,

grooved iron rollers, or where such rollers cannot be used, by heavy paver's rammers. The embankment shall be watered during rolling, if so required. No breaks or irregularities in the distribution of the material or the formation of the layers will be allowed. The whole embankment shall be carried up evenly to the height given by the Engineer in such a manner as to make a compact and solid foundation. When pipe is to be laid in a fill, the embankment shall be brought to a height of at least one foot (1') above the proposed top of the pipe before the trench is excavated. The embankment shall then be excavated to the proper form and grade, and the sewer placed thereon; after which the embankment shall be carried up to a height of not less than three feet (3') above the top of the sewer, the material being placed and rolled or rammed in layers as above described.

### 3.11 BACKFILLING TRENCHES

- A. It is the intent of the following requirements for the backfilling of trenches to specify materials and methods which will:
  - 1. Result in thorough compaction of the backfilled material without the displacement of the grade or alignment of the sewer line and its appurtenances, and
  - 2. Eliminate settlement of the backfilled material.
- B. If displacement of the sewer or settlement of the backfilled material does occur, it will be considered as conclusive evidence of improper workmanship or the inclusion of unsuitable materials or both, and it shall be the Contractor's responsibility, at his own expense, to remove and recompact the settled material and regrade and realign the sewer. During the course of the backfilling operation, the Engineer may, at any location of depth of trench, make tests to determine whether the Contractor's compaction operations are sufficient to meet the requirements specified below.
- C. The procedure of backfilling shall be as follows:
  - 1. After the structure, pipe, or conduit and its appurtenances have been installed or constructed, the excavation, to a height of at least two feet (2') above the top of pipe or conduit, shall be refilled with clean earth deposited

in four inch (4") layers and solidly rammed down and tamped around the pipe, or conduit and under it, with mechanical tampers and proper tools made for this purpose. The operation shall be done in such manner as not to disturb the structure. The area around the pipe shall be hand-tamped.

- 2. The earth, to the height specified above, shall be carefully thrown in with hand shovels; under no condition shall any other means than hand shoveling, such as pushing in with heavy equipment be used.
- 3. The remainder of the trench, except as described below, shall then be refilled evenly to the required height in layers, each layer not to exceed six inches (6") in thickness after compaction. Mechanical tampers shall be used so as to produce a density of backfill (as determined by weight) at the bottom of each layer of not less than ninety-five percent (95%) of the optimum density of that material based upon the AASHTO T-180 modified proctor. The earth shall be properly rammed as directed, and wetted as required as the work progresses.
- 4. Care shall be taken to carry the fill up evenly on opposite side of the sewer, other trench excavations, and around the sides of all structures.
- D. If, in the opinion of the Engineer, the material being used for backfilling is of such character that satisfactory results cannot be obtained by tamping and ramming, the Contractor shall backfill and puddle the excavations in such manner and at such times as the Engineer may direct.
- E. If the material excavated is not clean earth, as above specified, the best of the materials excavated shall be used in backfilling, in position and manner as directed by the Engineer.
- F. In rock trenches, selected earth, sand or gravel shall be provided and used as backfill in the manner hereinbefore described to a height of two feet (2') above the top of the sewer. The backfill for the balance of the trench in all cases shall be of good earth, sand or gravel, which may contain stores not more than six inches (6") in largest dimensions, but not in proportion exceeding twenty percent (20%) of the total volume of backfill.

- G. No bulkheads, or retaining walls for the backfilling, will be allowed in the trenches over the sewer, except for temporary use.
- H. Should there be a deficiency of proper material for refilling the Contractor shall furnish acceptable material at his own cost and expense.
- I. No house ashes, putrescible refuse or other material of unsatisfactory character shall be used in refilling, and the Contractor shall not permit the trench to be used as a dumping ground for refuse.
- J. Testing of backfill in trenches shall be performed as deemed necessary by the Engineer or his representatives; the Contractor will supply and pay for the testing.

## 3.12 BORROW EXCAVATION

- A. In cases where the amount of embankment exceeds the amount of excavation within the limits of the site as indicated by the Drawings, and where material is not available from other sources of contracts, the Contractor shall obtain sufficient, suitable material from borrow pits located entirely beyond the limits of the site unless the Engineer gives written permission to obtain such material from an area within the site.
- B. The Contractor shall notify the Engineer sufficiently in advance of borrow excavation requirements to permit the Engineer to determine necessity and to view the proposed borrow pit.
- C. Borrow obtained from within the site shall be removed to uniform lines and grades satisfactory to the Engineer, and in such a manner as not to detract from the general appearance of the improvement and shall not create unsatisfactory conditions.
- D. All borrow pits shall be stripped of brush, roots, grass and other vegetation prior to removal of material for embankment purposes.

### 3.13 BUILDINGS AND STRUCTURES

## A. Excavation.

- 1. All excavation for buildings and structures shall be performed in the dimensions indicated on the Drawings. If suitable bearing is not encountered at the planned footing or foundation elevations, the excavation shall be carried to such elevations as are approved by the Engineer.
- 2. Prior to construction of foundations, the excavation shall be inspected by the Engineer and no foundation work shall be started prior to the Engineer's approval of the excavation. Care shall be exercised to avoid excavation below the depths indicated on the Drawings or as directed by the Engineer.
- 3. Where excavation is made below plan elevation or below elevations directed by the Engineer. Where excavation is made below plan elevation or below elevations directed by the Engineer, through the fault of the Contractor, the excavation shall be restored to the proper elevation in the manner described for backfill below, or the heights of walls or footings shall be increased, as may be directed by the Engineer, at the expense of the Contractor.
- B. Drainage.
  - 1. Grading in the vicinity of structures shall be controlled to prevent water running into excavated areas. Any accumulation of water in excavations shall be removed by pumping or other means at the Contractor's expense.
- C. Backfill.
  - 1. After completion of footings and walls, and the removal of forms, and prior to backfilling, the excavation shall be cleaned of all trash and debris.
  - 2. Backfill material shall consist of the excavation or other materials free from trash, lumbar or other debris. It shall be placed in horizontal layers not exceeding six inches (6") in depth, moistened if required and compacted by hand or mechanical tampers to a density to prevent excessive settlement.

### 3.14 RESPONSIBILITY FOR CONDITION OF EXCAVATION

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- B. The failure of the Engineer to order the use of bracing or sheeting or a better quality, grade or section, or larger sizes of steel or timber, or to order sheeting, bracing, struts, or shoring to be left in place, or the failure to give orders or directions as to the manner or methods of placing or driving sheeting, bracing jacks, wales, rangers, or other members, shall not in any way or to any extend relieve the Contractor of any responsibility concerning the condition of excavation or of any of his obligations under the Contract; nor shall any delay, whether caused by any action or want of action on the part of the Contractor, or by any act of the Owner, or his agents, or employees, resulting in the keeping of an excavation open longer than would otherwise have been necessary, relieve the Contractor or from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of his obligations under the Contract relating to injury of persons or property, nor entitle him to any claim for extra compensation.

## 3.15 PROTECTION OF PROPERTY AND STRUCTURES

- A. The Contractor shall, at his own expense, sustain in their places, and protect from direct or indirect injury, all pipes, tracks, walls, buildings, and other structures or property in the vicinity of his work, whether above or below the ground, or that may appear in the excavation. He shall at all times have a sufficient quantity of timber and plank, chains, ropes, trench boxes, and other material and equipment, on the ground and shall use them as necessary for sheeting his excavations and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened or weakened.
- B. The Contractor shall take all risks attending the presence of proximity of pipes, poles, tracks, walls, buildings, and other structures and property, of every kind and description, in or over his excavation, or in the vicinity of his work, whether above or below the surface of the ground; and he shall be responsible for all damages and assume all expense for direct or indirect injury, caused by his work, to any of time,

or to any person or property by reason of injury to them, whether such structures are not shown on the Drawings.

- C. Where necessary, in order to keep one side of the street or roadway free from any obstruction or to keep the material piled alongside the excavation from falling on private property outside the right of way, a safe and suitable fence shall be placed alongside the excavation.
- D. In the event of encountering quicksand, subsurface streams or similar dangerous contingencies, or where passing especially heavy building or any structures which by their construction or position might bring a great pressure upon the excavations the right is reserved by the Engineer to direct that such buildings, or structures, shall be underpinned, or supported and protected, or that special sheeting shall be driven in such a manner and to such depth, as may be directed, or that only a short length of excavation shall be opened at one time; and furthermore, if necessary, that the excavation shall be securely sheeted and braced on all sides, after the manner of a shaft, and that the permanent work shall be constructed in the same manner and the shaft backfilled before another opening is made. Any work done as above directed shall be at the cost and expense of the Contractor.
- E. The Engineer reserves the right under such conditions to stop the excavation or any other part of the work, and to require the Contractor to complete the structure and the backfilling up to such a point as the Engineer may direct before proceeding further with the excavation; and the Contractor shall not thereby become entitled to demand or to receive any allowance or compensation, other than an extension of the contract time for as many days as the Engineer may determine that the work was delayed by such stoppage.

## 3.16 OBSTRUCTION SHOWN ON DRAWINGS

A. Certain information regarding the reputed presence, size, character, and location of existing underground structures, pipes and conduits has been shown on the Contract Drawings. There is no certainty of the accuracy of this information. The location of underground structures shown may be inaccurate and other obstructions not shown may be encountered.

- B. The Contractor hereby distinctly agrees that the Owner is not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information given, or on account of the insufficiency or absence of information regarding obstructions either revealed or not revealed by the Drawings; and that he shall have no claim for relief from an obligation of responsibility under the Contract, in case the location, size or character of any pipe or other underground structure is not as indicated on the Drawings; or in case any pipe or other underground structure is encountered that is not shown on the Drawings.
- C. The Contractor is solely and completely responsible for contacting utility providers and locating services to field locate existing utilities 48 hours in advance of his activities. If inadequate locations are made, or if hand-digging of "test holes" is deemed necessary, this shall be accomplished and affected by the Contractor at no additional expense to the Owner.

## 3.17 REMOVAL OF OBSTRUCTIONS

- A. Should the position of any pipe, conduits, pole, or other structures, above or below the ground be such as, in the opinion of the Engineer, to require its removal, realignment, or change due to work to be done under the Contract, the work of removal, realignment, or change will be done as extra work, or will be done by the Owner of the obstructions, without cost to the Contractor; but the Contractor shall uncover and sustain the structures, at his own expense, before such removal and before and after such realignment or change as constituting part of the Contract; and the Contractor shall not be entitled to any claim for damage or extra compensation on account of the presence of said structure, or on account of any delay in the removal or rearrangement of the same.
- B. The Contractor shall, without extra compensation, break through and reconstruct, if necessary, the invert or arch of any sewer, culver, or conduit that may be encountered, if the said structure is in such a position that in the judgment of the Engineer, as not to require its removal, realignment or complete reconstruction.
- C. The Contractor shall not interfere with any persons, firms or corporations, or with the Owner in protecting, removing, changing, or replacing their pipes, conduits,

poles, or other structures; but he shall suffer said persons, firms, or corporations, or the Owner to take all such measures as they may deem necessary or advisable for the purpose aforesaid, and the Contractor shall thereby be in no way relieved of any of his responsibilities under this Contract. At railway or railroad track crossings or paralleling, any expense to which the Owner of the trackage is put in shoring up tracks, or in maintaining traffic, shall be borne by the Contractor, whether the same is billed directly to him, or the Owner. Should any such bill be unpaid by the Contractor, before final payment under the Contract is made, the Owner shall be empowered to pay said bill and retain the amount thereof, from any monies due, or to become due the Contractor.

D. Except where trees are in rights-of-way, in immediate proximity to the excavation, they shall not be cut down except by authorization of the Engineer and the Contractor shall have no claim for the extra compensation owing to the fact that he may be required to excavate by hand, or tunnel in the vicinity of trees that may be left standing.

### 3.18 CHANGE OF EXCAVATION LOCATION

- A. In case the Engineer shall direct that the location of a trench or other excavation be changed from that shown on the Drawings, on account of the presence of an obstruction, or from other cause, or if a changed location shall be authorized upon the Contractor's request, the Contractor shall not be entitled to extra compensation, or to a claim for damage, provided that the change is made before the excavation is begun. If, however, such change, made at the direction of the Engineer, involves the abandonment of excavation already made, such abandoned excavation, together with the necessary refill, will be classed as miscellaneous excavation. In the event that the excavation is abandoned in favor of a new location, at the Contractor's request, the abandoned excavation and refill shall be at the Contractor's expense.
- B. Minor changes in alignment of pipe or other structures to accommodate the actual location of existing facilities shall be considered typical of construction activities and no additional compensation will be made for changes of this nature.

### 3.19 CLEANUP

- A. As the trenches are filled in and the work completed, the Contractor shall immediately and at his own cost and expense remove and dispose of all surplus earth, stone or other material from the work, in such manner and at such point or points, as he may select or provide, subject to the approval of the Engineer; or he may deposit the same, either with or without rehandling, at any point or points on the line of the work covered by the Contract, if so directed by the Engineer; and shall leave all roads, sidewalks and other places free, clear and in good order. In case the Contractor shall fail or neglect to do so, or to make satisfactory progress in doing so within twenty-four (24) hours after the receipt of a written notice from the Engineer, the Owner may remove such surplus material and clear the roadways, sidewalks and other places, and the cost of said work shall be charged to the Contractor and deducted from any monies due or to become due him under the Contract.
- B. All surplus earth or other material wasted on public property shall be evenly spread and left in a neat and smooth condition. All removed materials shall become the property of the Owner, if they so desire. If the Owner does not want the removed materials, surplus materials will be removed by the Contractor at no extra cost to the Owner.
- C. As soon as the trenches are refilled, all surplus earth, sand or rubbish shall be removed and kept removed to a point not more than two hundred feet (200') from the head of the open trench, unless otherwise authorized by the Engineer.

## 3.20 MAINTENANCE OF BACKFILLED TRENCH SURFACES

- A. The Contractor shall crown to such height, as directed by the Engineer, the top of all backfilled trench excavations. The Contractor shall also maintain these crowned surfaces to the satisfaction of the Engineer, without additional compensation, from the time of crowning operation to and including a period of eight (8) months beyond date of a Certificate of Completion of the work under this contract.
- B. The Contractor shall be responsible for any injury or damage resulting from lack of required trench maintenance during the prescribed maintenance period. If the Contractor does not satisfactorily provide specified maintained surfaces or begin

repairs of such surfaces when needed, within twenty-four (24) hours after written notice from the Engineer, such work may be done by the Owner and the cost thereof charged against the Contractor.

# END OF SECTION

# SECTION 31 23 19 DEWATERING

### PART 1 - GENERAL

### 1.01 DESCRIPTION OF WORK

- A. Scope: In general, the work specified in this section of the specifications shall consist of supplying labor, materials, and plant, and performing all work necessary to lower and control the groundwater levels and hydrostatic pressures to permit all excavations and construction specified under this Contract to be performed in the dry.
- B. Examination of Site: The Contractor shall take all steps that he considers necessary to familiarize himself with the site conditions, the ground conditions and the groundwater conditions. It is expressly understood that neither the Owner nor the Engineer will be held responsible for any interpretations or conclusions drawn by the Contractor.

## PART 2 - PRODUCT

### 2.01 METHOD AND EQUIPMENT

A. The Contractor may use any dewatering method he deems feasible so long as it results in working in the dry and in stable soil conditions. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction of the structures, construction of pipelines, and the placement of the fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the foundations, the drains, the sewers and all other excavations. An adequate weight of fill material shall be in place prior to discontinuing operation of dewatering to prevent buoyancy of the structure.

### PART 3 - EXECUTION

### 3.01 GENERAL

- A. The Contractor shall be solely responsible for the arrangement, location and depths of the dewatering system necessary to accomplish the work described under this section of the specifications. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level and piezometric water levels in the construction area are below the prevailing excavation surface; will prevent the loss of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.
- B. Disposal of Water: The Contractor shall promptly dispose of all water removed from the excavations in such a manner as will not endanger public health, damage public or private property, or affect adversely any portion of the work under construction or completed by him or any other Contractor. Contractor shall obtain written permission from the Owner of any property involved before digging ditches or constructing water courses for the removal of water.
- C. Siltation and Erosion:
  - 1. The Contractor shall take steps and make suitable provisions to minimize siltation and erosion which may result from, or as a result of, his operations during the course of construction of this project.
  - 2. The methods and provisions utilized by the Contractor to minimize siltation and erosion shall be approved by the Engineer and shall be in conformance with current Florida Department of Environmental Protection and St. Johns River Water Management District practices and regulations.
- D. Inadequate System: If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata, or instability of the slopes, or damage to the foundations or structures may occur. The supply of all labor, materials, and plant, and the performance of all work

necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by the Contractor to the approval of the Engineer, and at no additional expense to the Owner.

### END OF SECTION

# SECTION 32 92 00 TURF AND GRASSES

### PART I - GENERAL

### 1.01 WORK INCLUDED

A. The work specified in this section consists of grassing, or of grassing and mulching on slopes, shoulders and other areas. The work of grassing shall include seeding and fertilizing; also watering as required. Any of the items of work covered by this section may be eliminated from the contract, at the discretion of the Engineer. Sodding is included herewith and shall conform to the lines and grades as shown on the plans.

### PART II - MATERIALS AND EQUIPMENT

### 2.01 MATERIALS AND EQUIPMENT

A. The materials used for the work in this section shall conform to the requirements hereinafter specified.

### 2.02 SOD

- A. Sod shall be well matted with roots. St. Augustine shall be used in residential areas.Bahia shall be used in the right-of-way areas, not covered by St. Augustine grass.
- B. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 12-inch, except where 6-inch strip sodding is called for.
- C. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured, at the time of planting. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted. The sod shall be approved by the Engineer before placing.
- D. Source Requirements for Sod and Mulch. No mulch material or sod shall be used which is not certified as being free of the imported fire ant, and before any mulch or sod is brought to the project, the Contractor will be required to furnish the

Engineer a written certification and clearance, from pest control officials of either the State or the Federal Department of Agriculture, verifying that the materials are being obtained from an area outside of the zone of quarantine of the imported fire ant, or that they are free of the imported fire ant.

## 2.03 WATER

- A. The water used in the grassing operations may be obtained from the reclaimed water system.
- B. The water shall be free of excess and harmful chemicals, acids, alkalis, or any substance which might be harmful to plant growth or obnoxious to traffic.
- C. Salt water shall not be used.

## 2.04 EQUIPMENT

- A. Fertilizer Spreader
  - 1. The device for spreading dry fertilizer or for spraying liquid fertilizer shall meet the approval of the Engineer.
- B. Seed Spreader
  - 1. The seed spreader shall be an approved mechanical head spreader or other approved type of spreader and may be integral with the cultipacker roller equipment specified below.
- C. Equipment for Cutting Mulch into Soil
  - 1. The mulching equipment shall be a rotovator, or other equipment determined by the Engineer to be equally suitable for cutting the specified materials uniformly into the soil and to the required controlled depth.
  - 2. Harrows will not be allowed.

- D. Rollers
  - 1. A cultipacker, traffic roller, or other roller approved by the Engineer, will be required for rolling the grassed and mulched areas.
- E. Water-Metering Devices
  - 1. The vehicle used for applying the water to the grassed areas shall be equipped with an approved metering device installed at such point on the vehicle as to measure the water at the time of its being applied to the grassed areas.

### PART III - EXECUTION

### 3.01 TIME OF BEGINNING OPERATIONS

A. Whenever a suitable length of roadway is completed and ready for planting the Contractor shall, if directed by the Engineer, proceed at once with the planting of the available shoulder or embankment areas.

### 3.02 WEATHER AND SOIL LIMITATIONS

- A. Fertilizing, seeding or mulching operations will not be permitted when wind velocities exceed 15 miles per hour.
- B. Seed shall be sowed only when the soil is moist and in proper condition to induce growth.

### 3.03 SOIL MANIPULATION

A. All soil manipulation shall be done at right angles to the direction of slope.

### 3.04 WATERING

A. The soil shall be maintained in a moist condition for a period of at least two weeks after the planting.

### 3.05 APPLYING AND MIXING FERTILIZER

- A. Rate of Application
  - 1. At the Contractor's option either dry or liquid commercial grade fertilizer may be used.
  - 2. The rate of application for dry fertilizer shall be 800 to 1000 pounds per acre, with application in the upper range for sandy soils in the lower range for loamy soils. The exact rate will be set by the Engineer.
  - 3. Liquid fertilizer shall be applied at an equivalent rate which will provide the same amount of plant food as required for dry fertilizer (or at approximately 74 to 92 gallons per acre).
- B. Application
  - The fertilizer shall be spread or sprayed uniformly over the area to be grassed by use of the approved distributing device, except that on steep slopes or other areas where machine-spreading may not be practicable, spreading may be done by hand or by hose if the Engineer so directs.
  - 2. Immediately after dry fertilizer is spread, it shall be harrowed in and mixed with the soil to a depth of approximately four inches.
  - 3. When liquid fertilizer is sprayed, the soil, if dry, shall be moistened by sprinkling before the liquid fertilizer is applied not later than seven days after the seed is in place.

### 3.06 MULCHING

- A. When Dry Mulch is Used:
  - 1. When mulching is called for, approximately two inches, loose thickness, of the straw or hay material shall then be applied uniformly over the grassing

area, and the mulch material cut into the soil with the equipment specified, so as to produce a loose mulch thickness of three to four inches.

- 2. Care shall be exercised so that the materials are not cut too deeply into the soil.
- B. When Green Mulch is Used:
  - 1. When green mulch is used, the green mulch shall be incorporated into the soil not later than two days after being cut, and not artificial watering shall be done before the mulch is applied.
  - 2. It shall be spread in a layer of approximately two inches loose thickness, and cut into the soil with the equipment specified.
  - 3. The material shall not be cut too deeply into the soil.

## 3.07 SEEDING

A. Soon after the mulch material has been cut into the soil, and while the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area.

The rate of spread for the seed shall be as follows:

- 1. Where mulching is not called for, or where dry mulch is used, the rate shall be 60 pounds per acre. In the period from March 15 to October 15 the seed mixture shall be 30 pounds of Bahia and 30 pounds of Bermuda. In the remainder of the year, the mixture shall be 20 pounds each of Bahia, Bermuda and rye seed.
- 2. When green mulch is used, the required rate of spread shall be reduced to 45 pounds per acre, because of the faster growing rate of the green mulch as compared with that of the seeds. The seed mixture shall be 22-1/2 pounds of Bahia and 22-1/2 pound of Bermuda, except that in the period October 15 to March 15 the mixture shall be 15 pounds each of Bahia, Bermuda and rye grass seed.

- 3. Seeding may be done in conjunction with the rolling if the equipment used is designed for that purpose.
- 4. Rolling. Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required.

## 3.08 SODDING

A. Wherever sodding is indicated on the plans, it shall include all of the requirements of this section except "Mulching".

## 3.09 MAINTENANCE

A. The Contractor shall be responsible for keeping the ground moist by watering until an acceptable stand of grass is grown. He will also be required to repair at his own expense any damage due to washouts, erosion or other causes which might occur prior to final acceptance of this work.

# END OF SECTION

# SECTION 33 01 00 OPERATION AND MAINTENANCE OF UTILITIES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of furnishing all labor, equipment and materials and in performing all operations necessary for the construction or installation of all process and utility piping, valves, valve boxes and all castings and appurtenances within, complete and ready for operation as shown on the Drawings and specified herein.

## B. RELATED WORK SPECIFIED ELSEWHERE

1. Section 31 23 00: Excavation and Fill

## 1.02 QUALITY ASSURANCE

- A. Construction Requirements:
  - 1. All underground lines shall be installed with at least 30 inches of cover or as detailed on the drawings.
  - 2. For underground utilities changes in pipe alignment and use of fittings may be allowed, subject to approval of the Engineer as to layout. Deflection shall not exceed 80 percent of the maximum allowable deflection as stated in the pipe manufacturer's installation instructions.
- B. Pipe Inspection:
  - 1. The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications. Certification shall be stamped with corporate seal.

- 2. All pipe and fitting shall be subject to visual inspection at time of delivery by rail or truck and also just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.
- 3. The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.

## 1.03 SUBMITTALS

- A. Shop Drawings:
  - 1. In general electronic copies of the following, but not limited to, shop drawings shall be submitted to the Engineer for approval prior to construction. Shop drawings to be numbered sequentially. Cover transmittal sheets to include project name, shop drawing number, shop drawing description and spec section(s).
    - a. Mill test certificates or certified test reports on pipe and fittings
    - b. Details of restrained and flexible joints
    - c. Valve vaults
    - d. Valve boxes
    - e. All gate, plug, ball, solenoid, check valves, and automatic air release valves
    - f. Couplings
    - g. Service saddles, curb, & corp stops.
    - h. Flexible expansion joints
    - i. Pressure gauges
- j. Identification tape
- k. Joint lubricant
- 1. Detailed piping layout drawings and pipe laying schedule
- m. Temporary plug and anchorage system for hydrostatic pressure test
- n. Tie rods
- o. Reduced pressure backflow preventers.
- 2. A separate shop drawing submittal will be required for each major item listed above and for each different type of an item within a major item. For example, separate submittals will be required for gate, plug, ball, solenoid, check and automatic air release valves. All submittals shall be in accordance with the General Conditions and the Supplementary Conditions.
- B. Acceptance of Material:
  - 1. The Contractor shall furnish an Affidavit of Compliance certified by the pipe manufacturer that the pipe, fittings and specials furnished under this Contract comply with all applicable provisions of current AWWA and ASTM Standards and these Specifications. No pipe or fittings will be accepted for use in the work on this project until the Affidavit has been submitted and approved by the Engineer.
  - 2. The Owner reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.
- C. Operation and Maintenance Manuals:
  - 1. Submit copies of operation and maintenance manuals for all the items requiring routine maintenance.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. During shipping, delivering and installing pipe, fittings, valves, backflow preventers, and accessories, they shall be handled in such manner as to ensure a sound undamaged condition.
- B. Particular care shall be taken not to damage the pipe coating.
- C. Insides of valves and backflow preventers shall be kept free of dirt and debris.

## 1.05 JOB CONDITIONS

- A. Water in Excavation:
  - 1. Water shall not be allowed in the trenches while underground pipes are being laid and/or tested. The Contractor shall not open more than 100' of trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to interfere with the normal drainage of the territory in which he is working.
  - 2. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately plugged during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such materials have entered the pipelines, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

## PART 2 - PRODUCTS

## 2.01 DUCTILE IRON PIPE AND FITTINGS

Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of ANSI/AWWA C150/A21.50, latest revision. The minimum thickness class for all pipe greater than 12" diameter shall be pressure Class 250, and all pipe 12" or less in diameter shall be pressure Class 350.
 33 01 00-4

Pipe shall have a minimum rated water working pressure of 250 psi and shall be furnished in laying lengths of 20 feet or less, unless specifically shown otherwise on the Drawings. The pipe shall be lined and coated as specified below.

- 1. Interior Lining for Raw Activated Sludge (RAS), Sludge Lines and Force Mains: Ductile iron fittings and specials shall be coated with 40 mils nominal dry film thickness of Protecto 401 or approved equal in accordance with the manufacturers recommended actions.
- 2. Interior Lining for Potable and Reclaimed Water Piping: Ductile iron pipe, fittings and specials shall be cement lined in accordance with ASNI/AWWA C104, current revision, "Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water". The cement lining shall have a standard thickness and after curing the lining shall have a seal coat of bituminous material in accordance with ANSI/AWWA C104, current revision.
- 3. Exterior Coatings: The exterior of ductile iron pipe fittings and specials to be installed underground shall be coated at the factory with standard bitumastic coating.
- 4. Polyethylene Encasement: Where indicated the Contractor shall utilize polyethylene encasement in accordance with ANSI/AWWA C105-T1. The polyethylene shall conform with ASTMD-1248-68 and be color coded to the service application.
- 5. Ductile iron pipe, fittings and specials to be installed aboveground shall be furnished with a shop applied primer on the exterior. The shop primer shall be as specified in accordance with manufacturers recommendations.
- B. Fittings: Fittings for ductile iron pipe shall be either mechanical joint, restrained joint or flanged joint as indicated on the Drawings and shall have a minimum working pressure of 250 psi. Fittings shall be ductile iron and shall conform to ANSI/AWWA C110, ANSI/AWWA C111 and ANSI/AWWA C153, latest revisions for flanged and mechanical joint pipe. Fittings shall be coated and lined as specified above for ductile iron pipe. The rubber gaskets for flanged, mechanical, and push on joints shall be as described below.

- C. Push-On Joints: Pipe using push-on joints shall be in strict accordance with ANSI/AWWA C111, latest revision and shall be as manufactured by American Cast Iron Pipe Company (Fastite Joint), United States Pipe Company (Tyton Joint), or Clow Corporation (Super Bell Tite Joint). Jointing materials shall be provided by the pipe manufacturer and installation shall be in strict accordance with the manufacturer's recommended practice.
- D. Mechanical Joints: Jointing materials for mechanical joints shall be provided by the pipe and fitting manufacturer. Materials assembly and bolting shall be in strict accordance with ANSI/AWWA C111 and ANSI/AWWA C153, latest revisions. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan or an equal approved by the Engineer.
- E. Flanged Joints: Flanges shall be American Standard for 125 pound steam pressure with any special drilling and tapping as required to insure correct alignment and bolting. Gaskets shall be rubber full face type, minimum thickness of 1/8 inch. Flanged joints shall be made with bolts and nuts, studs with a nut on each end, or studs with nuts where the flange is tapped.

The number of size of bolts shall conform to the same American National Standard as the flanges. Unless noted otherwise, bolts and nuts shall be Grade B conforming to the ASTM Specifications for Steel Machine Bolts and Nuts and Tap Bolts, Designation A 307. Bolts and studs shall be of the same quality as machine bolts. Bolts and nuts shall have hexagonal heads. Where noted on the Drawings or where flanges are underground, stainless steel nuts and bolts shall be used for flanges. Stainless steel shall be Type 316 in accordance with ASTM A320, Class 2.

- 1. Machined Surfaces: Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined.
- F. Restrained Joints: Restrained joints shall be provided for all buried piping systems at the location required to restrain the system thrust. Pipe joints and fitting shall be restrained as specified below.
  - Manufactured Restrained Joints: Manufactured restrained joints shall be Flex-Ring, Lok-Ring or Lok-Fast manufactured by the American Cast Iron 33 01 00-6

Pipe Company, Lok-Tyte or Tr-Flex Type manufactured by the United States Pipe Company as manufactured by McWane, or an equal approved by the Engineer. Joints shall be manufacturer's standard specifically modified push-on type joints with joint restraint provided by ductile iron retainer rings joined together by corrosion resistant, high strength steel tee head bolts and nuts or with joint restraint provided by a welded on retainer ring and a split flexible ring assembled behind the retainer ring.

Restrained joint pipe and fittings shall be ductile iron only and shall comply with applicable portions of this specification. Manufactured restrained joints shall be capable of deflection during assembly. Deflection shall not exceed 80 percent of the manufacturer's recommendations.

Tee head bolts and nuts for restrained joints shall be manufactured of CORTEN, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan, or an equal approved by the Engineer.

- 2. Alternate Restrained Joints:
  - a. When prior approval is obtained from the Engineer, ductile iron pipe and fittings with mechanical joints may be restrained using a follower gland which includes a restraining mechanism. When actuated during installation, the restraining device shall impart multiple wedging action against the pipe wall which increases resistance as internal pressure in the pipeline increases. The pipe must be suitable for use with the proposed device.

The joint shall maintain flexibility after installation. Glands shall be manufactured of ductile iron conforming to ASTM A536 and restraining devices shall be of head treated ductile iron with a minimum hardness of 370 BHN. The gland shall have standard dimension and bolting patterns for mechanical joints conforming to ASNI/AWWA C111 and C153, latest revisions.

Tee head bolts and nuts shall be manufactured of corrosion resistant, high strength, low alloy CORTEN steel in accordance with ASTM A242.

The restraining wedges shall have twist off nuts to insure proper torquing. The mechanical joint restraint device shall have a minimum working pressure rating of 250 psi with a minimum safety factor of 2 to 1 and shall be MEGALUG<sup>R</sup> as manufactured by EBBA Iron, Inc.. No other retainer gland type device will be acceptable. After installation prior to backfilling, all parts of the joint restraint system shall be coated

- with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.
- b. When prior approval is obtained from the Engineer, ductile iron pipe and fittings with push on joints may be restrained using a restraining gasket similar to the "Field Lok" gasket manufactured by U.S. Pipe & Foundry. The device must be suitable for the pipe and pressure rating intended and is subject to approval by the Engineer. The required length of restrained joint pipe shall be provided on either side of all valves and fittings employing restraining devices. Restrained lengths shall be calculated per DIPRA standards based on Type II laying conditions and an operating pressure of 150 psi, unless otherwise indicated.

#### 2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Gravity Drainage Piping: PVC pipe used for gravity drainage piping installed underground shall be SDR 26 pipe.
- B. Small PVC Pressure Piping: Unless otherwise specified, all PVC pressure pipe smaller than 4 inches nominal diameter shall be Schedule 80 PVC or Endot Endpure HDPE, (as shown). Schedule 80 pipe shall have either solvent welded or threaded joints. PVC pressure pipe shall bear the approved seal of the National Sanitation Foundation (NSF). PVC pipe that is exposed to sunlight shall be manufactured with additives to provide resistance to ultraviolet deterioration. No glued joint pipe shall be installed below ground, unless other specified. All water pipe to be Class 200 (DR 21) gasketed bell and spigot pipe blue in color.
- C. Fittings: Socket type, solvent welded fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2467. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All solvent welded or threaded joints shall be watertight.

- D. Flanges: Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively. Gaskets shall be neoprene, full faced type with a minimum thickness of 1/8 inch. Nuts and bolts shall be hexagonal with machine threads, manufactured of Type 316 stainless steel in accordance with ASTM A320, Class 2. Type 316 stainless steel flat washers with lock washers shall be used against PVC flanges.
- E. Solvent Cement: PVC solvent cement shall be in compliance with ASTM D2564 and in accordance with the pipe manufacturer's recommendations.
- F. Thread Lubricant: Lubricant for Schedule 80 threaded joints shall be Teflon tape only.
- G. Polyvinyl Chloride Pipe 4 Inches and Larger in Size for Pressure Service: Polyvinyl chloride pipe for nominal diameters 4 inches to 12 inches in size shall conform to the requirements of AWWA C900 with a dimension ratio of DR 18, pressure class 150, and gasketed integral bell ends. For PVC pipe larger than 12 inches for pressure service, the pipe shall conform to the requirements of AWWA C-905 with a minimum DR of 25, pressure rating of 165 psi, with gasketed integral bell ends. Pipe shall be designed for maximum working pressure of not less than 150 psi and with not less than a 4 to 1 sustained hydrostatic pressure safety factor. Fittings for C-900 PVC pipe shall be ductile iron fittings with restrained joint ends for potable water or reclaimed water lines, and restrained PVC fittings for sanitary force mains.
- H. All PVC pipe installed shall be color coded for the service intended. Potable water piping shall be extruded blue, reclaimed water shall be lavender, force main white, and gravity sewer green. Care shall be taken to avoid exposure to sunlight. Pipe should be marked for its use in three places on the pipe barrel.

- I. Joints (4 Inches and Larger PVC Pipe):
  - 1. Bell and Spigot:

Pipe joints shall be made with integral bell and spigot pipe ends. The bell shall consist of an integral thickened wall section designed to be at least as strong as the pipe wall. The bell shall be supplied with factory glued rubber ring gasket with conforms to the manufacturer's standard dimensions and tolerances. The gasket shall meet the requirements of ASTM F477 "Elastomeric Seals (Gaskets) for Joining Plastic Pipe". PVC joints shall be "Ring-Tite" as manufactured by J-M Manufacturing Company, Inc. or an equal approved by the Engineer.

2. Restrained Joints:

Where indicated on Drawings, to prevent pipe joints and fittings from separating under pressure, pipe joints and fittings shall be restrained as follows:

- a. PVC pipe bell and spigot joints shall be restrained with EBBA Iron MEGALUG<sup>R</sup> Series 1500 Restrainer or an equal approved by the Engineer. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 65-42-10. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy CORTEN steel meeting the requirements of ASTM A242.
- b. Cast iron mechanical joint fittings used with PVC pipe shall be restrained with the EBBA Iron MEGALUG<sup>R</sup> Series 2000 PV Restrainer or an equal approved by the Engineer. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 65-42-10. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy CORTEN steel meeting the requirements of ASTM A242.
- c. Thrust Blocking. Provided concrete reaction or thrust backing on all pressure pipe lines four (4) inches in diameter or larger (except those having flanged joints or restrained joints) at all tees, plugs, 33 01 00-10

caps, and at bends defecting 222E or more, or movement shall be prevented by attaching suitable metal rods or straps as directed by the Engineer. Concrete used for this purpose shall be Class "C". Reference reaction blocking table shown on construction plan details.

d. Joint restraint. Push on joints on either side of valves and fittings restrained by mechanical restraining devices shall be restrained with "Uni-Flange" mechanisms. The number of restrained joints shall be determined by DIPRA methods and a laying schedule shall be provided for approval by the Engineer prior to installation of joint restraint.

#### 2.03 PVC FITTINGS (4 INCHES AND LARGER PVC PIPE)

- 1. Fittings shall be PVC and manufactured of the same design as the PVC pipe. PVC fittings 4 inches through 36 inches shall be PVC injection molded made of materials meeting or exceeding the requirements of cell class 12454-B material as defined in ASTM D1784. Fittings shall be manufactured with pipe that meets or exceeds AWWA C-905 standard. All PVC fittings must comply with or exceed ANSI/AWWA C907, Uni-B-12, Uni-B-14 standards. All PVC fittings must be certified by CSA to the CSA B137.3 standard as third party certification. The fittings must be of the same design as the PVC pipe with an HDB of 4000 psi and minimum SDR 25 wall thickness design. All fittings must have UL-FM approval, and shall comply with or exceed all ASTM Standards for fittings. Fittings must have NSF-61 certification for contact with potable water. PVC fittings shall be pressure rated to 165 psi or greater.
- 2. All restrained joint systems shall be pressure rated the same as the PVC pipe and fittings. All components of the restraint system shall meet or exceed all requirements of ANSI/AWWA C-111/A21.11 latest revision. Restraints shall provide a full 360 degree contact on the pipe with sufficient gripping action to secure the clamp to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure. Restraint devices for PVC pipe and fittings shall consist of split restraint ring installed on the spigot, connected to a split ring which seats behind the gasket race of the fitting. The split restraint ring shall incorporate a series of machined serrations (not "as cast") on the inside diameter to provide positive restraint, exact fit and 360 degree contact and support 33 01 00-11

of the pipe wall. The two halves of the split backup ring shall interlock without the need for additional bolts and shall form a beveled leading edge to assure exact fit behind the fitting gasket race. Restraint devices shall be of ductile iron, ASTM A536, Grade 65-45-12 and connecting bolts shall be of high strength, low alloy material in accordance with ASNI/AWWA C111/A21.11. Restraint devices shall be Uni-Flange 1300 series or other approved restrained joint devices.

#### 2.04 WALL SLEEVES, SEALS, PIPES AND NON-STANDARD CASTINGS

- A. Wall Sleeves: Wall sleeves shall be of cast iron, ductile iron or carbon steel. The sleeve shall be hot dipped galvanized after fabrication and shall have a waterstop located in the center of the wall. Sleeves shall be provided with seals and shall be sized as required for the installation of seals. Sleeves shall terminate flush with finished surfaces of walls and ceilings, and shall extend 2 inches above the finished floor unless otherwise shown on the Drawings.
  - 1. Wall sleeves shall be installed for all piping passing through building walls and floors, except where noted on the Drawings. Sleeves shall be of sufficient size to pass the pipe without binding. Escutcheons shall be provided at walls and floor to completely conceal the sleeves smaller than 3 inches. Escutcheons shall be 304 SS split-type.
- B. Wall Sleeve Seals: Wall sleeve seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cease the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. The synthetic rubber shall be suitable for exposure to sludge and groundwater. Bolts, nuts and hardware shall be 18-8 stainless steel. The seals shall be Link Seal as manufactured by Thunderline Corporation or equal, and the wall sleeve and seal shall be sized as recommended by the seal manufacturer.
- Wall Pipes: Wall pipes shall be of the size and types indicated on the Drawings.
   All wall pipes shall be of ductile iron and shall have a central fin not less than 2 inch thick and the same diameter as the bolting flange cast midway of the length to form a waterstop. Each wall pipe shall be of the same grade, thickness and interior 33 01 00-12

coating as the piping to which it is joined. Those portions of the wall pipes that are buried shall have a coal tar epoxy outside coating.

D. Non-Standard Fittings and Castings: Fittings having non-standard dimensions and cast especially for this project shall be of an approved design. Fittings shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings but laying lengths and types of ends shall be determined by positions in the pipelines and by the particular piping to which it is connected. Flange facing and drilling shall conform to the 125 pound American National Standards Institute. Where require, flanges shall be drilled and tapped for studs. Other dimensions shall be substantially equal to corresponding parts of standard bell and spigot fittings.

# 2.05 PIPE COUPLINGS

- A. Couplings:
  - 1. Pipe couplings used to joint two pieces of plain end pipe shall be sized to suit the outside diameter of the pipe ends to be jointed. Transition couplings shall be used to join pipes of different outside diameters. Pipe couplings shall be bolted type with steel middle ring and end followers. The couplings shall be restrained for the test pressure of line using approved retaining system.
  - 2. All carbon steel parts of the coupling shall be coated on the interior and exterior with a fusion bonded thermosetting epoxy coating with a 12 mil nominal coating thickness. The coating shall be equal to AL-CLAD as manufactured by Dresser Industries, Inc.
  - 3. Gaskets for the coupling shall be wedge type manufactured of Buna-N resilient rubber.
  - 4. Bolts shall be manufactured of high strength Type 304 stainless steel with Type 316 stainless steel hexagonal nuts. Bolts and nuts shall conform dimensionally to ANSI/AWWA C111, latest revision.

5. Couplings shall be Style 38 as manufactured by Dresser Industries, Inc. or an equal approved by the Engineer.

# 2.06 PVC BALL AND BALL CHECK VALVES

- A. PVC Ball Valves: All PVC ball valves 2 inch through 4 inch in size shall be of a one piece capsule type manufactured of Type 1, Grade 1 PVC. Ball valves shall be true union design with two-way blocking capability and shall have solvent welded socket or NPT threaded ends. Ball valves shall have Teflon seats with Viton backing cushions and Viton O-ring seals, and shall be designed for a 150 psi water working pressure at 120° F. Valves shall be supplied with ABS lever operating handles. PVC ball valves shall be manufactured by Asahi/America, or equal approved by the Engineer.
- B. PVC Ball Check Valves: All PVC ball check valves 1 inch through 2-1/2 inch in size shall be of a solid thermoplastic construction manufactured of Type 1, Grade 1 PVC. Ball check valves shall be true union design with solvent welded socket or NPT threaded ends. Ball check valves shall be furnished with a solid thermoplastic ball. Ball seat shall be Teflon coated Viton. The same seal shall function as both the ball seat and the union seal. PVC ball check valves shall be designed for a 150 psi water working pressure at 120° F. Valves shall be manufactured by Asahi/America, or an equal approved by the Engineer.

## 2.07 GATE VALVES

- A. Bronze Gate Valves: Gate valves installed aboveground, less than 2 inches in size and smaller, shall be Class 150 all bronze valves conforming to Fed. Spec. WW-V-54d, Type I, Class B designed for a non-shock water pressure of 300 psi. Bronze for valve body and internals shall be in accordance with ASTM B16.18. Valves shall be furnished with screwed ends, handwheel operator, non-rising stem, onepiece solid wedge disc and screwed bonnet. Valves shall be as manufactured by Crane, Powell or an approved equal.
- B. Ductile Iron Gate Valves:
  - Ductile iron gate valves shall open by turning to the left (counterclockwise), when viewed from the stem. When fully open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. Operating 33 01 00-14

nut or hand wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast in the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C509, latest revisions.

2. Gate valves with nominal sizes from 2 to 24 inches shall conform to ASNI/AWWA C509, latest revision, and shall be designed for a minimum working pressure of 250 psi. Valves shall be ductile iron body resilient seat type with O-ring stem seals. The valve stem, stem nut, glands and bushings shall be manufactured of zinc free bronze. Valve disc shall be constructed to assure uniform seating pressure between disc seat ring and body seating surface. Resilient seat of valve shall be formed by a special corrosion and chloramine resistant, synthetic elastomer which is permanently bonded to and completely encapsulates a ductile iron valve disc.

Interior of valve body shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces shall be coated as specified hereinafter. Resilient seated type gate valves shall be as manufactured by U.S. Pipe or equal.

- 3. Valve Joints: All gate valves shall have either mechanical joint, restrained joint or flanged ends to fit the pipe run in which they are to be used. Gate valves installed on push on joint pipe shall have mechanical joint ends unless otherwise specified.
- 4. Valve Operators: Gate valves shall open left (counter-clockwise) when viewed from the stem. Unless otherwise shown on the Drawings or specified herein, gate valves shall have non-rising stems. Buried gate valves shall be furnished with a 2 inch square AWWA standard nut operator with a valve box and cover. Gate valves located aboveground or inside structures shall be furnished with a handwheel operator which shall have an arrow cast in the metal indicating the direction of opening. Gate valves used as

isolation valves for reduced pressure backflow preventers shall be of the open screw and yoke (OS&Y) design with a handwheel operator.

5. Exterior Valve Coatings: All exterior surfaces of iron body gate valves shall be clean, dry and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Prior to backfilling, all uncoated units, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation, aboveground valves shall be finish painted in accordance with manufactures recommendations.

## 2.08 PINCH CHECK VALVES

equal.

- A. Valves are to be of the flow operated check type with flanged joint ends on both check sleeve and metal body. Port areas shall be 100% of the mating pipe port area. The port area shall contour down to a duckbill which shall allow passage of flow in one direction and prevent reverse flow in the other direction. The flexible duckbill sleeve shall be one piece rubber construction with fabric reinforcement. The flange shall be drilled to ASNI B16.1, Class 125/ANSI B16.5 Class 150 standard. Valve body shall be drilled and tapped for flushing connection on top and bottom of the housing. Valve body shall be two piece split body construction. The two halves shall be sealed by diamond shaped cross section rubber gaskets permanently locked by a groove cast in the valve body. Company name and location shall be cast onto the valve body. The valve shall be designed for a maximum back pressure of 100 psi. The valve shall be red valve series 33 or
- B. Interior Valve Coating: Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished, non-ferrous or bearing surfaces, shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating.

C. Exterior Valve Coating: All exterior surface of swing check valves shall be clean, dry and free from rust and grease before coating. For valves installed in below ground valve vaults, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Following installation, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer's recommendations.

#### 2.09 PLUG VALVES

- A. General: Plug valves shall be non-lubricated eccentric type with flanged or mechanical joint ends as specified below. Valves shall open by turning to the left (counter-clockwise), when viewed from the stem. Port area of valves shall be a minimum of 80 percent of full pipe area. Valve pressure ratings, body flanges and wall thicknesses shall be in full conformance with ASNI B16.1, latest revision. Valves shall seal leak-tight against full rated pressure in both directions. Prior to shipment from the factory, each valve shall be hydrostatically tested as follows: Valve seats shall be tested to provide leak tight shut off to 175 psi for valves through 12 inch and 150 psi for valves 14 inches and larger, with pressure in either direction. In addition, a hydrostatic shell test shall be performed with a plug open to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body. Plug valves shall be eccentric plug valves as manufactured by DeZurik, Milliken, or approved equal.
- B. Eccentric Plug Valves: Eccentric plug valves shall be Series 100 as manufactured by DeZurick or equal. Valve bodies shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C504, latest revisions. Valve bodies shall be cast with raised eccentric seats which have a corrosion resistant welded in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Valves shall be furnished with resilient faced plugs with Neoprene facing, suitable for use with sludge. Valves shall be furnished with replaceable, permanently lubricated, stainless steel, sleeve-type bearings in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA 33 01 00-17

C504 and C507, latest revisions. Valves shall be bolted bonnet design. Valves shaft seals shall be designed so that they can be repacked without removing the bonnet and the packing shall be adjustable. Packing material shall be Buna-Vee type packing. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. All exposed valve nuts, bolts, springs, washers and the like shall be Type 304 stainless steel.

- C. Interior Valve Lining: All interior ferrous surfaces of the valve that will have contact with the leachate except the valve seating surfaces shall be coated with a factory applied, fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revisions. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust, oil and grease before coating.
- D. Exterior Valve Coating: All exterior surfaces of plug valves shall be clean, dry and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Prior to backfilling, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed above ground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer's recommendations.
- E. Valve Joints: All plug valves installed aboveground, in valve vaults or on flanged piping shall have flanged ends. Flanges shall comply with facing, drilling and thickness of ANSI Standards for Class 125 dimension. Nuts and bolts for flanged connections in valve vaults or corrosive atmospheres shall be Type 316 stainless steel in accordance with ASTM A320, Class 2. Nuts and bolts for aboveground installations or non-corrosive atmospheres shall be carbon steel in accordance with ASTM A307, Grade B. All buried plug valves shall have mechanical joint ends with dimensions, bolting patterns and assembly in strict accordance with ANSI/AWWA C111, latest revision. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN-A, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan or an equal approved by the Engineer.

- F. Mechanical Valve Actuators:
  - 1. All plug valves installed in valve vaults or buried underground shall have actuators designed for buried and submerged service. Valves shall have seals on all shafts and gaskets on valve and actuator covers to prevent entry of water and dirt. Actuator mounting brackets for buried and submerged service shall be totally enclosed and shall have gasket seals. All exposed valve nuts, bolts, springs, washers and the like shall be Type 304 stainless steel.
  - 2. All plug valves 6 inch in size and larger shall be furnished with mechanical gear actuators. Gear actuators shall be furnished with AWWA Standard 2 inch square operating nuts for buried valves, or handwheel, chainwheel or 2 inch square nut operators for aboveground or valve vault installation, as shown on the Drawings. Gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high strength cast iron housing, suitable for running in a lubricant. Housing shall be provided with seals on all shafts to prevent the entry of dirt and water into the actuator. Actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuator shall clearly indicate valve position for aboveground and valve vault installations and an adjustable stop shall be provided to set closing torque. Actuator shall be capable of withstanding an over-torque without damage up to 450 foot pounds for 2 inch square nut operators and to 300 foot pounds for handwheel or chainwheel operators.
  - 3. Four inch and smaller aboveground valves shall be furnished with manual actuators, one-quarter turn to open. Actuator shall be supplied with an AWWA Standard 2 inch operating nut with a standard valve operating lever.

## 2.10 BUTTERFLY VALVES

A. General: All butterfly valves shall be of the tight closing, rubber seat type with rubber seats that are securely fastened to the valve body or disc. No metal to metal seating surfaces will be permitted. Valves shall be bubble tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving

throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity and for buried installation. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. Valves shall meet the full requirements of AWWA Standard C 504 for Class 150B, short body, flanged or mechanical joint as required. Wafer design valves are not acceptable, except when indicated on the Drawings. The manufacturer shall have manufactured tight closing, rubber seat butterfly valves for a period of at least five years. All valves shall be Henry Pratt Company, DeZurik, Mueller, or equal.

- B. Valve Body: Valve bodies shall be constructed of cast iron ASTM A126 Class B or ASTM A48 Class 40. Ends shall be mechanical joint for buried service and flanged for aboveground use. Flange drilling shall be 125 pound in accordance with ANSI B16.1. Two trunnions for shaft bearings shall be integral with each valve body. When disc has the rubber seat, the valve body shall have a 18-8 Type 304 stainless steel body seat. The port diameter shall be no smaller than one inch less than the nominal valve size.
- C. Valve Shaft: The valve shaft may consist of a one piece unit extending completely through the valve unit or may be the "stub shaft" type. Materials to be stainless steel 18-8 Type 304.
- D. Valve Discs: Valve discs shall be constructed either of cast iron ASTM A126 Class
   B, ductile iron ASTM A536 or cast iron ASTM A48 each with Type 316 stainless
   steel seating edge or the entire disc may be constructed of cast 316 stainless steel.
   The stainless steel seating edge is not applicable to rubber seat disc type valves.
- E. Valve Seats: Valve seats shall be of a synthetic or natural rubber compound and any be mounted on the valve body.
- F. Valve Bearings: Valves shall be fitted with sleeve type bearings. Bearings shall be corrosion resistant and self-lubricating.
- G. Valve Packings: Packing shall be self-adjusting Chevron type or of the O-ring type.
- H. Interior and Exterior Valve Coatings: The valve shall be coated similarly as described in Section 2.07 B(2) and B(5).

#### 33 01 00-20

#### 2.11 SWING CHECK VALVES

- A. Swing check valves 2-inch through 12-inch in size shall conform to AWWA C-508, latest revision, and shall be designed for a minimum water working pressure of 150 psi. Check valves shall have cast iron body, swing type and ends shall be flanged, Class 125 in accordance with ANSI B16.1 When open, the valve shall have a straight way passage with a minimum flow area equal to the full pipe area. Swing check valves shall be completely bronze fitted with renewable bronze seat ring and a rubber faced disc; valve hinge pin shall be stainless steel. Check valves shall be supplied with an outside lever and weight.
- B. Swing check valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the downstream pressure. The check valve shall be constructed such that the disc and body seat ring may be easily removed and replaced without removing the valve from the line. Each valve shall by hydrostatically tested at the factory, at a test pressure of 300 psi.
- C. Interior Valve Coating: Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished, non-ferrous or bearing surfaces, shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C-550, latest revision. Coating shall be holiday-free with a minimum thickness of 12 mils. Surfaces shall be clean, dry and free from rust and grease before coating.
- D. Exterior Valve Coating: All exterior surface of swing check valves shall be clean, dry and free from rust and grease before coating. For valves installed in below ground valve vaults, the exterior ferrous parts of all valves shall be coated at the factory with coal tar epoxy with a minimum total finish dry film thickness of 20 mils. Following installation, all uncoated nuts, bolts, glands, rods and other parts of joints shall be coated in the field with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation aboveground valves shall be finish painted in accordance with manufacturer's recommendations.

E. All swing check valves shall be provided with a limit switch to indicate valve close position to pump starter, VFD, or control panel.

# 2.12 SERVICE SADDLES AND CORPORATION STOPS

A. Service Saddles: Service saddles shall have ductile iron bodies in accordance with ASTM A536, latest revision, with double stainless steel straps. Bodies shall be brass or ductile iron, body shall have a fusion bonded nylon coating with a minimum thickness of 12 mils. Straps shall be Type 304 stainless steel with premium grade Type 304 L stainless steel bolts and Type 304 stainless steel washers and nuts. The nuts shall be Teflon coated.
The gasket material shall be an elastomeric compound resistant to degradation by oil natural gas acids alkalias most alignatic fluids and leaghete. The outlet of the

oil, natural gas, acids, alkalies, most aliphatic fluids and leachate. The outlet of the saddle shall have NPT threads. Service saddles shall be Rockwell No. 317, Ford or an equal approved by the Engineer.

- B. Corporation Stops: Corporation stops shall be all bronze construction in accordance with AWWA C80, latest revision. Inlet threads shall be NPT iron pipe threads and the outlet connections shall be of the packed joint type suitable for use with Schedule 80 PVC pipe. Corporation stops shall be Ford Ball Corp Type FB 1102, McDonald or an equal approved by the Engineer.
- C. Polyethylene Tubing. Service tubing shall be nominal wall polyethylene tubing conforming to the requirements of ASTM D-2737 and AWWA C-901. Tubing shall be manufactured from prime virgin PE-3408 high density polyethylene (HDPE) resin. Each coil of tubing shall be spiral wrapped with four (4) inch wide black .004 polyethylene film with minimum 2% carbon black content to shield the tubing from ultraviolet and violet light. Reclaimed water service tubing shall be lavender in color.
- D. Tubing shall be DR 9.0 CTS OD and supplied in 100 foot rolls. Tubing shall conform to all requirements set forth in AWWA C901. Tubing shall be marked with the following information at not more than 5 foot intervals: nominal size, material code designation, dimension ration and diameter base, AWWA pressure class, AWWA designation and manufacturer's name or trademark and product record code.

E. Fittings for use with polyethylene (PE) tubing shall be brass containing a pressure sealing O-ring and undirectional grip ring and shall be designed for "press-on" or "stab-on" installation, and manufactured by Ford Meter Box Company.

# 2.13 SOLENOID VALVES

A. Solenoid valves shall be 2 way type for normally closed operation designed for not less than a 150 psi water working pressure. The valves shall have forged stainless steel Series 300 bodies for 3/4 inch and smaller and brass bodies for 1 inch and larger with NPT threaded ends, Buna N seals/disks and NEMA 4X Red hat II solenoid enclosures. The valves shall operate on 120 VAC power, shall have threaded conduit hubs, standby manual operators and shall not require a minimum operating pressure differential for standby operation. The valves shall be provided with a manual override. The valves shall be Series 8210G for 3/4 inch and smaller and Series 8221G for one inch and larger as manufactured by Automatic Switch Company or approved equal.

## 2.14 FLEXIBLE EXPANSION JOINTS

- A. Flexible expansion joints shall be of the molded wide arch design manufactured of chloroprene (neoprene) rubber with polyester reinforcement. Chloroprene (neoprene) body shall be supplied with a hypalon coating. Joints shall be flanged suitable for 150 psi water working pressure and in accordance with ANSI B16.1 dimensions and bolting patterns. Flanged ends shall be furnished and galvanized, split ductile iron retaining rings.
- B. Provide limit restraint bolts on all pump suction and discharge lines. Expansion joints 6 inches and larger in size shall have a minimum of four limit restraint bolts. Restraint bolts and nuts shall be Type 304 stainless steel.
- C. Minimum performance for flexible expansion joints shall be as follows:

	Axial	Axial	Lateral	Angular
Size	Compression	Elongation	Deflection	Deflection
<u>(in.)</u>	(inches)	(inches)	(inches)	(degrees)
2	1-3/4	3/4	3/4	30
3	d.o.	d.o.	d.o.	30
4	d.o.	d.o.	d.o.	25
5	d.o.	d.o.	3/4	25
6	d.o.	d.o.	1	20
8	d.o.	d.o.	d.o.	20

 D. Flexible expansion joints shall be Style 1015 Maxi-Joint as manufactured by General Rubber Corporation, Style 100 Metrasphere as manufactured by the Metraflex Company or an equal approved by the Engineer. Flexible joints for pump suction and discharge piping shall be designed for leachate service at 250 degrees F.

## 2.15 PRESSURE GAUGE ASSEMBLIES

- A. Pressure gauges shall have the following design features: glycerin filled, 2 inch dial, aluminum dial with black numerals on white background, Type 316 stainless steel bourdon tube and movement, 300 series stainless steel case and ring, safety glass lens, threaded lens retaining ring, adjustable pointer with over-pressure stop and zero pointer stop, blowout protection, 2 inch Type 316 stainless steel stem mounting and 1.0 percent accuracy based on full scale. Provide Type 316 stainless steel pressure snubbers on all gauges not protected by seals. Pressure gauges shall be as manufactured by U.S. Gauge, Ashcroft, Marshalltown, Marsh, or approved equal.
- B. Pressure Gauge Service and Ranges: Pressure gauges shall be furnished for the following services with the indicated ranges. Diaphragm seals shall be furnished for gauges as indicated.

#### 2.16 VALVE BOXES

- A. Furnish, assemble, and place a valve box over the operating nut for each buried valve. The valve box shall be designed so as to prevent the transmission of surface loads directly to the valve or piping.
- B. Valve boxes shall be of the adjustable slide type of suitable length with an interior diameter of not less than 5 inches. The valve boxes shall be manufactured of cast iron and shall be of the two piece design including a bottom section and top section with cover. The cast iron cover shall be shaped and labeled for the appropriate service designation. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade.
- C. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections and other harmful defects. The seating surfaces of both the cover and the top section shall be machined so that the cover will not rock after it has been seated.
- D. The valve boxes shall be coated inside and outside with an asphaltic coating prior to machining, so that the machined seating surfaces will be free of any coating. Cast iron valve box assemblies shall be Clow Corp. No F2452, Tyler Corp. Series 6855 or 6865 or an approved equal.
- E. Valve extension stems shall be provided for all buried valves when operating nut is deeper than 3 feet below final grade.

## 2.17 PIPE AND VALVE IDENTIFICATION SYSTEMS

A. Not Included

## 2.18 GLOBE VALVES AND ANGLE VALVES

Globe valves and angle valves shall be suitable for throttling flows of liquid, oil, gas and air lines. Valves shall have end connections as indicated on the Drawings and shall be suitable for a working pressure of not less than 150 psi.

- B. Each valve shall have self-lubricating TFE-impregnated asbestos packing to provide a tight stem steel. Valves shall have a removable bonnet in order to facilitate dismantling and reassembly of the valves.
- C. Globe valves shall be Crane Model No. 1, Stockham Valves Figures B-16, or equal. Angle valves shall be Crane Model No. 2, Stockham Valves Figure B-216, or equal.

## 2.19 PRESSURE REGULATING VALVE

- A. Pressure regulating valves shall be of bronze body construction, seat shall be of stainless steel, diaphragm shall be Buna N.
- B. Regulator shall have a maximum pressure limit of 100 psi and the pressure reduction range shall be to 5 psi for all the services except for belt washwater. The maximum and minimum pressure variation range for the belt washwater shall be per gravity belt supplier's recommendations. The regulator shall be a direct acting, spring loaded, diaphragm type for hydraulic operation, and shall be capable of delivering a constant pressure. An adjusting screw shall be easily accessible for changing the outlet pressure.
- C. Valves shall be installed in strict accordance with the manufacturer's recommendations. The manufacturer shall be Watts, or equal.

## 2.20 TIE RODS

- A. When prior approval is obtained from the Engineer, ductile iron pipe, fittings, and valves may be restrained using tie bolt joint restraint. Joint restraint materials for this method of restraint shall be the Super-Star SST Series Joint Restraint Joint System as manufactured by Star National Products, a Division of Star Industries, Inc., Columbus, Ohio, or an equal approved by the Engineer.
- B. All bolts, nuts, washers, tie rods and other fasteners for the joint restraint system shall be manufactured of CORTEN high strength, low alloy, corrosion resistant steel in conformance with ASTM A242. Tie bolts shall be manufactured of heat treated CORTEN steel. Tie rods and all fasteners for the system shall be galvanized in conformance with the requirements of ASTM A123. Tie rods shall have a

minimum diameter of 3/4 inch. The number of tie rods required per joint shall be as recommended by the manufacturer.

C. Prior to backfilling after installation, all parts of the joint restraint system shall be coated with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M, for a minimum dry film thickness of 20 mils.

## 2.21 REDUCED PRESSURE BACKFLOW PREVENTERS

- A. Standards of Construction: Backflow prevention devices shall be manufactured in accordance with AWWA C506, latest revision, American Society of Sanitary Engineering Standards, and the University of Southern California Foundation for Cross Connection Control and Hydraulic Research "Manual of Cross Connection Control", latest edition.
- B. Product Handling: Exercise care in transporting and handling backflow preventers to avoid damage. Inside of backflow preventers shall be kept free of dirt and debris.
- C. Reduced pressure principle backflow preventers shall include an integral sensing system that will automatically open a relief valve whenever the differential pressure between the inlet supply and the reduced pressure zone drops to 2 psi. The relief valve shall remain open until a positive pressure differential of 2 psi is reestablished. if pressure upstream of the first check valve drops to atmospheric or below, the relief valve shall remain fully open providing an internal air gap between the first check valve and the water level in the reduced pressure zone. The unit shall also be constructed such that any minor leakage of the second check valve will result in visible flow from the relief valve, event if the first check valve is totally disabled.
- D. Reduced pressure principle backflow preventers shall have all bronze bodies for sizes 22 inches and smaller and all ductile iron bodies for sizes 3 inches and larger. Ductile iron bodies shall be coated with a fusion bonded thermosetting epoxy coating in accordance with AWWA C550 with a minimum, holiday free, coating thickness of 12 mils. The reduced pressure backflow preventer shall consist of two independently operated, spring loaded, wye pattern, poppet type check valves designed for installation in a normal horizontal flow attitude. An independent spring loaded relief valve shall be located between the two check valves. Check

valve assemblies, springs and seats and all other internal parts shall be constructed of Type 316 stainless steel. Relief valve body and trim shall be constructed of bronze. Check valve and relief valve seats shall be field replaceable without removing the device from the service line. Backflow preventers shall be designed for a working pressure of 200 psi and a temperature range of 32°F to 140°F. The backflow preventer shall be manufactured as a complete unit including test cocks, and upstream and downstream isolation valves. The test cocks shall be manufactured of bronze and shall be arranged such that the unit can be tested without removing the unit from the line.

- E. Isolation Valves: Reduced pressure backflow preventers shall be furnished complete with isolation valves, For sizes 22 inches and smaller, the isolation valves shall be all bronze ball valves with Buna N O-rings and valve seats, and a lever operating handle. Ball valves shall be in accordance with AWWA C80, latest revision. For sizes 3 inches and larger, the isolation valves shall be resilient seated gate valves with flanged ends and OS&Y handwheel operators. Gate valves shall be as specified and described hereinbefore.
- F. Exterior Coating: The exterior ferrous surfaces of the reduced pressure backflow preventer and the isolation valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust inhibitive pigments and synthetic resins compatible with the finish coats. Following installation, the backflow preventer unit and aboveground piping shall be finish painted in accordance with manufacturer's recommendations. All surfaces to be coated shall be clean, dry and free of rust, oil and grease.
- G. Acceptable Manufacturers: Reduced pressure principle backflow preventers shall Model 825 as manufactured by Febco, or an equal approved by the Engineer.

## 2.22 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves shall be designed for a water working pressure of 150 psi and shall be mechanical joint end type. Tap shall be done under pressure and without interruptions of service. Taps shall be tested at factory to 175 psi.
- B. Tapping valves shall be as specified herein under Gate Valves.

- C. The manufacturer shall furnish the services of a supervisor who will direct all operations for the installation of material, attachment of tapping machine and operation of the machine in making the connection. The Contractors shall bear all such rental and supervision costs, and all other related costs.
- D. Tapping sleeves and valves shall be the product of one of the following manufacturers, or equal: Mueller, Clow, M&H.

# 2.23 FLANGED ADAPTERS (WHEN APPLICABLE)

- A. For joining plain end or grooved end pipe to flanged pipes and fittings.
- B. Adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125 or 150 pound standard unless otherwise required for connections.
- C. Exposed Sleeve Type:
  - 1. Constructed from steel.
  - 2. Coating: In accordance with manufacturer's recommendations.
  - 3. Bolts: Carbon steel.
  - 4. Acceptable Manufacturers:
    - a. Dresser Manufacturing Company Style 128 for cast iron ductile iron and steel pipes with diameters of two (2) inches through 96 inches.
    - b. Or equal.

## 2.24 FIRE HYDRANTS

A. Hydrants shall comply with AWWA Standard C402 "Fire Hydrants for Ordinary Water Works Service", and shall be equipped with a minimum of one (1) pump outlet nozzle 4 inches in diameter and two (2) hose nozzles 2 inches in diameter.

Threads, nozzle caps, operating nuts and color shall conform to City standards. Units shall be traffic types with breakable safety clips, or flange, and stem, with safety coupling located below barrel break line to preclude valve opening. Hydrants shall be dry top. Outlet nozzles shall be on the same place, with minimum distance of 18 inches from center of nozzles to ground line. Valve shall be compressive type with 52 inches minimum opening and hose inlet connection to be 6 inches minimum. Hydrants shall open left by Mueller A-423 or Clow Medallion Hydrant (AWWA C-502). Hydrants must drain.

#### 2.25 INSERT VALVE

A. General

The Ductile Iron Insert Valve shall be a rated for 250 psig and shall be a Resilient Wedge Gate Valve as specified in this section. The valve shall be able to be installed into an existing pressurized pipeline while maintaining constant pressure and service as usual. After closing the wedge and adequately restraining the valve body the downstream pipe can be completely removed and replaced (allowing for upsizing of the pipe if necessary). The host pipe shall not be a permanent component of the Insert Valve. The Insert Valve shall be UL listed and approved to *NSF / ANSI Standard 61- Drinking Water System Components*. The insert valve must be installed by a qualified installer per the manufacturer's requirements.

- B. Construction: Sizes 12" and smaller must be capable of working on Cast/Grey Iron or Ductile Iron Class A, B, C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body. The 250 psig maximum working rating markings must be cast into the body of the valve. After the installation of the Insert valve body on to the existing pipe a pressure test of 1.1 times that of the contents shall sustained for 15 minutes. Once the pressure test is affectively achieved the Insert valve body must not be moved in accordance with AWWA Standards. If the Insert valve is moved the pressure test must be completed again. The Insert valve must not be moved or repositioned once the pressure test is achieved.
- C. **Resilient Wedge Gate Assembly:** The construction of the Resilient Wedge shall comply with AWWA C509 requirements. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process. This will assure the ductile gate is fully 33 01 00-30

coated with molded rubber – no exposed iron. The resilient wedge shall seat on the valve body and not the pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal. Abrasion results thus shorting the life and quality of the shut down if the wedge contacts the pipe. Pressure equalization on the down or upstream side of the closed wedge shall not be necessary to open the valve. The wedge shall be symmetrical and seal equally well with flow in either direction. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. An oversized flow way shall be unobstructed to provide optimum flow. The valve shall be fully epoxy coated on the interior and the exterior a minimum of 10 mils epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61. The fusion-bonded coating shall be applied prior to assembly so that even the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated.

- D. The valve shall have triple O-Ring stem seals, two O-Rings above, and one below the thrust collar. The lower two O-Rings provide a permanently sealed lubrication chamber that will make the valve easier to operate over a longer period of time. The upper O-Ring ensures that sand, dirt or grit cannot enter the valve to cause damage to the lower O-Rings. This is especially important for buried and sewage service applications. Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross-sectional shape.
- E. American Made Quality: All primary parts and components to be exclusively and completely assembled, manufactured, machined and coated in the USA. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense. Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.
- F. Split Restraint Devices: Shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes. Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Three test bars shall be incrementally poured per production shift as per U.L. specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with 33 01 00-31

ASTM E8.Gland body wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Set screw pressure point type hardware shall not be used.

The Insert valve shall be as manufactured by **Team Industrial Services** 13131 Dairy Ashford Rd Sugar land, TX 77478 1-800-662-8326 281-331-6154, Team InsertValve Patent number 6,776,187 and 7,225,827 or approved equal.

#### PART 3 - EXECUTION

#### 3.01 INSPECTION

A. All pipe, fittings, valves and other material shall be subject to inspection and approval by the Engineer after delivery, and no broken, cracked, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used. When a defect or crack is discovered, the injured portion shall not be installed. Cracked pip shall have the defect cut off at least 12 inches from the break in the sound section of the barrel.

#### 3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Excavation, backfill, and compaction shall conform to the provisions of Section 312300.
  - 1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified, a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
- B. Cover for underground piping shall not be less than that indicated on the Drawings. The minimum cover for pipe shall be 36 inches. In areas where other piping conflicts preclude the maximum cover desired, the piping shall be laid to provide the maximum cover obtainable.

- C. Pipe, fittings, valves and accessories shall be installed as shown or indicated on the Drawings.
- D. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation and cooperation with authorities of the Owner.
- E. Pipe Joint Deflection: Whenever it is desirable, and approved by the Engineer, to deflect pipe joints to avoid obstructions or to maintain required alignment, the amount of the joint deflection shall not exceed 80 percent of the maximum limits allowed by the pipe manufacturer.
- F. In preparation for pipe installation, placement (stringing) of pipe should be as close to the trench as practical on the opposite side of the trench from the excavated material. The bell ends of the pipe should point in the direction of the work progress.
- G. Pipe and fittings shall be laid accurately to the lines and grades indicated on Drawings or required. Where grades for the pipeline are not indicated on the Drawings, maintain a uniform depth of cover with respect to finish grade. Care shall be taken to insure a good alignment both horizontally and vertically and to give the pipe a firm bearing along its entire length. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid.
- H. All pipe and fittings shall be cleared of sand, dirt, and debris before laying. All precautions shall be taken to prevent sand, dirt or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any sand, dirt, or other foreign material that enters the pipe shall be removed from the pipe immediately. Interior of all pipe and fittings shall be kept clean after installation until acceptable in the complete work.
- I. Any time that pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. No pipe shall be installed when trench conditions are unsuitable for such work, including standing water, excess mud, or rain.

- J. After pipe has been laid, inspected, and found satisfactory, sufficient backfill shall be placed along the pipe barrel to hold the pipe securely in place while conducting the preliminary hydrostatic test. No backfill shall be placed over the joints until the preliminary test is satisfactorily completed, leaving them exposed to view for the detection of visible leaks.
- K. Upon satisfactory completion of the hydrostatic test, backfilling of the trench shall be completed.
- L. Aboveground and Exposed Piping: Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings. Pipe connections shall be made in accordance with the details shown and manufacturer's recommendations. Open ends of pipe lines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated or as required to insure adequate support of the piping.

# 3.03 INSTALLATION OF DUCTILE IRON PIPE

- A. Handling and Cutting Pipe:
  - 1. Care shall be taken in handling, cutting, and laying ductile iron pipe and fittings to avoid damaging the pipe and interior coal tar epoxy or cement mortar lining, scratching or marring machined surfaces, and abrasion of the pipe coating. All cracked pipe and fittings shall be removed at once from the work at no additional cost to the Owner.
  - 2. Pipe cutting shall be done in a neat workmanlike manner without creating damage to the pipe and interior coal tar epoxy or cement mortar lining. Ductile iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw or oxyacetylene torch. Cut ends and rough edges of ductile iron pipe shall be ground smooth. For push-on joint connections, the cut end shall be beveled to prevent gasket damage during joint assembly. Interior lining shall be repaired at cut ends per the manufacturer's instructions prior to joint assembly.

- B. Laying Pipe and Fittings:
  - 1. Bedding for Ductile Iron Pipe: Minimum bedding requirements shall be Type 2 as defined in ANSI/AWWA C600, latest revision. Provide proper bedding required, in accordance with thickness class of pipe being laid and depth of cover. Proper pipe laying conditions shall be in accordance with ANSI/AWWA C150 and C151, latest revision, and ANSI/AWWA C600, latest revision.
  - 2. All ductile iron pipe and fittings shall be laid in accordance with American Water Works Association Standard ANSI/AWWA C600, latest revision, entitled "Standard for Installation of Ductile Iron Water Mains and Their Appurtenances", with the following sections specifically applying:
    - a. Section 3.3 Pipe Installation
    - b. Section 3.4 Joint Assembly
- C. Ductile Iron Pipe Joints:
  - 1. Type: The joints of all pipelines shall be made absolutely tight. The particular joint used shall be approved by the Engineer prior to installation. Where shown on the Drawings or where, in the opinion of the Engineer, settlement or vibration is likely to occur, all pipe joints shall be bolted mechanical type or restrained type as specified above, or as indicated on the Drawings.
  - 2. Push-on Joints: Push-on joints shall be made in strict accordance with the the manufacturer's recommendations. Lubricant, if required, shall be an inert, non-toxic, water soluble compound incapable of harboring, supporting, or culturing bacterial life. Manufacturer's installation recommendations shall be submitted to the Engineer for review and approval before commencing work. The bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

- 3. Mechanical Joint: All types of mechanical joint pipes shall be laid and jointed in full conformance with manufacturer's recommendations, which shall be submitted to the Engineer for review and approval before work is begun. Only skilled workmen shall be permitted to makeup mechanical joints. Torque wrenches, set as specified ion AWWA Standard C111, shall be used; or spanner type wrenches not longer than specified therein may be used without the permission of the Engineer.
- 4. Flanged Joints: Flanged joints shall be made up by inserting the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with suitable lubricant immediately before installation.
- 5. Restrained Joints: Restrained joints shall be provided where indicated on the Drawings. Joint assembly shall be made in strict accordance with the manufacturer's instructions, which shall be submitted to the Engineer for review and approval before commencing work.

# 3.04 INSTALLATION OF PVC PIPE

- A. Storage and Handling:
  - 1. PVC pipe shall be delivered to the site in unbroken bundles packaged in such manner as to provide protection against damage. When possible, pipe should be stored at the job site in the unit packages until ready for use. Packaged units shall be handled using a forklift or a spreader bar with fabric straps. Packaged units shall not be stacked at the job site higher than two units high.
  - 2. When it is necessary to store PVC pipe for long periods of time, exposure to direct sunlight shall be prevented by covering the pipe with an opaque material. Adequate air circulation above and around the pipe shall be provided as required to prevent excessive heat accumulation. PVC pipe shall not be stored close to heat sources of hot objects such as heaters, fires, boiler, or engine exhaust. Pipe gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. The interior and all sealing surfaces of pipe, fittings, and other appurtenances shall be kept clean and free of dirt and foreign matter.

- 3. Care shall be taken in handling and laying pipe and fittings to avoid severe impact blows, crushing, abrasion damage, gouging or cutting. Pipe shall be lowered, not dropped, from trucks or into trenches. All cracked, damaged, or defective pipe and fittings, or any length of PVC pipe having a gouge, scratch or other permanent indentation of more than 10 percent of the wall thickness in depth, shall be rejected and removed at once from the work and replaced with new acceptable pipe at no additional cost to the Owner.
- B. Field Cutting PVC Pipe: Field cutting of pipe shall be done in a neat workmanlike manner without creating damage to the pipe. The pipe shall be cut square with a fine-toothed hand or power saw or other cutter or knife designed for use with plastic pipe. Prior to cutting, the pipe shall be marked around its entire circumference or a square in vise shall be used to ensure the pipe end is cut square. Remove burrs by smoothing edges with a knife, file, or sandpaper.
  - Field Cutting Bell and Spigot PVC Pipe: Bevel the cut end of the pipe using a pipe beveling tool, wood rasp or portable sander to prevent damage to the gasket during joint assembly. A factory finished beveled end should be used as a guide to ensure proper beveling angle and correct depth of bevel. Round off any sharp edges on the leading edge of the bevel with a knife or file.
- C. Laying PVC Pipe:
  - 1. Pipe Bedding: Bedding for PVC pipe shall be as specified using granular pipe bedding material.
  - All PVC pipe shall be laid in accordance with the pipe manufacturer's published installation guide, the AWWA Manual of Practice No. M23 "PVC Pipe-Design and Installation" and the Uni-Bell Plastic Pipe Association installation recommendations.
- D. PVC Pipe Joint Assembly for Rubber Gasketed Bell and Spigot Pipe:
  - 1. The PVC bell and spigot joint shall be assembled in accordance with the pipe manufacturer's installation instructions. Clean the interior of the bell, the gasket, and the spigot of the pipe to be jointed with a rag to remove any

dirt or foreign material before assembling. Inspect the gasket, pipe spigot bevel, gasket groove and sealing surfaces for damage or deformation.

- 2. Lubricate the spigot end of the pipe with a lubricant supplied or specified by the pipe manufacturer for use with gasketed PVC pipe in potable water systems. The lubricant should be supplied as specified by the pipe manufacturer. After then spigot end is lubricated, it must be kept clean and free of dirt and sand. If dirt and sand adhere to the lubricated end, the spigot must be wiped clean and relubricated.
- 3. Insert the spigot into the bell so that it contacts the gasket uniformly. Align the pipe sections and push the spigot end into the bell until the manufacturer's reference mark on the spigot is flush with the end of the bell. The pipe should be pushed into the bell using a bar and wood block. The joint shall not be assembled by "stabbing" or swinging the pipe into the bell, nor shall construction machinery be used to push the pipe into the bell.
- 4. If undue resistance to insertion of the spigot end is encountered or if the reference mark does not reach the flush position, disassemble the joint and check the position of the gasket. If the gasket is twisted or pushed out of its seat, inspect the components, repair or replace damaged items, clean the components and repeat the assembly steps. Be sure the pipe is in proper alignment during assembly. If the gasket was not out of position, check the distance between the spigot end and the reference mark and relocate the mark if it is out of position.
- E. PVC Pipe Joint Assembly for Threaded and Solvent Welded Pipe
  - 1. All threaded and solvent welded joints shall be made watertight. All pipe cutting, threading and jointing procedures for threaded and solvent welded PVC pipe joints shall be in strict accordance with the pipe and fitting manufacturer's printed installation instructions. Thread lubricant for threaded joints shall be Teflon tape only.
  - 2. At threaded joints between PVC and metal pipes, the metal side shall contain the socket end and the PVC side the spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.
F. PVC forcemains underground shall be strapped every 10 feet or spiral wrapped with an insulated green No. 14 gauge copper ground wire for future location. The wire shall be stubbed out at each valve box or manhole.

# 3.05 FITTING INSTALLATION FOR UNDERGROUND PIPING

- A. The weight of ductile iron fittings shall not be carried by the pipe on which they are installed. The fitting shall be supported by a concrete cradle as shown on the standard details. Concrete used for supports shall have a minimum compressive strength of 3000 psi at 28 days. Concrete for support cradle shall be poured against undisturbed soil.
- B. All glands, clamps, bolts, nuts, studs and other uncoated parts of fitting joints for underground installation shall be coated with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.

# 3.06 CONCRETE PIPE ENCASEMENT

- A. Concrete for concrete pipe encasement shall have a minimum strength of 3000 psi at 28 days and encasement shall be constructed in accordance with details shown on the Drawings. Encasement shall be constructed where:
  - 1. Indicated on the Drawings
  - 2. The Engineer shall order the pipeline encased.
- B. The points of beginning and ending of concrete pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads. Pipe shall be wrapped in visqueen.
- C. Pipe encasement shall provide a minimum coverage of 6 inches all around the pipe including pipe bells.

# 3.07 INSTALLATION OF PIPE SLEEVES, WALL CASTINGS AND COUPLINGS

- A. Pipe sleeves and wall castings shall be provided at the locations called for on the Drawings. These units shall be as detailed and of the material as noted on the Drawings. They shall be accurately set in the concrete or masonry to the elevations shown. All wall sleeves and castings required in the walls shall be in place when the walls are poured. Ends of all wall castings and wall sleeves shall be of a type consistent with the piping to be connected to them.
- B. Link seals for wall sleeves shall be installed in strict accordance with the manufacturer's printed installation instructions. For watertight applications in tanks or treatment units, the link seal installation shall be tested hydrostatically for leaks at the same time as the tank or treatment unit. Any leaks that occur during the test period shall be repaired by checking the link seals for proper installation and replacement of unit(s) found to be defective at no additional cost to the Owner.
- C. Pipe couplings shall be installed in strict accordance with the manufacturer's published instructions and recommendations.

# 3.08 INSTALLATION OF VALVES

- A. Valves of the size and type shown on the Drawings shall be set plumb and installed at the locations indicated on the Drawings. Valves shall be installed in accordance with manufacturer's installation instructions and with the Details shown on the Drawings.
- B. Valves shall be installed such that they are supported properly in their respective positions, free from distortion and strain. Valves shall be installed such that their weight is not borne by pumps and equipment that are not designed to support the weight of the valve.
- C. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Check and adjust all valves for smooth operation.
- D. Install valves with the operating stem in either horizontal or vertical position.

- E. Allow sufficient clearance around the valve operator for proper operation.
- F. Clean iron flanges by wire brushing before installing flanged valves. Clean carbon steel flange bolts and nuts by wire brushing, lubricate threads with oil or graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- G. For buried valves, a valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Drawings.
  - 1. In paved areas, tops of valve box covers shall be set flush with pavement. Following paving operations, a 16 inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a 30 inch square by 6 inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the Drawings. Concrete for the pad shall be 3000 psi compressive strength.
  - 2. In unpaved areas, tops of valve box covers shall be set 2 inches above finished grade. After the top of the box is set to the proper elevation, a 16 inch square by 6 inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3000 psi compressive strength.
- H. Valves shall be tested hydrostatically, concurrently with the pipeline in which they are installed. Protect or isolate any parts of valves, operators, or control and instrumentation system whose pressure rating is less than the pressure test(s). If valve joints leak during pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts and hydrostatically retest the joints.
- Following installation, all aboveground valves shall be painted in accordance with the painting system specified in accordance with manufacturer's recommendations.
   Following installation of buried valves or valves installed in valve vaults, repair any scratches, marks and other types of surface damage, etc., with a coating equal to the original coating supplied by the manufacturer. Prior to backfilling, all nuts,

bolts and other parts of the valve joints shall be coated with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.

# 3.09 SEPARATION OF NON-POTABLE WATER MAINS AND POTABLE WATER MAINS

A. Reclaimed water mains shall be installed with at least a 3 foot horizontal separation from any potable water main. Force mains and gravity sewers shall have a 6 foot separation from potable mains. At crossings the installation shall provide of a minimum vertical

separation distance of 12 inches between the outside of the crossing non-potable and potable water mains. This separation shall be provided where the potable water main is either below or above the non-potable water main. When the 12 inch minimum vertical separation distance cannot be maintained, the potable water main shall be encased in concrete. Concrete encasement shall be as specified above. The potable water main shall be encased for 10 feet each way of the crossing.

# 3.10 MAIN CLEANING AND FLUSHING

- A. Following the hydrostatic and leakage tests, all the mains constructed under this contract shall be cleaned and flushed to remove sand, loose dirt and other debris. Flushing velocity shall be a minimum of 2.5 fps. Flushing shall continue until clean water flows from the main. However, the Contractor shall endeavor to use the minimum amount of flushing water required to complete the work. To increase the efficiency of the cleaning and flushing operation, the Contractor shall use a pipeline pigging device of the proper size and designed to clean the intended pipeline. The pigging device shall be capable of turning through a standard 90 degree MJ bend. The type of pipeline pigging device and the method of operation shall be approved by the Engineer.
- B. Upon completion of testing for the gravity drain line system, drain lines shall be flushed to remove dirt, sand, stones and other debris which may have entered the lines during construction and settled out in the lines and manholes. Materials and debris flushed from the drain lines shall be removed from a downstream manhole or basin and disposed of at an approved disposal area.

- C. Water for flushing shall be clean water provided by the Contractor from a source approved by the Engineer and the owner prior to beginning connections for flushing operations. Flushing shall only be completed upon approval by the Owner.
- D. Temporary blow offs may be required for the purpose of flushing mains. Temporary blow offs shall be installed as close as possible to the ends of the main being flushed. Blow offs installed on the main shall be the same diameter as the main. Temporary blow offs shall be removed and plugged after the main is flushed. All costs for installing and removing temporary blow offs shall be at n additional cost to the Owner.
- E. The Owner shall be notified at least 3 working days prior to flushing mains.
- F. Blow offs and temporary drainage piping used for flushing shall not be discharged into any gravity sewer or pumping station wetwell. The Contractor shall obtain prior approvals from the Engineer and the Owner as to the methods and locations of flushing water discharge.

# 3.11 INSTALLATION OF TIE RODS

- A. Tie rods shall be installed in strict accordance with the manufacturer's written installation requirements. Unless otherwise indicated on the Drawings, the size and number of tie rods for a joint or installation shall be as recommended by the manufacturer's design chart for a working pressure of 150 psi.
- B. Following installation and prior to backfilling, all parts of the tie rod joint restraint system, including tie rods, tie bolts, nuts, washers, and other fasteners, shall be coated with two coats, 10 mils DFT per coat, of coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M.

# 3.12 INSTALLATION OF REDUCED PRESSURE BACKFLOW PREVENTERS

Backflow preventers shall be installed at the locations shown on the Drawings.
 Backflow preventers shall be installed in accordance with the manufacturer's written installation instructions and as shown on the Drawings.

- B. Reduced pressure principle backflow preventers shall be installed horizontally with an 18 inch minimum clearance between the finished grade and the lowest point on the bottom of the unit. Reduced pressure backflow preventers shall be installed with provisions for a suitable drain arrangement to drain off discharges from the relief valve, so that discharges are not objectionable. Backflow preventers shall be installed such that they are easily accessible for testing, maintenance and repair.
- C. Piping and fittings for units 3 inches and larger in size shall have flanged joints. Piping, fittings and valves shall be properly supported with pipe support stands as shown on the Drawings.
- D. Following installation of the reduced pressure backflow preventer, piping, fittings and valves, the entire aboveground assembly shall be finished painted in accordance with manufacturer's recommendations.

# END OF SECTION

# SECTION 33 01 30.09 SANITARY SEWER BYPASS PUMPING

# PART – GENERAL

# 1.01 DESCRIPTION OF WORK

A. The work covered by this section consists of providing all labor, equipment, material, and supplies and performing all operations required to bypass pump sewage around a manhole or sewer section in which work is to be performed. The CONTRACTOR shall be prepared to bypass pump sewage as part of his operations. The CONTRACTOR shall provide all pumps, piping and other equipment necessary to accomplish bypass pumping; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities to conditions equal or better than existed prior to construction and to the satisfaction of the ENGINEER. All costs to accomplish bypass pumping, at the required volume, and all associated work including restoration, shall be considered incidental to the work and no additional compensation will be allowed.

### 1.02 GENERAL

- A. When the depth of flow in the sewer line being televised or repaired is above the maximum allowable for the proposed work, then the CONTRACTOR shall reduce the flow to the level shown below by manual operation of pump stations, plugging or blocking of the flow or by pumping and bypassing of the flow as acceptable to the ENGINEER. For manual operation of pump stations, the CONTRACTOR shall coordinate such operations with the appropriate City personnel. Plugging or blocking of the flow shall only be allowed when the CONTRACTOR can demonstrate that the upstream gravity collection system can accommodate the surcharging without any adverse impact.
- B. The depth of flow in the sewer line being televised or repaired shall not exceed that shown for the respective pipe sizes and for the operations indicated.

- C. Initial Television Inspection. For the initial television inspection, the sewer line shall be blocked completely. No flow, except infiltration, will be allowed through the sewer line.
- D. Television Inspection Before and After Lining Installation. For the television inspection before and after lining installation the sewer line shall be blocked completely. No flow, except infiltration before lining, will be allowed through the sewer line.
- E. Other Television Inspection, including Warranty.

Pipe Size	Maximum Depth of Flow
6" – 10" Pipe	20 Percent (20%) of Pipe Diameter
12" – 24" Pipe	25 Percent (25%) of Pipe Diameter
Above 24" Pipe	30 Percent (30%) of Pipe Diameter

- F. Television Inspection After Joint Testing/Sealing. For the television inspection after joint testing/sealing the sewer line shall be blocked completely. No flow will be allowed through the sewer line.
- G. Joint Testing/Sealing

Pipe Size	Maximum Depth of Flow
6" – 10" Pipe	20 Percent (20%) of Pipe Diameter
12" – 24" Pipe	30 Percent (30%) of Pipe Diameter
Above 24" Pipe	35 Percent (35%) of Pipe Diameter

- H. Pipe Lining Installation. For the pipe lining installation, the sewer line shall be blocked completely. No flow, except infiltration, will be allowed through the sewer line.
- I. Manhole Repairs. For manhole repairs, the flow through the manhole shall be controlled or blocked completely, as required, to properly complete the repairs as specified.

### 1.03 SUBMITTALS

The CONTRACTOR shall submit a written plan describing his means and methods for flow control and bypass pumping to the ENGINEER for review.

### PART 2 – PRODUCTS (NOT USED)

### PART 3 – EXECUTION

# 3.01 PLUGGING AND BLOCKING

A. A sewer line plug shall be inserted into the line upstream of the section being televised or repaired. The plug shall be so designed that all or any portion of the upstream flow can be released. During the television inspections and repair operations the flow through the line being worked shall be reduced to within the maximum limits stated above. After the work has been completed, the flow shall be restored to normal.

### 3.02 PUMPING AND BYPASSING

A. When pumping and bypass pumping is required, as determined by the ENGINEER, the CONTRACTOR shall supply all necessary pumps, conduits, and other equipment to divert the flow around manhole section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during rainstorm events. The CONTRACTOR will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. Pumps and equipment shall be continuously monitored by the CONTRACTOR during the periods that pumping and bypassing are required. If pumping is required on a 24-hour basis, engine shall be equipped in a manner to keep noise to a minimum.

### 3.03 FLOW CONTROL PRECAUTIONS

A. When flow in a sewer line is plugged, blocked or bypassed by the CONTRACTOR, he shall take sufficient precautions to protect the public health and to protect the sewer lines from damage that might result from sewer surcharging, Further, the CONTRACTOR shall take precautions to insure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved and he shall be responsible for any damage resulting from his flow control operations.

- B. When flow in a sewer line is plugged or blocked by the CONTRACTOR, he shall monitor the conditions upstream of the plug and shall be prepared to immediately start bypass pumping, if needed. Any liquid or solid matter which is bypass pumped from the sewer collection system shall be discharged to another sewer manhole or appropriate vehicle or container only. No such liquid or solid matter shall be allowed to be discharged, stored, or deposited on the ground, swale, road, stormwater drainage system or open environment. The CONTRACTOR shall protect all pumps, conduit and other equipment used for bypass pumping from traffic.
- C. Should the liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the open environment as a result of the CONTRACTOR's flow control operations, he shall be responsible for all cleanup and disinfection of the affected area and all costs associated with same. The CONTRACTOR shall also be responsible for notifying the sewer system operating personnel and appropriate regulatory agencies and performing all required cleanup operations at no additional cost to the OWNER.

# END OF SECTION

# SECTION 33 01 30.82 HDPE SHEET LINER WASTEWATER PUMP STATIONS

# PART 1 – GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish and install all labor, materials, equipment, and incidentals required to supply and install High Density Polyethylene (HDPE) sheet lining in the lift station/pump station wet wells and manholes as required and as shown on the Drawings.
- B. HDPE liner shall be designed and installed to protect concrete surfaces from corrosion in the collections system pump station wet well.

# 1.02 SUBMITTALS

- A. The Contractor shall submit for review, as provided in the General Conditions and Section 01 33 23, complete detailed shop drawings for all materials furnished under this section.
- B. The manufacturer of the lining shall furnish an affidavit attesting to the successful use of its material as a lining for concrete structures for a minimum period of five (5) years in wastewater conditions recognized as corrosive or otherwise detrimental to concrete.

# PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. Composition
  - 1. The material used in the liner and in all joint, corner, and welding strips shall be a combination of HDPE Resin, pigments, plasticizers, and stabilizers specially compounded to remain flexible. The ingredients added to the

HDPE resin shall be limited to no more than three percent (3%), by weight, of the resin used in the formulation.

- B. Physical Properties
  - 1. All HDPE liner sheet shall be extruded with a large number of anchoring studs; a minimum of  $39/ft^2$ , manufactured during the extrusion process in one piece with the sheet, so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a resistance to pull out of  $T/ft^2=3$  and shall withstand a back pressure of 29 psi.
  - 2. All HDPE liner plate sheets, including lock extensions, all joints, corner, and welding strips shall be free of cracks, cleavages, or other defects adversely affecting the protective characteristics of the material. The Engineer may authorize the repair of such defects by approved methods.
  - 3. The lining shall have good impact resistance, shall be flexible, and shall have an elongation sufficient to bridge up to a one-quarter inch (1/4") settling crack which may occur in the pipe or in the joint after installation, without damage to the lining.
  - 4. The lining shall be repairable at any time during the life of the structure.
- C. Details and Dimensions
  - 1. HDPE liner sheet shall be a minimum of 0.079 inches (0.079") thick. Anchoring studs shall be of the same material as that of the liner and shall be integrally extruded with the sheet and shall have a minimum height of 0.39 inches (0.39") and a length of 0.55 inches (0.55").
  - 2. Flat liner sheet (non-anchored) used for overlapping joints shall have a minimum thickness of 0.118 inches (0.118").
  - Liner sheet shall have a nominal width of 78 inches (78") and lengths of up to 780 inches (780"). Lengths specified shall include a tolerance at a ratio of plus one-third inch (+1/3") of each 100 inches (100").

### 33 01 30.82 - 2

- 4. Liner sheet shall be shop fabricated into shapes and sizes needed to completely cover the interior surfaces of the structure which are exposed to sewer gases.
- D. Material
  - 1. Liner shall be AGRU Sure Grip, or approved equal.

# PART 3 – EXECUTION

### 3.01 SHOP FABRICATION

- A. General
  - 1. Sheet liner shall be fabricated into suitable dimensions only by manufacturer certified fabricators.
  - 2. The sheet manufacturer shall provide written certification of the fabricator and shall provide the necessary field supervision to ensure that the quality specified for fabrication is maintained.

### 3.02 INSTALLATION

- A. General
  - Installation of the lining, including preheating of sheets in cold weather (below +41°F) and the welding of all joints, shall be done in accordance with the recommendations of the manufacturer.
  - 2. Coverage of the lining shall include all surfaces subject to attack from the raw wastewater and gasses.
  - 3. The lining shall be held snugly in place against inner forms by means of banding straps of other means recommended by the manufacturer.

- 4. Concrete poured against lining shall be vibrated, spaded, or compacted in a careful manner so as to protect the lining and produce a dense, homogenous concrete, securely anchoring the locking extensions into the concrete.
- 5. In removing forms, care should be taken to protect the lining from damage. Sharp instruments shall not be used to pry forms from lined surfaces. When forms are removed, any nails that remain in the lining shall be pulled, without tearing the lining, and the resulting holes clearly marked. Form tie holes shall be marked before ties are broken off and all areas of serious abrasion or damage shall be marked.
- 6. All nail and tie holes and all cut, torn, and seriously abraded areas in the lining shall be patched. Patches made entirely with welding strip shall be fused to the liner over the entire patch area. Larger patches may consist of smooth liner sheet extrusion welded over the damaged area.
- 7. Hot joint compounds, such as coal tar, shall not be poured or applied to the lining.
- 8. The Contractor shall take all necessary measures to prevent damage to installed lining from equipment and materials used in or taken through the work.
- B. Application to Cast-in-Place Concrete
  - 1. Liner sheet shall be closely fitted and properly secured to the inner forms. Sheets shall be cut to fit curved and warped surfaces using a minimum number of separate pieces. If liner joints are to be Type C-3 joints the adjacent sheets shall be butted with not more than one-eighth inch (1/8") opening between sheets and joined together with a specifically designed "Tear-Off" joining strip made by the manufacturer of the liner which prevents concrete from entering the seam during the pouring process and hold the sections of sheet together at the seam.
  - 2. Unless otherwise shown on the drawings, the lining shall be bonded to items not of concrete (including manhole frames, gate guides, access hatches, clay pipe, or brick manholes, and clay or cast iron pipes). The same procedure

shall be followed at joints where the type of protective lining is changed or the new work is built to join existing unlined concrete. At each point of transition, the liner shall be sealed to the non-lined material using a polyester backed HDPE transition sheet which will bond to the unlined section using an elastomeric adhesive recommended by the manufacturer, the transition sheet will be extrusion welded to the concrete liner.

- C. Joints in Lining for Cast-in-Place Concrete Structures
  - 1. Lining at joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made. The manufacturer of the liner shall provide special "Tear-Off" profile strips which can be used to join the two edges of the liner and keep the seam clean during the forming process. When "Tear-Off" strips are used, the adjoining edges of the liner may be connected by wiring the anchor studs on each side of the seam with forming wire at 10 inch intervals.
  - 2. Field joints in the lining shall be of the following described types, used as prescribed.
    - a. Type C-1: The joint shall be made with a separate four inch (4") joint strip. The four inch (4") joint strip shall be centered over the joint, tack welded to the liner, then welded along each edge to adjacent sheets. The width of the space between adjacent sheets shall not exceed two inches (2"). The four inch (4") strip shall lap over each sheet a minimum of one inch (1"). It may be used at any transverse or longitudinal joint.
    - b. Type C-2: The joint shall be made by lapping sheets not less than one inch (1"). The upstream sheet shall overlap the downstream. The lap shall be tack welded into place prior to welding.
    - c. Type C-3: The joint shall be made by using an HDPE "Tear-Off" strip to hold the butt joint together and to prevent wet concrete from getting under the sheet. After the forms have been stripped, the "Tear-Off" strip is removed and the seam extrusion welded.

### 33 01 30.82 - 5

- 3. All welding is to be in strict conformance with the specifications of the lining manufacturer. All welding is to be done by approved applicators.
- 4. Joints not incorporating a welding technique shall be made using a Ramnek gasket or other prior approved joint material.
- D. Testing and Repairing Damaged Surfaces
  - 1. After the liner is installed, all surfaces covered with lining, including welds, shall be tested with an approved electrical hold detector.
  - 2. All welds shall be physically tested by a nondestructive probing method. All patches over holes, or repairs to the liner wherever damage has occurred, shall be accomplished in accordance with paragraph 3.02(A)(6).

# END OF SECTION

# SECTION 33 05 05.31 HYDROSTATIC TESTING

# PART 1 - GENERAL

### 1.01 DESCRIPTION OF REQUIREMENTS

- A. The CONTRACTOR shall be responsible for the pressure testing of all systems prior to placing them in service.
- B. The pressure testing shall be as required to prove that the piping is left in proper condition for satisfactory operation under the conditions specified.

PART 2 - MATERIALS AND EQUIPMENT (Not Applicable)

### PART 3 - EXECUTION

- 3.01 PRESSURE AND LEAKAGE TESTS
  - A. Tests shall be conducted in the presence of and to the satisfaction of the ENGINEER and of authorities having jurisdiction over the work. Notice shall be given prior to start of tests.
  - B. Field pressure and leakage tests shall be conducted on the following:
  - C. Force Mains.
    - 1. Mains shall be subjected to a leakage test. This test measures the amount of water required to be supplied to newly laid pipe to maintain a specific pressure after the pipe has been filled with water and the air expelled. The duration of this test shall be not less than two hours and the test pressure shall be 100 psig as measured at the end point in the line. The maximum allowable leakage shall not exceed the limits specified in AWWA C-600.

# 3.02 ENGINEER'S RIGHT TO RETESTING

- A. Should the CONTRACTOR refuse or neglect to make any tests necessary to demonstrate the integrity of the completed system, the ENGINEER may retain the services of an outside consultant to make all such tests and their resulting adjustments and balance.
- B. The costs for such tests shall be deducted from amounts owing to the CONTRACTOR and shall not be borne by the OWNER.

# END OF SECTION

# SECTION 33 05 61 CONCRETE STRUCTURES

# PART 1 - GENERAL

# 1.01 DESCRIPTION

A. Scope of Work: The work under this Section includes the design, casting, delivery and erection of concrete structures as indicated on the Drawings.

# B. RELATED WORK SPECIFIED ELSEWHERE

1. Section 03 60 00: Grouting

# 1.02 QUALITY ASSURANCE

- A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall be in accordance with the current editions of the following standards:
  - 1. Standard Building.
  - 2. ACI 318, Building Code Requirements for Reinforced Concrete.
  - 3. PCI MNL 116, Manual for Quality Control for Plants and Production of Precast Concrete Products.

### 1.03 SUBMITTALS

- A. The following information shall be submitted for approval. Fabrication shall not begin until submission has been approved.
  - 1. Quality Control: Satisfactory evidence shall be submitted that plant and production methods meet the requirements of PCI MNL 116.
  - 2. Design: Complete calculations including shear, moment, buoyancy, and camber calculations shall be submitted. All computation sheets shall bear

the seal of a Professional Engineer registered in the State of Florida. Design water table shall be assumed to be at finished grade.

- 3. Shop Drawings: Complete fabrication and erection drawings shall be submitted. All drawings shall bear the seal of a Professional Engineer registered in the State of Florida.
- B. Manufacturer's data sheets shall be submitted on the following:
  - 1. Joint mastic and gaskets.
  - 2. Pipe connections.
  - 3. Grout material.
  - 4. Hatches and manhole covers

# 1.04 DELIVERY, STORAGE AND HANDLING

A. Transportation and erection shall be done by qualified personnel using proper equipment. Lifting and supporting shall be done only at points indicated on the shop drawings.

# PART 2 - PRODUCTS

# 2.01 MATERIALS AND FABRICATION

- A. Precast Concrete Structures:
  - Design loads shall consist of dead load, live load, impact, soil loads and loads due to water table, as well as other loads which may be imposed upon the structure. Wetwells and manholes shall be designed in accordance with ASTM C-478. The minimum wall thickness for wetwells up to 7 feet I.D. shall be 8 inches. The minimum wall thickness for wetwells 8 feet 0 inches to 12 feet 0 inches I.D. shall be 10 inches. The minimum wall thickness for 4 foot I.D. manholes shall be 6 inches. The minimum wall thickness for valve vaults shall be 6 inches.

- 2. Forms used for precast concrete shall be of metal and sufficiently designed and braced to maintain their alignment under pressures of the concrete during placing. Base and first section of precast structures shall be an integral cast.
- Aggregates: All aggregates, fine and coarse, other than lightweight aggregate shall conform to ASTM C33. Lightweight aggregates, fine and coarse, shall conform to ASTM C330.
  Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregate shall be graded in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.
- 4. Cement shall be Portland cement Type II.
- 5. Minimum compressive strength of concrete used for precast concrete structures shall be 4000 psi at 28 days.
- 6. Placing. All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. Maximum elapsed time from batching to placement shall be 2 hours. Concrete shall be placed in layers not over 2 feet deep. Each layer shall be compacted by mechanical internal or external vibrating equipment. Duration of the vibration cycle shall be limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.
- 7. Curing:
  - a. For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. The steam temperature shall not exceed 160°F, and the temperature shall be raised from normal ambient temperatures at a rate not to exceed 40°F per hour.

- b. The steam cured unit shall not be removed from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used, and shall be of a clear or white type, conforming to ASTM C 309.
- 8. Reinforcing steel shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be Grade 60.
- 9. Joints shall be tongue and groove pipe ends sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C433 or by a flexible performed bitumastic sealing material equal to Ram-Nek as manufactured by R.K. Snyder and Co., Houston, Texas. If rubber joint ring gaskets are used, interior and exterior voids in the pipe joints shall be sealed with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If manhole sections are sealed with a flexible preformed bitumastic sealing material, adequate material shall be applied so that "squeeze out" occurs at the interior and exterior of the joint. Rubber joint ring gaskets and flexible preformed bitumastic sealing material shall be provided by the manhole manufacturer.
- 10. Eccentric precast concrete cone sections shall be manufactured of precast concrete with reinforcing and joints as specified above for straight riser.
- 11. Lifting holes through the structures are not permitted. Equally spaced lifting lugs, rings or non-penetrating lift inserts shall be provided.
- 12. Top slabs for shallow manholes, valve vaults, and pumping station wet wells may be precast or cast-in-place. Steel reinforcing shall be as required for the dead load of the slab plus an H-20 designation live load. Concrete for top slabs shall have a compressive strength of 4000 psi at 28 days. Thickness of concrete for top slabs shall be a minimum of 6 inches for shallow manholes and valve vaults and 8 inches for pumping station wet wells.

- 13. Manholes inverts shall be precast into the manhole base section by the manhole manufacturer unless prior approval is obtained from the Engineer to construct inverts in the field. The drop from inlet to outlet shall be a minimum of one inch unless approved by the Engineer. The channel height of the manhole invert shall match the crown of the exit sewer. Manhole benches shall be sloped a minimum of one inch per foot from the outside periphery of the manhole to the edge of the invert channel.
- B. Sealing Compound and Grout: Plastic sealing compound shall comply with Federal Specification SS-SS-00210. Mortar shall comply with ASTM C387, Type S, or use grout complying with Section 03 60 00.
- C. Pipe Connections:
  - Pipe connections for wet wells and manholes shall be resilient, waterproof connections designed in accordance with ASTM C923 "Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes". Resilient pipe connectors shall either be cast into the manhole wall or installed following casting in a cored section of the manhole wall. Resilient connectors shall either be a gasket type connector equal to the A-Lok pipe to manhole seal as manufactured by Atlantic Concrete Products, Inc., or a flexible neoprene boot with stainless steel clamps equal to KOR-N-Seal System as manufactured by the Dukor Corporation. When the pipe is installed in the resilient manhole connector, the pipe shall be capable of 20° minimum deflection in any direction.
  - 2. Pipe connections for wall penetrations for valve vaults and for manholes and wetwells where resilient connectors cannot be used shall be provided with wall sleeves and link seals.
- D. Frames and Covers: Cast iron manhole frames and covers shall be provided for manholes and aluminum access hatches shall be provided for wetwells and valve vaults as specified below:
  - 1. Standard Manhole Frames and Covers: Shall be gray iron castings conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections and

other harmful defects. The seating surfaces of both the frame and cover shall be machined so that the cover will not rock after it has been seated. The cover shall be provided with a precisely machined dovetail groove with a neoprene O-ring gasket to provide a self sealing cover. The gasket shall be glued in place at the foundry. The manhole cover shall be solid with two non-penetrating pick holes. Manholes frames and covers shall be coated on all non-machined surfaces with three coats of coal tar epoxy as specified for the Class 7 Coating System in Section 09 90 00. Manhole frames and covers shall be U.S. Foundry and Manufacturing Corp. No. 38B, Ref. Cat. No. 225, Neenah Foundry Company No. R-1642 with a Type "B" cover or an equal approved by the Engineer.

- a. Anchor Bolts: Anchor bolts for bolting manhole frame to precast manholes shall be 3/4 inch diameter galvanized all thread steel rods with a 5 inch hook for embedment in the precast manhole top. The bolts shall be of sufficient length to provide a minimum 2 inch thread projection through the flange of the manhole frame. Two anchor bolts shall be cast into the precast manhole top section or slab, positioned at 180 degrees, at the time of manufacturer. Manhole frames shall be drilled to match the bolt settings prior to coating.
- 2. Aluminum Access Hatches: Aluminum hatches shall be provided for wetwells and valve vaults sized as indicated on the Drawings. Access hatches shall be a specified in Section 07 72 33.
- E. Coatings:
  - 1. Interior and exterior surfaces of precast structures shall be coated with a primer coat and three finish coats of coal tar epoxy.
  - 2. Interior coatings for wet wells and manhole nearest to lift stations shall be HDPE sheet liner, as indicated on plans.

# 3.01 INSTALLATION

- A. Earthwork: The Contractor shall prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Earthwork shall conform to the applicable sections of Division 31.
- B. Installation of Precast Concrete Structures: Precast concrete structures shall be constructed in a workmanlike manner at the locations and dimensions indicated on the Drawings. Precast structures shall be set on foundation of crushed stone, 12 inches thick. Crushed stone material shall be a well graded crushed stone or crushed gravel meeting the requirements of ASTM C33, Gradation No. 67 (3/4 inch to No. 4 sieve). The precast structures shall be constructed such that the structure will not transmit dead or live loads to the piping. Care shall be taken to prevent earth and other material from entering precast structures.
- C. Sealing and Grouting: Fill all interior and exterior joints between precast sections with a joint sealant, as recommended by the structure manufacturer.
  - 1. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least 2 inch thick with the concrete base or with a preceding unit. Point the inside joint and wipe off the excess sealant.
  - 2. Assemble units so that the cover conforms to the elevations shown on the Drawings.
  - 3. Pipe connections at precast structures shall be provided at the locations shown on the Drawings. Connections shall be resilient and waterproof.
  - 4. All voids in interior and exterior manhole section joints and lift holes for manhole sections shall be filled with a non-shrinking, non-metallic grout. Grout shall be applied and cured in strict accordance with the manufacturer's recommendations. The grout shall be finished smooth and flush with the wall surface of the manhole.
- D. Manhole Flow Channels and Bench Walls:

- 1. Unless prior approval is obtained from the Engineer, manhole flow channels (inverts) and bench walls shall be precast into the manhole base section as specified above.
- 2. Upon prior approval from the Engineer, manhole inverts may be constructed in the field. Invert channel bottoms shall be smooth and semicircular in shape conforming to inside of adjacent sewer sections. Changes in direction of flow shall be made with a smooth curve of as large radium as the size of manhole will permit. Changes in size and grade of channels shall be made gradually and evenly to give a smooth uninterrupted flow pattern through the manhole. Channel height shall match the crown of the connection sewer pipe exiting the manhole. Manhole bench walls shall be smooth and shall slope one inch per foot from the edge of the invert channel to the precast manhole wall. Invert channels may be constructed by forming in concrete or by building up brick and mortar to form the manhole bench walls on each side of the channel, and plastering over bricks with cement mortar with a minimum thickness of 2 inch. Manhole invert construction shall only be performed by experienced and qualified workmen.
- 3. Bricks used to construct manhole invert channels and bench walls shall be standard size (22 in. H X 4 in. W X 8 in. L) brick in conformance with ASTM C32 "Sewer and Manhole Brick (Made From Clay and Shale)", Grade MS. Mortar used for masonry work shall be prepared by thoroughly mixing: One (1) volume of Type II Portland Cement with three (3) volumes of sand and sufficient clean water to produce a rich mass of approved consistency. Mixing mortar on the ground or any paved surface shall not be permitted. Sand to be used in making mortar shall be clean, well-graded, and shall pass a standard No. 4 sieve.
- E. Setting Frames and Covers:
  - 1. Unless otherwise indicated on the Drawings, in unpaved areas the tops of manholes shall be set 0.2 feet above finished grade and the tops of wetwells and valve vaults shall be set 0.5 feet above finished grade.

- 2. The top of all precast manholes may be brought to proper grade for receiving manhole frame by using not more than three courses of brick or precast concrete grade rings. Bricks and mortar used for manhole top grade adjustments shall be a specified above in Paragraph 3.01.E.3. Precast concrete grade rings shall be precast with steel reinforcement in conformance with ASTM C478 and concrete with a compressive strength of 4000 psi in 28 days. Precast concrete grade rings shall be manufactured in half annular shapes for ease of handling. The grade ring dimensions shall be 2 inches thick with an annular width of 8 inches and an inside diameter of 24 inches.
- 3. Masonry construction shall be performed by experienced and qualified workmen only. All work shall be laid plumb, straight, level, square and true. Brick shall be laid in full beds of mortar and shoved into place. All joints shall be full and not more than 2 inch in thickness. The Contractor shall set in place and bond in the masonry all necessary anchor bolts and miscellaneous items specified elsewhere. The masonry walls shall be plastered on the inside and outside with a one-half inch coat of Portland Cement mortar.
- 4. Following curing of any masonry construction required for manhole top adjustment, set manhole frame in a bed of 3 to 2 inch thick flexible bitumastic sealing material (Ram-Nek) and anchor in place with two 3/4 inch diameter anchor bolts, which shall be securely embedded in the top of the manhole. Seal the flange of the manhole ring to the top of the manhole with cement mortar.
- F. Interior Lining: The interior coating system shall be applied following installation of the precast structures and any piping or equipment which will penetrate or attach to the walls. Surface preparation and application of the coating system shall be in strict accordance with the manufacturer's recommendations. Refer to Section 09 90 00 for additional specifications.
- G. Backfill: After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the Drawings. Backfill material shall consist of sand or loose earth, free from stones, clods, or other deleterious material. It shall be placed in horizontal layers not

exceeding 12 inches in depth, and shall be moistened and thoroughly compacted to a minimum relative density conforming to the requirements of Division 31.

# END OF SECTION

# SECTION 33 32 20 COLLECTION SYSTEM SUBMERSIBLE PUMPS

# PART 1 – GENERAL

# 1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing submersible pumps, mixer, motors, VFDs, control panel and related equipment for the pump station as shown on the Drawings and specified herein. The station shall be fully tested, complete and in operating condition.

# 1.02 QUALITY ASSURANCE

- A. Unit Integrity: The pumps, motors, lifting chains, and guide bars shall be supplied by the pump supplier to ensure unit integrity.
- B. Pump Tests: The pump supplier shall perform the following tests on each pump before shipment from the supplier:
  - 1. Megger the pump for insulation breaks or moisture.
  - 2. Prior to submergence, the pump shall be run dry and be checked for correct rotation.
  - 3. Pump shall be run in a submerged condition.
  - 4. Pump shall be removed from test tank and meggered immediately for moisture.
  - 5. A written certified test report giving the above information shall be supplied with each pump at the time of shipment.
  - 6. All end of pump chains will then be fitted with a rubber shrink fit boot to protect chains prior to electrical installation.

### 1.03 SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall submit detailed and dimensioned working shop drawings showing the construction of the proposed facility and installation of all equipment complete in every respect. Each drawing shall be indexed and/or referenced to the Contract Drawings and Specifications. No work upon the manufacture or fabrication of any equipment shall be performed until the ENGINEER's approval has been obtained. The CONTRACTOR shall submit, with the certified pump shop drawings, layout drawings showing exact installation, piping and foundation details for the pumping units being submitted.

# 1.04 WARRANTY

A. The pump manufacturer shall provide a prorated warranty against defects in workmanship and materials for a period of five (5) years under normal use, operation, and service. The warranty shall be in published form and apply to all similar units.

# PART 2 – PRODUCTS

### 2.01 MATERIALS

A. The pump manufacturer shall provide a prorated warranty against defects in workmanship and materials for a period of five (5) years under normal use, operation, and service. The warranty shall be in published form and apply to all similar units.

### 2.02 PUMPS

A. The supplier shall furnish and install motor driven, totally submersible sewage pumps which meet the following requirements. Pumps shall be manufactured by ABS, or equal, as pre-approved by the design engineer of the lift station.

Lift Station #4		
Pumps Required	Three (3)	
ABS Model	XFP 155J – CB2	

Design Point GPM	1,300
Head Feet	120 feet (120')
Impeller Dia.	310 mm
Motor HP Required	70 HP
Speed	1,780
Voltage	460
Phase	Three (3)
Frequency Hertz	60

B. Pump Design: The heavy duty submersible wastewater pump(s) shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging. The pump shall be driven by a Premium Efficiency Motor, providing the highest levels of operational reliability and energy efficiency.

# **<u>GUIDE RAIL BASE ASSEMBLY (wet pit installation)</u>**

There shall be no need for personnel to enter the wet well to remove or reinstall the pump(s). In a wet pit installation, the discharge base & elbow assembly shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pump(s) shall connect to the guide rail base automatically and firmly, guided by two (2) two-inch (2") guide pipe extending from the base elbow to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard eight inch (8") ANSI class 125 or metric DN150 pump flanges, so that the pump mounting is non-proprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.

A field replaceable Nitrile (Buna-N) rubber profile gasket or O-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the discharge elbow. Base assemblies which rely solely on metal to metal contact between the pump flange and

discharge base elbow as a means of sealing are inherently leak prone, and shall not be equal. No portion of the pump shall bear directly on the floor of the sump. The guide rail system shall be available in an optional non-sparking version, approved by Factory Mutual for use in NEC Class 1, Division 1, Group C&D hazardous locations.

- C. Pump Construction:
  - Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two (2) part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall be stainless steel 1.4401 (AISI 316), and shall be rated to lift a minimum of four times (4x) the pump weight.

Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two (2) planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds shall be required or used.

2. Impeller: The ABS ContraBlock Plus impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the semi-open, non-clogging, single vane design, meeting the <u>Ten State Standards</u> requirement for minimum solids passage size of three inches (3"). The impeller shall be capable of passing a minimum of 3.9 inch (3.9") diameter spherical solids as are commonly found in waste water. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation. Impeller designs which do not meet the <u>Ten State Standards</u> requirement for three inch (3") solids passage size, those that rely on retractable impeller designs to pass three inch (3") solids, or those that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal.

- 3. Self-Cleaning Wear Plate: The ABS ContraBlock Plus wear plate shall be constructed from gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves and an outward spiral V-shaped groove on the side facing the impeller, to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with three (3) stainless steel securing screws and three (3) stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. The wear plate shall be factory mounted to the volute in a fixed position with metal to metal contact on machined surfaces to insure optimal clearance and efficiency at startup. Future adjustments shall be easily accomplished by removing three (3) securing screws and rotating the plate 45 degrees  $(45^{\circ})$  to the adjustment Adjustment to allow for wear and restore peak pumping position. performance shall then be accomplished using standard tools, and without requiring disassembly of the pump. The use of fixed or non-adjustable wear plates or rings, or systems that require disassembly of the pump or shimming of the impeller to facilitate adjustment shall not be considered equal. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and threaded to accept standard \_\_\_\_\_ inch (\_\_\_") ANSI class 125 flanged fittings.
- 4. Pump Volute: The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge

flange shall be slotted to accept both six inch (6") ANSI class 125 and metric DN150 (PN 10) metric flanged fittings. Proprietary or non-standard flange dimensions shall not be considered acceptable. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).

### D. PREMIUM EFFICIENCY MOTOR

The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium\*. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request.

\* IE3 and NEMA Premium efficiency levels are equivalent, however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.

The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters [65 feet (65')], and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 18°C (356°F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be  $40^{\circ}$ C ( $104^{\circ}$ F), and intermittently up to  $50^{\circ}$ C ( $122^{\circ}$ F). The motor shall be capable of handling up to 12 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be **1.3**. The motor shall have a voltage tolerance of plus or minus 10 percent ( $\pm 10\%$ ) from nominal, and a phase to phase voltage imbalance tolerance of one percent (1%). The motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C.

For submerged (wet pit) applications, the motor shall be self-cooling via the process fluid surrounding the motor. For unsubmerged (dry pit) applications, an integrated oil cooling system shall be utilized to enhance heat transfer, and allow the motor to operate at full rated power continuously without the need for de-rating or reduced duty cycle. No external coolant supply or external cooling jacket shall be required for dry pit applications. The motor shall have a NEMA Class A temperature rise for submerged service, and class B rise for dry pit service, providing cool operation under all operating conditions.

- Thermal Protection: Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C (284°F) plus or minus five degrees (±5°C). They shall be connected to the control panel, and used in conjunction with, and supplemental to, external motor overload.
- 2. Mechanical Seals: Each pump shall be equipped with a tandem mechanical shaft seal system consisting of two (2) totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one (1) stationary industrial duty silicon-carbide seal ring and one (1) rotating industrial duty **silicon-carbide** seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one (1) stationary industrial duty silicon-carbide seal ring, and one (1) rotating industrial duty silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the

pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non-toxic material.

*The following seal types shall not be considered equal:* Seals of proprietary design, or seals manufactured by other than major independent seal manufacturing companies. Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, any system requiring a pressure differential to seat the seal and ensure sealing.

- 3. Mechanical Seal Protection System: The primary mechanical seal shall be protected from interference by particles in the waste water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller, or wrap around the mechanical seal shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs which do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.
- 4. Seal Failure Early Warning System: The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned between the primary and secondary mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be filled with environmentally safe non-toxic oil. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters
the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency maintenance. Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber between the mechanical seals are not considered to be early warning systems, and shall not be considered equal.

- 5. Shaft: The pump shaft and motor shaft shall be an integral, one (1) piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed 0.05 mm [0.002 inch (0.002")] at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals, and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.
- 6. Bearings: Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a deep grooved ball bearing and the lower bearings shall be a heavy duty double row angular contact ball bearing. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 50,000 hours at flows ranging from one-half (1/2) of BEP flow to one and a half (1-1/2) times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.
- E. Power Cable: The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil and water resistant, and shall be capable of

continuous submerged operation underwater to a depth of 65 feet (65').

F. Cable Entry System: The cable entry system shall consist of a submersible plug assembly which allows the cable be easily disconnected from the pump for service or replacement. Cable sealing shall be accomplished by a Nitrile compression grommet with both cylindrical and conical sealing surfaces, flanked by a stainless steel washer and an integrated strain relief. A brass (C3604) compression nut shall be threaded into to the cast iron EN-GJL-250 (ASTM A-48, Class 35B) cable plug housing, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry housing. Cable conductors shall be terminated in copper pin connectors which are separated and retained by a circular pin retainer fabricated from high dielectric strength Polyamid [30 percent (30%) GF]. Each pin shall pass through its own hole in the pin retainer, maintaining perfect alignment with the mating pins in the motor body. The corresponding motor body pin assembly shall be manufactured from high dielectric strength Polyamid [30 percent (30%) GF], with copper connector pins. The pin assembly shall be sealed with an O-ring to prevent water entry into the motor, and retained in the motor housing bore via a retaining ring. Attachment of the plug assembly to the motor shall engage the corresponding copper pins, creating a complete circuit between the motor and cable. The plug assembly shall be fastened with stainless steel fasteners, and shall be sealed by an Oring.

The cable plug and sealed entry system as part of the motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The system shall be anti-wicking by design, and shall prevent any water that enters the cable through damage to the jacket from entering the motor. Cable entry designs which utilize potting compounds to provide a water tight seal, or those which do not allow the cable to be easily changed in the field shall not be considered equal.

#### 2.03 ACCESSORIES

- A. The pump manufacturer shall supply related pump accessories for the lift station as shown on the plan drawings.
  - 1. Standard pump accessories may include, but not limited to, upper guides, rails, float brackets, floats, lift chains, lifting bails, anchor bolts, and hardware; all to be supplied in type 316 stainless steel materials.

#### 33 32 20-10

2. The integral base elbows and pump rail brackets are to be construction of cast iron material.

#### 2.03 CONTROL PANEL

### A. GENERAL

- 1. The work included in this Section consists of furnishing all labor, equipment, tools, materials, and performing all operations required for furnishing control cabinet.
- 2. The Drawings are diagrammatic in character but should be adhered to as closely as possible consistent with fabrication of the control panel.
- 3. All work shall be executed in workmanlike manner by skilled personnel and the work shall present a neat and professional appearance when completed.
- 4. The term "provide" shall mean to furnish completely unless otherwise indicated.
- 5. The Vendor shall provide a detailed shop drawing.
- 6. In general, electrical materials and apparatus shall comply with all applicable tests, ratings, specifications, and requirements of the appropriate standards listed in section 1.02 herein. Underwriter's Laboratories, Inc. (UL) listed electrical components or assemblies shall be used and shall bear the approved device label of UL, and conform to UL 508A standards. The standards herein are minimums; the Vendor may exceed such minimums with prior approval of the County.
- 7. All work shall comply with applicable requirements and recommendations of standards published by listed agencies and trade associations, except to the extent more detailed and stringent requirements are indicated or required by

local governing regulations. The control cabinets furnished herein shall be fully FDEP compliant.

- 8. All work shall comply with the latest editions of the NEC, National Fire Protection Association NFPA 70, NFPA 79, the National Electrical Safety Code (NESC), and all applicable state, municipal, and local codes. Work shall be subject to inspection and approval requirements of the local authority having jurisdiction.
- 9. Vendor shall guarantee all work and rectify any defects due to faulty materials or workmanship for a period of 18 months after delivery of control cabinet.

## B. CONTROLS AND INSTRUMENTATION

- The triplex pump station will have an electrical building constructed to house the control panel and wall mounted VFDs. The control panel shall be designed for 460 Volt, three (3) phase. The panel will contain controls for the three (3) submersible pumps and power feed and controls for one (1) submersible mixer. The submersible mixer is 2.4 horsepower mixer with 3.5 full load amps. Across the line starter shall be used to start the mixer up to full speed.
- The pump supplier shall provide four (4) VFDs for the submersible pumps, three (3) VFDs will be wall mounted in the electrical room and one (1) VFD will be provided as a spare.
- 3. The control panel shall be manufactured for Hydra Service USA, Sanford, Florida, or approved equal to these specifications. The panel shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the serialized UL label, with all components being U/L listed or Recognized for use in Industrial Control Panels.

### C. ENCLOSURE:

1. All controls for the station operation shall be enclosed in a single tamperresistant, NEMA 3R 304 stainless steel enclosure. The outer door shall have three-point latch mechanism with roller bar and heavy duty lockable handle. The door shall be able to be held open position at 90 degrees (90° minimum) with mechanical latches. The panel shall be sufficiently large to accept all control components without crowding. Larger enclosures shall contain door and panel stiffeners as required.

- 2. The enclosure shall have a hinged full-height inner door fabricated from high quality aluminum 5052-H32 0.125-inch (0.125") thick, shall be powder coat Iron Gray Texture. All holes shall be in accordance with UL 508A to maintain proper fitting of devices, i.e. notches to prevent turning. All components exposed for access shall have symmetrical cut outs with clean and de-burred edges.
- 3. All circuit breakers, control switches, indicator lights and other control devices shall be identified permanently with etched engraving on the dead front cover of the control panel. The door shall have a continuous aluminum piano type hinge with two (2) twist type latches.
- 4. The enclosure shall have a twelve gauge steel, formed, removable subpanel. The subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with white industrial grade baking enamel.
- 5. The enclosure and mounting system shall be designed to withstand wind loads as required by applicable building codes.

### D. CONTROLS:

- 1. The panel shall consist of the following components:
  - a. Liquid Level Sensor (one).
  - b. Motor Starters (one per pump).
  - c. Thermal Magnetic Circuit Breaker (one per pump).
  - d. Manual Transfer Assembly (one interlocked Main and Emergency Breaker).

#### 33 32 20-13

- e. Control Transformer with Primary and Secondary Circuit Breaker protection (one).
- f. Generator Receptacle (one).
- g. Duplex Convenience Outlet, GFI (one).
- h. HOA Selector Switches (one per pump, float backup, and panel light).
- i. Elapse Time Meters (one per pump).
- j. Pilot Lights:
  - 1) Run (one per pump green).
  - 2) Seal Fail (one per pump amber).
  - 3) Over-Temperature (one).
  - 4) Fault (one per pump amber).
  - 5) Backup Float Enable (one red).
  - 6) Control Power Available (one green).
  - 7) Alarm Light (one).
  - 8) Audible Alarm (one), residential area.
  - 9) Lightning/Surge Arrestor (one).
  - 10) Moisture Sensors (one per pump).
  - 11) Heat Sensors (one per pump).
  - 12) Power/Phase Monitor (one).
  - 13) Power Supply (one).
  - 14) Work Lamp (one).

### E. GENERAL COMPONENTS:

- 1. Liquid Level Sensor: The primary liquid level sensor shall be a submersible pressure transducer that is designed for the wastewater industry. It shall be a submersible hydrostatic type with a 316L Stainless casing. The transducer element shall be made of ceramic material. The level sensor shall provide a 4-20 mA output signal proportional to liquid level. It shall also provide transient protection. The level sensor shall be an "ABS", Model HSC2 pressure transducer or pre-approved equal.
- 2. Variable Frequency Drives: The pump supplier shall provide VFDs for each pump that will be wall mounted in the electrical building. The VFDs shall be "Square D", or pre-approved equal.
- 3. Thermal Magnetic Circuit Breakers: The circuit breakers shall be quickmake, quick-brake and trip free. The thermal and magnetic elements shall operate independently and be designed with a common trip bar breaking all poles when a fault is received on any pole. "H" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device. Each circuit breaker shall be mounted with the handles extending through the inner door. The circuit breakers shall be "Square D" LAL, JDL, or HDL series, or pre-approved equal.
- 4. Duplex Convenience Outlet: Provide a convenience outlet, duplex receptacle with integral ground fault interrupter, to be mounted on the inner door. The receptacle shall be rated 15A, 120VAC and shall be manufactured by "Hubbell", or pre-approved equal.
- 5. HOA Selector Switches: A three (3)-position selector switch shall be provided for each pump. A two (2)-position selector switch shall be provided for the Backup Float Enable feature and the panel work lamp. These switches shall be 30 mm, NEMA 4X, maintained type switches. The HOA switches shall be manufactured by "Square D", series 9001, KS12B, and KS43B, or pre-approved equal.

- 6. Elapse Time Meters: Five (5) digit, non-resettable elapse time meters interfaced with the appropriate motor starters shall be mounted on the inner door. One (1) time meter for each pump. The elapse time meter shall be ENM, model T-50, or pre-approved equal.
- 7. Pilot Lights: Pilot lights shall be provided to indicate run and alarm status of the pumps/motors and the use of the float backup system. The lights shall have a removable lens and replaceable lamp. The lights shall be 30 mm, NEMA 4, 120VAC, full voltage type. The pilot lights shall be "Square D", series 9001, KP38G31, KP38A31, KP38R31, or pre-approved equal.
- 8. Alarm Light: A red strobe alarm light pipe mounted on the panels left side, unless otherwise shown on the drawings, shall be provided to indicate a high water condition. The unit shall consist of Ingram CTO15F-R strobe light, OLB one-half inch (1/2") conduit body, six inch (6") aluminum pipe, one-half inch (1/2") Myers hub, or pre-approved equal.
- 9. Audible Alarm: A Horn shall be provided to sound upon a high level condition. The horn shall be piezo type and shall be rated 45 db at 10 feet (10'). A silence pushbutton shall be mounted on the left side of the enclosure used to energize a relay to disconnect the horn when pressed. The silence pushbutton shall be individually labeled on the outside of the enclosure with a custom laser printed label that has been laminated for protection. The label color shall be white with black letters and black border. This label shall meet the requirements of the "Component Labels" section listed below. The pushbutton switch shall be 30 mm, NEMA 4X, flush type, black in color, and manufactured by "Square D", series 9001, KR1B, or pre-approved equal. The horn shall be a Federal Signal model 350-120-30 with trim ring (TR), or pre-approved equal.
- Lightning/Surge Arrestor: A secondary arrestor, complying with UL 1449, 3<sup>rd</sup> Edition - latest, shall be installed on the line side of the main breaker in accordance with manufacturer's instructions. Arrestor shall be "Square D", model SDSA1175, or pre-approved equal.

- 11. Moisture Sensors: The panel shall be equipped with moisture sensing relays for each pump energizing red status indicator lights mounted on the inner door. The relays shall be "ECS" model 1110016, or pre-approved equal.
- 12. Heat Sensors: The panel shall be equipped to accept a thermal signal from each pump/motor. This signal shall shutdown the pump and energizes a red status indicator for the appropriate pump/motor.
- 13. Power/Phase Monitor: A power monitor relay shall be installed and connected to the control logic. When the relay is deactivated, it shall disconnect control power to the motor starters. The relay shall be deactivated in the event that any of the following conditions occur:
  - a. Phase loss (single phasing).
  - b. Phase reversal (sequence).
  - c. Low voltage (brown out).

The phase monitor relay shall be an "ORCO", model 001-230-1212 for 240VAC, 001-480-1212 for 480VAC, no equal.

- 14. Work Lamp: A work lamp shall be provided in the control panel. The work lamp shall be a fluorescent light fixture, 18 inches (18") wide, and have a single lamp. It shall be mounted inside of the top of the enclosure and centered from left to right. Mounting shall be welded studs mounted to the roof of the enclosure. Drilling holes into the roof of the enclosure will not be accepted. The work lamp shall be provided with a manual operator type, two (2)-position switch (see HOA switches) located on the dead front and be labeled per the label specifications listed below. The work lamp shall be manufactured by "Utilitech", part number 069486, or pre-approved equal.
- 15. Battery Backup: Include battery backup system with 12 pin socket, battery, and signal system. Battery to maintain pump controller and accessories for minimum four (4) hours.

### F. MISCELLANEOUS REQUIREMENTS:

- 1. Wiring: All wiring shall be color-coded using MTW #16 AWG minimum. Control wiring shall be numbered/lettered at each end. Wire numbers/letters shall be Panduit shrink sleeve or pre-approved equal. All wiring shall be routed through a wiring duct system to provide wire protection and an organized appearance.
- 2. Terminals: A 10 pole terminal block mounted on a 30-degree (30°) angle shall be provided as a minimum for interface with field installed equipment for the ease of field connection. If additional terminals are required, then additional 10 pole terminals must be used to meet the additional requirements unless there are less than seven (7) additional terminals required. If less than seven (7) additional terminals are needed, then terminal blocks of lesser poles of the same brand may be used to make up the difference needed. Individual pole terminal blocks supplied to meet the total connections required will not be allowed.

Terminal blocks shall be mounted with a minimum of two inches (2") from both enclosure sides and a minimum of one inch (1") from the bottom of the enclosure for easy access to terminal screws.

- 3. Component Labels: All back panel components shall be labeled using UL approved yellow polyester laser/ink jet labels. The labels shall be manufactured by "Panduit", part number series C100 C200. The nameplates shall be etched or engraved for the inner door components and logos. The labeling system shall be computer controlled to provide logos, post-script type or custom designs.
- 4. Control Panel Label: The control panel shall be provided with a job name or pump station name/number nameplate. This nameplate shall be located on the front door of the enclosure. The nameplate shall be a laminated two (2)-part system using black letters on a white background providing protection against fading, peeling, or warping. The labeling system shall be computer controlled to provide logos, post-script type or custom designs. The use of engraved plastic type nameplates is not acceptable.

- 5. Warning Label: A "Danger!! High Voltage Inside" label shall be provided on the inner door of the enclosure. The label shall be a laminated two (2)part system using black letters on a goldenrod background providing protection against fading, peeling, or warping. This label shall meet the requirements of the "Component Labels" section listed above.
- 6. Drawings/Schematics: The control system shall have complete drawing/schematics using AutoCad®. The drawing shall have a complete Bill of Material, front panel view with component locations, sub-panel view with component locations and electrical schematic. References to the Bill of Material shall be located for each component. These drawings/schematics shall also be provided as laminated sheets that shall be affixed to the inside of the enclosure door.
- 7. Print Pocket: A plastic print pocket shall be provided and mounted on the inside of the front door for all stainless steel enclosures. This print pocket shall be mounted by welding three (3) threaded studs onto the inside of the front door of the enclosure. One (1) stud will be used for each side of the print pocket as well as one (1) used for the bottom edge of the print pocket. No self- tapping screws, adhesive tapes, or Velcro will be accepted for the mounting of the print pocket.
- 8. Mounting Hardware: All mounting hardware such as screws or bolts used in the manufacturing of the control panel shall be stainless steel. All holes in the back plate and dead front shall be drilled and tapped. No self-tapping screws, adhesive tapes, glues, epoxy, or Velcro will be accepted for the mounting of any hardware.

### G. OPERATION:

1. Triplex Operation: Under normal conditions, the pump controller will be provided by a telemetry unit located in a Data Flow Systems control panel and the submersible transducer will provide a 4-20 mA output signal that is proportional to level to the pump controller. The pump controller will then provide signals to the starters to start the pumps up to full speed as needed to maintain the water level in the wet well. The pump controller will provide start and stop set points and alarm set points for all pumps. The pump

controller will also provide alternation of the three (3) pumps to ensure equal runtime of all pumps. If the incoming flow exceeds the pump capacity of the lag-lag pump, and the high-level float is activated a high-level alarm shall be activated on control panel visual and audible and by remote through the pump controller to alert maintenance personnel to the condition. A silence button shall be provided to turn off the horn, but the alarm beacon shall remain on until the high level condition is corrected. If the high-level float is activated for more than the time set on the backup float timer (10 sec.), control will transfer to float backup operation regardless of the position of the "Select Controller / Floats" switch. Control will remain on backup floats until manually reset.

2. Redundant Float Backup Operation: Five (5) Floats (off, lead, lag, lag-lag and high) shall be utilized to send a signal to the motor starters to operate the pump only if the level rises above the floats designated for the controller operation. Contingent upon wet well level, the lowest float shall signal the lead pump to shut down. Upon sump level rise, the next higher float shall signal the alternator to select and start a pump. If after the lead pump starts and the level continues to rise to the Lag Pump start contact, the float shall send a signal to the alternator to start the lag pump and both pumps shall run simultaneously. The level shall be lowered until the Stop Float is reached and the controller shall shutdown both the appropriate control contacts and the Alternator manufactured by Macromatic, ECS part number 1110011, or equal, will start and run the pumps simultaneously.

#### 2.04 PUMP ACCESS HATCH

#### A. General

- 1. Door opening sizes, number, and direction of swing of door leaves, and locations shall be as shown on the Drawings. The Drawings shall indicate the clear opening requirements.
- 2. All doors shall be aluminum (mill finish) unless otherwise noted.
- 3. Openings larger than 42 inches (42") in either direction shall have double leaf doors.

#### 33 32 20-20

- 4. Doors shall be designed for flush mounting and for easy opening from both inside and outside.
- 5. All doors shall be provided with an automatic hold-open arm with release handle.
- 6. Double leaf doors shall be provided with Type 316 stainless steel safety chains to go across the open sides of the door, when in the open position. Brackets shall be provided on the underside of the doors to hold the safety bars when not in use.
- 7. All hardware, including but not limited to, all parts of the latch and lifting mechanism assemblies, hold open arms and guides, brackets, hinges, springs, pins, and fasteners shall be Type 316 stainless steel.
- 8. Cylinder locks with keyway protected by a cover plug shall be provided with all hatches.
- 9. Door leafs shall be one-quarter inch (1/4") aluminum diamond plate, minimum, stiffened and designed for 300 psi.
- 10. Mill finish with bituminous coating finish applied to the exterior.
- 11. Hatches covers to be manufactured by USF Fabrication or Halliday.

### PART 3 – EXECUTION

### 3.01 INSTALLATION

A. The equipment shall be installed and mounted by the CONTRACTOR in accordance with the manufacturer's drawings and instructions. All equipment shall be installed as shown in the drawings and in accordance with the manufacturer's recommendations. Piping shall be run as shown on the plans and be connected to all units in a manner to prevent leakage of water or sewage. Any departures from the locations or arrangements of units or connections there to, as shown on the plans, shall be detailed by the CONTRACTOR and approval there of obtained from the ENGINEER. B. All units shall be factory assembled by the pump manufacturer.

### 3.02 MANUFACTURER'S FIELD SERVICES

- A. Manufacturer's Service Representative shall provide competent personnel for a period of one (1) day in one (1) trip to:
  - 1. Check installation of equipment.
  - 2. Provide start-up of equipment.
  - 3. Run specified tests (if any).
  - 4. Train personnel in operation and maintenance of equipment.

### 3.03 TESTING

- A. After installation of the sewage pumps, the pumps shall be given a running test in the presence of the ENGINEER during which time they shall demonstrate their ability to:
  - 1. Perform without vibration or overheating at the specified conditions.
  - 2. Load test, check amperage, phase to voltage test and insulation test.
  - 3. Flow test based on timed drawdown of the wetwell and force main pressure.
- B. All defects revealed by or noted during the tests shall be corrected or equipment replaced promptly at no additional expense to the OWNER.
- C. CONTRACTOR shall furnish all labor, piping, equipment, and materials necessary for conducting the tests.
- D. In case the CONTRACTOR is unable to demonstrate to the satisfaction of the ENGINEER that the units will satisfactorily perform the service required, the units may be rejected. CONTRACTOR shall remove and replace the equipment, at his own expense.

E. Prior to acceptance of the lift station, the as-built shop drawings, curves, details, and the operation and maintenance manuals shall be submitted. Provide, as a minimum, a set of four (4) manufacturer's manuals. In an effort to conserve environmental resources, and to minimize carbon footprint on the environment, an electronic file in PDF formatted manual can be supplied by email upon request.

### 3.04 SPARE PARTS

- A. CONTRACTOR shall provide the following spare parts:
  - 1. One (1) spare VFD
  - 2. One (1) impeller, wear ring, impeller key and impeller bolt.
  - 3. One (1) UPS battery backup for the control panel

### END OF SECTION

# SECTION 33 32 23 SUBMERSIBLE MIXER

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. The work included under this Section consists of furnishing and installing submersible mixers, motors, and related equipment, fully tested, complete and in operating condition.
  - 2. Equipment furnished and installed under this Section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer as approved by the Engineer.

#### B. RELATED WORK

- 1. Section 01 33 23 Shop Drawings, Product Data, and Samples
- 2. Section 01 60 00 Product Requirements
- 3. Section 01 75 16 Startup Procedures
- 4. Section 01 78 23 Operation and Maintenance Data
- 5. Section 01 78 36 Warranties

#### 1.02 QUALITY ASSURANCE

A. Unit Responsibility: The mixers, motors and mounting hardware shall be supplied by the mixer supplier to insure unit responsibility.

- B. Factory Tests: The following inspections shall be performed as a routine quality check on each mixer prior to shipment from the factory:
  - 1. Propeller size, motor rating, voltage, phase and frequency will be checked for compliance with customer purchase order and specifications.
  - 2. Motor and power cable shall be checked before submergence for insulation defects and moisture content.
  - 3. Pressurize the motor with dry air and check for leaks at all joints and seals.
  - 4. Before submergence run the mixer to check for correct rotation and ensure mechanical integrity.
  - 5. The mixer shall be submerged in a tank containing water on a guide tube assembly and run completely submerged to check amp readings under load.
  - 6. Motor and power cable shall be checked after submergence for insulation defects and moisture content after the mixer is removed from the tank.

A quality control check sheet showing that the above has been accomplished shall be completed and kept on file for each mixer.

### 1.03 SUBMITTALS

- A. Shop Drawings and Manufacturer's Literature: For all mixers to be furnished under this Section, the Contractor shall submit shop drawings, including at least the following, to the Engineer for approval in accordance with the provisions of Section 01 33 23:
  - 1. Manufacturer's literature and illustrations.
  - 2. Shop Drawings including details of mixer assembly and installation layouts and procedures, motor control wiring diagrams, types of materials used in construction, details of all accessories, and dimensions of major components.

- B. Operating Instructions: For all mixers furnished under this Section, the Contractor shall submit operation and maintenance manuals to include the following in accordance with the provisions of Section 01 78 23:
  - 1. General equipment function, description and normal and limiting operating characteristics.
  - 2. Installation instructions assembly procedures and alignment and adjustment procedures.
  - 3. Operation instructions start-up procedures, normal operating conditions, emergency and normal shutdown procedure.
  - 4. Lubrication and maintenance instructions including a list of at least three acceptable lubricants in each case.
  - 5. Troubleshooting guide.
  - 6. Parts list, the predicted life of parts subject to wear and normal delivery times of such parts.
  - 7. Drawings cross-sectional view, assembly and wiring diagrams.
  - 8. Recommended spare parts inventory.
- C. Factory Representative: A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided for four (4) hours to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the permission of the Owner, this work may be conducted in conjunction with the inspection of the installation and test run as provide under PART 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional services shall be provided at no cost to the Owner.
- D. Certifications: The Contractor shall furnish the Engineer with a written certification signed by the manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue

stress imposed by piping or mounting bolts and has been operated under full load conditions and that satisfactory operation has been obtained.

### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver a complete system ready to install as job progress requires.
- B. Store in weathertight building or suitable covering to protect against damage of any nature.
- C. Handle during delivery, storage, and installation in a manner to prevent damage of any nature.

### 1.05 WARRANTY AND GUARANTEES

- A. The mixer manufacturer shall warrant the mixers being supplied to the Owner against defects in workmanship and materials for a period of one (1) year under normal use, operation and service.
- B. Refer to Section 01 78 36 for additional requirements.

### PART 2 - PRODUCTS

- 2.01 GENERAL
  - A. The Contractor shall furnish and install submersible mixer in lift station wet well, attached to one of the submersible pumps.
  - B. All parts shall be designed and proportioned for ample strength, stability and stiffness for their intended purpose.
  - C. Mixers shall be designed for use 8 hours per day.

ITEM	LS 5
Mixers Required, #	1
Motor Rating, Shaft Hp	2.4
Voltage	460
Phase	3
Frequency, Hertz	60
Propeller Dia., in.	8.3
Propeller RPM	1750
Manufacturer	Sulzer
Model	XRW 2131-PA18/4

D. Mixers shall have the following operating characteristics:

#### 2.02 MATERIALS AND EQUIPMENT

- A. Mixers:
  - 1. Each mixer shall be of the close-coupled submersible type design. All components of the mixer, including the motor, shall be capable of continuous operation under water without loss of watertight integrity to a depth of 65 feet (20m). In addition, all components of the mixer shall be capable of operation in air, completely unsubmerged for at least two (2) hours.
  - All exposed hardware shall be stainless steel, 1.4401 (ASTM A276, Type 316). All surfaces coming into contact with the mixing liquid, other than stainless steel, shall be protected with a two-part epoxy coating.
- B. Propeller:
  - 1. The propeller shall be of cast iron, EN-GJL-250 (ASTM A48, Class 35B), and shall be of self-cleaning backward curved design, preventing material build-up on the blades, that decreases mixer performance and increases vibration. The propeller shall be manufactured as such that undue vibration or other unsatisfactory characteristics will not result when the mixer is operating.

2. The propeller shall have a slip fit onto the motor shaft with a drive key and shall be securely fastened to the shaft by a stainless-steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the propeller bolt shall be effectively recessed within the propeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency. The propeller shall be capable of handling solids, fibrous materials, sludge, and other matter normally found in screened sewage, water, and wastewater applications.

### C. Shaft Seal:

- 1. The mixer shall be provided with a double seal system consisting of one (1) outboard mechanical seal and one (1) radial shaft seal in tandem on the innermost side, separated by an oil chamber. The outboard mechanical seal faces shall be industrial duty silicon carbide and each seal interface shall be held in contact by its own spring system.
- 2. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. The seal system shall not rely upon the mixed media for lubrication and shall not be damaged when the mixer is run dry. Lubricant in the chamber shall be environmentally safe non-toxic material.
- 3. The following seal types shall not be considered equal: Seals of proprietary design, or seals manufactured by other than major independent seal manufacturing companies. Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, any system requiring a pressure differential to seat the seal and ensure sealing.
- D. Mechanical Seal Protection System:
  - 1. The mixer shall be equipped with a solids deflection ring to prevent seal failure due to interference from solids contained in the mixed liquid and to minimize solids that come into contact with the seals. Submersible mixer designs which

do not incorporate a solids deflection ring to protect the primary mechanical seal shall not be considered acceptable for wastewater service.

- E. Oil Chambers:
  - 1. The mixer shall have an oil chamber located between the outer mechanical seal and the inner lip seal. The oil chamber shall hold a sufficient quantity of oil to provide lubrication and cooling for the shaft seals. The oil shall also act as a sensing medium for the seal monitoring system to detect the presence of moisture.
- F. Motor Shaft:
  - 1. The shaft shall be stainless steel, 1.4021 (ASTM A276, Type 420), and designed to resist the maximum forces generated by the mixer. The mixer shaft shall have machined shoulders to permit exact bearing, seals and propeller placement. Carbon steel, chrome plated shafts shall not be considered adequate or equal.
- G. Bearings:
  - 1. The mixer shall rotate on two (2) high quality, permanently lubricated bearings. Bearings shall be of single row, deep grooved design and sized to transfer all radial and axial loads to the mixer housing and minimize shaft deflection for increased bearing and seal life. Bearings shall be lubricated for life and maintenance free.
  - 2. The bearings shall be manufactured by a major, internationally known manufacturer of high-quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.
- H. Elastomers:

- 1. All mating part surfaces of the mixer shall be machined and fitted with static, Nitrile rubber O-rings to provide watertight sealing. Mating surfaces shall be designed to provide watertight seals when metal-to-metal contact is made, resulting in controlled compression of the O-rings without special torque requirements. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease or other devices shall be used.
- I. Cable Entry:
  - The cable entry shall be an integral part of the motor. Cable sealing shall be accomplished by a Nitrile (Buna-N) compression o-ring or grommet. This will provide a leak proof, water tight seal at the cable entrance without the need for specific torque requirements.
- J. Liquid Ingress Monitoring System:
  - 1. A system shall be supplied to detect liquid ingress in the unit. The sensor shall be located in the seal oil chamber.
- K. Motor:
  - The electric motor shall meet efficiency standards in accordance with IEC 60034-30. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third-party certifying agency.
  - 2. The motor shall be of the squirrel-cage induction design, NEMA type B, with a NEMA Class B temperature rise and shall have an IP68 protection rating for continuous submerged operation underwater to a depth of 20 meters (65 feet). The copper stator windings shall be insulated with moisture resistant Class F insulation materials, rated for 155°C (311°F).
  - 3. The stator shall be press fitted into the stator housing. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum. The motor shall be designed for continuous duty and be capable of handling up to 15 evenly spaced starts per hour without overheating. The

maximum continuous temperature of the mixed liquid shall be  $40^{\circ}$ C ( $104^{\circ}$ F). The service factor (as defined by the NEMA MG1 standard) shall be 1.0. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase-to-phase voltage imbalance tolerance of 1%. Mixers with an optional explosion-proof design shall be FM and CSA approved for use in NEC Class 1, Division 1, Groups C & D hazardous locations. The surface temperature rating shall be T3C.

- L. Thermal Protection:
  - Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C +/-5°C (284°F). They shall be connected to the control panel, and used in conjunction with, and supplemental to, external motor overload protection..
- M. Seal Failure Early Warning System:
  - 1. The integrity of the mechanical seal system shall be continuously monitored during mixing operation and standby time.
  - 2. An electrical probe shall be provided in a sensing chamber positioned between the mechanical seal and lip seal for detecting the presence of water contamination within the chamber.
  - 3. The sensing chamber shall be filled with environmentally safe non-toxic oil. A solid-state relay mounted in the mixer control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber.
  - 4. If sufficient water enters the sensing chamber through the mechanical seal, the probe shall sense the increase in conductivity and signal the solid-state relay in the control panel. The relay shall then energize a warning light on the control panel. This system shall provide an early warning of mechanical

seal leakage, thereby preventing damage to the submersible mixer, and allowing scheduled rather than emergency maintenance.

Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber between the seals are not considered to be early warning systems and shall not be considered equal.

### 2.03 SPARE PARTS

- A. Provide one (1) set of spare parts for the mixers supplied.
  - 1. Repair kit
  - 2. Propeller
  - 3. Motor Cable

## PART 3 - EXECUTION

## 3.01 INSTALLATION

A. All materials and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer.

### 3.02 FIELD QUALITY CONTROL

- A. Field Tests: A qualified representative of the mixing system supplier shall inspect the installation and supervise start-up performed by the Contractor's personnel. All components of the systems shall be tested for proper operation during the start-up operation.
- B. Maintenance Procedures: After the equipment has been placed into operation, the qualified representative of the mixing system supplier shall instruct the Owner's personnel in proper operating and maintenance procedures without additional cost to the Owner.

## END OF SECTION

# SECTION 40 61 13 PROCESS INSTRUMENTATION AND CONTROLS SYSTEM GENERAL PROVISIONS

#### PART 1 - GENERAL

#### 1.01 SUMMARY OF WORK INCLUDED

- A. Furnish and install all instrumentation and controls hereinafter specified to perform the intended function. This shall include all labor, materials, plant facilities and equipment, performance of all work necessary to complete, make factory tests, prepare and load for shipment, deliver to the site, provide programming, calibration, installation supervision, system start up, services and incidentals required to completely furnish and install the instrumentation and control system upgrades as specified herein and shown on the Drawings.
- B. Provide all investigation work required to establish the use and configuration of the as found hardware and software of each control signal affected under this contract.
- C. All equipment, materials, programming and services hereinafter termed "the system", shall be integrated by the Process Instrumentation and Control System (PICS) integrator who, with the Contractor, shall coordinate and have responsibility for interconnecting with equipment now existing and/or being installed under this or other contracts as shown on the drawings and loop diagrams.
- D. Auxiliary and accessory devices necessary for system operation or performance such as transducers or relays to interface with existing equipment or equipment provided under other sections of this Specification shall be included whether specified or not.
- E. Attention is directed to the fact that the Instrumentation and Control System shall be furnished by a single pre-qualified system integrator (PICS) who shall provide all the services, equipment and appurtenances required to achieve a fully integrated and operational system. To facilitate the Owner's future operation and maintenance, products shall be of the same major instrumentation manufacturer with panel mounted devices of the same type and model as far as possible.

- F. Substitutions on functions or equipment specified will not be acceptable. To ensure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various sub systems and the establishment of minimums with regard to ranges and accuracy, strict compliance with the above requirements shall be maintained. To ensure compatibility between all equipment, it shall be the responsibility of the system supplier hereunder to coordinate all interface requirements with existing equipment and with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.
- G. Equipment shall be fabricated, assembled, installed, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer as approved by the Engineer.
- H. Equipment removed during this work shall become the property of the Owner.
- I. All equipment and installations shall satisfy applicable national, state, and local mechanical and electrical codes.
- J. Document all changes to the plant's control system, including the updating of the plant's existing control system documentation to reflect changes made during construction and discrepancies found during the investigation work.
- K. Furnish, install, connect, configure, and test PLC hardware, and software products and related items. Coordinate Process Control Network addressing schemes with Owner and incorporate agreed upon scheme for all equipment on the PCS including vendor supplied equipment.
- L. Furnish and install all equipment enclosures, power supplies, interconnecting cables, and support software and equipment required for a complete and functional system.
- M. Furnish and install all conduit, conductors, terminal boxes, and appurtenant equipment shown on the Drawings, hereinafter specified, and/or required for a complete and fully functional installation to the satisfaction of the Engineer.
- N. Configure all equipment to operate satisfactorily and demonstrate that the system is properly operating. Assist in the configuration and setup of all Variable Frequency

Drive parameters. The setup shall include data access via the Process Control Network.

- O. Inspect equipment provided under this Section prior to shipment to project site.
- P. Provide training on the OIT hardware and software supplied and implemented under this contract.
- Q. Provide a full operational system as described in the Function Descriptions and Control Strategies section of this specification.

#### 1.02 REFERENCES, CODES AND STANDARDS

- A. In general, the installation for the Process Instrumentation and Control System shall comply with the following standards:
  - 1. ANSI: American National Standards Institute
  - 2. IEEE: Institute of Electrical and Electronics Engineers
  - 3. ISA: Instrumentation, Systems and Automation Society
  - 4. UL 508 Standards for Safety, Industrial Control Equipment.
  - 5. NEMA ICS 1 General Standards for Industrial Control and Systems.
  - 6. NEMA ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies.
  - 7. NEMA ICS 3 Industrial Systems.
  - 8. NEMA ICS 6 Enclosures for Industrial Controls and Systems.
  - 9. NEMA ICS 250 Enclosures for Electrical Equipment.
  - 10. NFPA 79 Electrical Standard for Industrial Machinery
  - 11. UL 698A Intrinsic Safe Circuits.

#### 1.03 ABBREVIATIONS AND DEFINITIONS

- A. HMI Human/Machine Interface
- B. I&C Instrumentation and Control
- C. I/O Input / Output
- D. LOS Line of Sight
- E. NEC National Electrical Code
- F. PC Personal Computer
- G. PCN Process Control Network
- H. PCS Process Control System
- I. PLC Programmable Logic Controller
- J. OIT Operator Interface Terminal
- K. SCADA Supervisory Control and Data Acquisition
- L. UPS Uninterruptible Power Supply
  - 1. Process Control System A complete, integrated system of PLCs, PCs, Windows-based servers, instruments, devices, wireless and wired process control networks, software, application Engineering, and ancillary equipment for monitoring and control of wastewater collection and treatment facilities.
  - 2. Process Control Network A complete, integrated, and secured communication network consisting of equipment and cabling that provides communications between components of the Process Control System.
  - 3. System Integrator Organization, whose principle function is design, program, configure, manufacture, install and service of PCS. An organization, under the direction of the Contractor, who shall assume complete responsibility for: Detail Design, manufacture, installation, configuration, technically advising on and certifying correctness of

installation, testing and adjusting, documenting and starting-up, and training of the complete PCS.

#### 1.04 QUALITY ASSURANCE

- A. Contractor shall engage the services of a qualified System Integrator for the purposes of furnishing the Process Control System, providing technical assistance on the installation of System, and certifying the correctness of said installation. PICS shall be Data Flow Systems (DFS) based on standardization with the OWNER.
- B. The Contractor shall use only the approved system suppliers and must name his proposed system suppliers on the bid document.
- C. Equipment shall be latest and most modern design at time of Notice to Proceed.
- D. All software and firmware used in this Project shall be latest version that is compatible with each other, as of the Notice to Proceed.
- E. Like items of Equipment shall be end products of single manufacturer to achieve standardization for maintenance, spare parts, operation, and service.
- F. PCS components shall be grounded in accordance with NEC requirements.

### 1.05 SEQUENCE OF CONSTRUCTION

- A. The Contractor shall begin the submittal process within two (2) weeks after notice to proceed by submitting the name of the proposed System Integrator along with all information required to determine the adequacy of the proposed System Integrator.
- B. To ensure timely performance of the Contract and the System's conformance with Specifications, coordination meeting(s) shall be held during the project. Within fortyfive (45)

days of date of Contract Time commencement, submit Progress Meeting schedule for final coordination by Owner/Engineer, Contractor and Systems Integrator.

#### 40 61 13-5

- C. Also submit the Submittal Schedule and Project Activity Schedule for final review.
- D. Progress Meetings shall be held at the project site and designated by Owner with Owner/Engineer's, Contractor's, and System Integrator's representatives in attendance.
- E. Purpose of Progress Meetings is to obtain Owner/Engineer's clarification on intent of Contract Documents during Submittal preparation and prior to HMI and PLC software configuration at no additional cost to Owner.
- F. Progress Meeting(s) shall cover following:
  - 1. Review of functional descriptions describing equipment operation.
  - 2. Owner/Engineer selection of options.
  - 3. Owner/Engineer review documentation
- G. Prepare and submit Startup Schedule, coordinated with overall Construction Schedule including the following:
  - 1. Factory Acceptance Test(s).
  - 2. Review of Wiring Sign-Off forms by Owner/Engineer.
  - 3. I/O checkout by System Integrator.
  - 4. Plant startup.
  - 5. Training.
  - 6. Post startup services.
- H. Within one (1) month after approval of the System Integrator, all hardware and software product submittals shall be delivered to the Authority.
- I. Within two (2) months after approval of the System Integrator, detailed installation submittals shall be delivered to the Engineer.
- J. All power, control and instrumentation wiring associated with equipment, panels, devices, etc. to be removed and replaced shall be identified, marked, and then disconnected to make the equipment safe. Refer to any applicable demolition

drawings for more details. Notify the Owner prior to disconnection of any existing equipment.

- K. All work shall be coordinated with plant maintenance personnel and approved by plant operations personnel prior to beginning any work.
- L. Written consent from the Owner must be obtained not less than one (1) week prior to carrying out any portion of the work which requires interruption of service.
- M. Plant operations shall be notified no less than twenty-four (24) hours prior to beginning any work that requires disruption of plant operation.
- N. Complete any work that can be performed without interference to the existing operation of the plant control system, such as conduit and cable installations, prior to disconnecting any existing control equipment.
- O. Provide and implement a workaround to address any Plant control or monitoring process that is affected by temporary or permanent work being performed under this contract. Submit this plan to the Authority for review.
- P. Train operators in the functional operation of the new equipment.
- Q. Demonstrate that the new and existing equipment is properly configured and operating by displaying process data at the local workstation and at other workstations on the existing SCADA system and verifying the accuracy of the displayed data.

### 1.06 INSUFFICIENT INSTRUCTION

- A. The Contractor shall furnish and install all materials and equipment which are reasonably inferable to be part of the complete installation.
- B. If, in the opinion of the Contractor, any work shown on details or called for under these Specifications is insufficiently specified or specified in such a manner as to make it impossible for him to produce first-class work which will meet the approval of the Owner, he shall notify the Owner before proceeding with the work and, if he fails to refer such instances to the Owner, no excuse for poor workmanship will be entertained.

#### 1.07 FIELD ENGINEERING

- A. Where dimensions are shown or indicated, the information given is approximate only, and is not warranted by the Engineer to be either complete or correct. The Contractor shall verify actual existing conditions and dimensions in the field before ordering materials or starting construction.
- B. Drawing details indicate the general location and arrangement of conduit, wiring devices, equipment, and other products. The Contractor shall adjust the indicated locations (subject to approval in the field) as necessary to:
  - 1. Comply with all applicable code requirements.
  - 2. Permit access for construction, inspection, testing, operation, and maintenance.
  - 3. Avoid conflict with pipes, mechanical equipment, structural openings (e.g., doors), and other obstructions, as built, whether or not they are shown on the Drawings.
  - 4. Produce a neat, workmanlike arrangement.
- C. The Contractor shall determine the proper connection points for all power, control, and signal wiring, regardless of whether the connection points are in equipment furnished under this Contract, in equipment furnished by others, or in existing equipment.
- D. The Owner will make available to the Contractor any reference drawings. However, the Owner does not guarantee the correctness, completeness, or availability of reference drawings. Should the Contractor choose to rely upon the reference drawings, he does so at his own risk.
- E. The Contractor shall coordinate the making and sealing of all holes through structures to accommodate electrical conduits and supports for electrical equipment and shall submit working drawings thereof for the Owner's approval.

F. The Contractor shall ensure that proper service is provided to all mechanical equipment requiring electricity for power or control.

#### 1.08 SUBMITTALS

- A. The following information shall be provided in tabbed, booklet format covering all Project work. This is a comprehensive list and all items may not apply to this particular project.
  - 1. Submit detailed information for each instrument or control device including manufacturer's descriptive literature and a specific data sheet for each device and its configuration which shall include as a minimum.
  - 2. Tag number per the loop diagrams.
  - 3. Product (item) name used herein and on the contract drawings.
  - 4. Manufacturer's complete model number.
  - 5. Location of the device.
  - 6. Input/Output characteristics.
  - 7. Range, size, and graduations.
  - 8. Physical size with dimensions, enclosure NEMA classification and mounting details.
  - 9. Materials of construction of all components.
  - 10. Instrument or control device sizing calculations, where applicable.
  - 11. Certified calibration data on all flow metering devices.
  - 12. Accuracy, resolution, hysteresis, and frequency response.
- B. Panel Layout Drawings
  - 1. Drawings shall show all panel mounted devices to scale and dimensioned and shall include legend.

- 2. Include cross reference to a bill of material for components used.
- 3. Component designations shall match those used on elementary schematic diagrams and physical component labeling required.
- C. Elementary Schematic Diagrams Ladder type circuit diagrams prepared to facilitate the understanding of the system function and maintenance and fault detection.
  - Control devices shall be shown between vertical lines that represent control power wiring, with the left line representing control circuits common and right representing operating coils common except where permitted by Clause 9 of NFPA 79.
  - 2. Control devices shall be shown on numbered horizontal lines (rungs) between the vertical lines.
  - 3. Drawings shall include a cross referencing scheme used in conjunction with each relay, output device, limit switch, and other devices so that any contact related to a device can be readily located on the drawing.
  - 4. Component designations shall be included for all devices, with the same designations used on Panel Layout Drawings.
  - 5. Each panel terminal within a terminal strip shall be numbered; when multiple terminal strips exist, each shall be given a unique identification. Terminal strip identification shall be included on Panel Layout Drawings.
  - 6. All wires shall be numbered. Wiring and devices external to panel shall be clearly identified.
  - 7. Control devices shall utilize the symbology depicted in NFPA 79 and IEEE315.
  - 8. Switch symbols shall be shown with utilities turned off and devices in their normal starting condition. Include control settings on the diagrams when available.

- D. Panel Interconnection Diagrams Wiring interconnection diagrams prepared to show all signal and power wiring for external connections to control panels provided for Project.
  - 1. Wire and cable tags information shall be provided to Contractor in an electronic format for in physical wire and cable tagging.
  - 2. Drawings prepared on a per control panel basis.
  - 3. Show interconnecting wiring, field device, control panel, and provision for 2 field located termination cabinets.
  - 4. Interconnecting wiring shall include wire and cable tag numbers.
  - 5. Field device information shall include device tag and description, signal description, signal electrical characteristics, and range.
  - 6. Control panel information shall include terminal strip identification and terminal number.
  - 7. Drawings shall indicate source of control signal power.
  - 8. Prepare drawings in accordance with requirements of NFPA 79.
- E. PLC Equipment Layout Drawing including processing equipment, I/O components, power supplies, and peripheral devices.
- F. PLC data base list with I/O module cross reference identification for each PLC processor.
- G. PLC documentation describing memory type, size, and structure; listing of I/O; data table memory and size of memory available for all programs.
- H. PCS Equipment Layout Drawings including detailed enclosure layouts for servers, switches and communications systems with overall dimensions and equipment bill of materials.
- I. SCADA software user manuals for all applications, including operating system, describing programming methods and procedures, utilities, diagnostics,
documentation, and system support functions. Documentation covering all custom software or programming proposed or required for this Project.

- J. Network information including detailed block diagram showing system hardware and components; operating systems and software with revision numbers indicated; format, protocol and procedures for Process Control Network communications; on-line and offline capabilities for programming, system utilities and diagnostics; recommended test equipment.
- K. Process Control Network Drawings Drawings shall show connections between connected Process Control System devices including servers, HMIs, PLCs, radios, and network devices. Drawings shall indicate network domain and device addresses, subnet masks, gateways, and other pertinent network address information for both Ethernet and Devicenet systems.
- L. Detailed fiber optic system layout drawings including patch panel connections, cable ID and color code, and equipment bill of materials.
- M. Electrical power, UPS, Grounding, and DC Power Schematics for all equipment.
- N. Heat calculations for all enclosures.
- O. UPS sizing calculations.
- P. List of special tools (including software) required for instrument calibration, startup, checking, testing, parts replacement, troubleshooting, and maintenance of all components of the Process Control System. Identify any special tools specially designed or adapted for use on parts of this system.
- Q. Test Outline and Procedure Submittal A detailed description of each specified test procedure and demonstration shall be submitted for approval.
- R. Spare and Expendable Items Submittal provide a list of recommended spares and expendable items as recommended by System Integrator in sufficient quantities to sustain the Process Control System for a period of three (3) years after acceptance. A total purchase cost for the recommended list shall be provided in addition to the unit

cost for each item. The cost of obtaining spare and expendable items selected by Owner will be addressed as a Change Order at the Owner's discretion.

S. Operation and Maintenance (O&M) Data.

## 1.09 FINAL DOCUMENTATION

- A. Prior to final acceptance of the system, eight (8) sets of Operating and Maintenance manuals covering instructions and maintenance on each type of equipment shall be furnished as noted herein.
- B. The instructions shall be bound in three ring binders with drawings reduced or folded for inclusion and shall provide at least the following as a minimum.
  - 1. A comprehensive index.
  - 2. A complete "As Constructed" set of approved shop drawings.
  - 3. A complete list of the equipment supplied including serial number, ranges, and pertinent data.
  - 4. Full specifications on each item.
  - 5. System schematic drawings "As Constructed" illustrating all components, piping and electrical connections of the systems supplied under this section.
  - 6. Detailed service, maintenance and operation instructions for each item supplied.
  - 7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
  - 8. The operating instructions shall also incorporate a functional description of the entire system with references to the system's schematic drawings and instructions.
  - 9. Complete parts lists with stock numbers and name, address, and telephone number of the local supplier.

### 1.10 SOURCE QUALITY CONTROL

A. The manufacturers of the equipment and fabricators of panels and/or cabinets supplied under this section shall allow the Engineer and/or Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems and other pertinent systems and/or devices. A minimum of ten (10) working days notification shall be provide to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

# 1.11 PRODUCT HANDLING

- A. After completion of shop assembly, factory test and approval all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at jobsite.
- B. Special instructions for proper field handling, storage and installation required by the manufacturer for proper protection shall be securely attached to each piece of equipment prior to packaging and shipment.
- C. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.
- D. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number as given in the tabulation, shall be provided on each piece of equipment supplied under this section.
- E. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters and shall be adequately protected against mechanical and corrosive damage. If any apparatus has been damages, such damage shall be repaired by the Contractor at his own cost and expense. If any apparatus has been subject to possible injury by

water, it shall be thoroughly dried out and put through such tests as directed by the Engineer. This shall be at the cost and expense of the Contractor or the apparatus shall be replaced by the Contractor at his own expense.

# 1.12 WARRANTY

- A. Provide warranty in accordance with General Conditions.
- B. Furnish a copy of the warranty together with the operating instructions and maintenance data for the complete system.
- C. System defects and deficiencies shall be corrected by Contractor within twenty-four (24) hours of notification if Owner does not have necessary replacement parts in stock and within four (4) hours of notification if Owner has necessary replacement parts in stock. Failure to correct these items per these requirements may result in Contractor losing Maintenance Bond.

# PART 2 - PRODUCTS

# 2.01 SYSTEM INTEGRATOR EXPERIENCE REQUIREMENT

- A. The Contractor shall utilize a System Integrator having the experience and knowledge, as defined herein, to undertake the work specified in this Section.
- B. Shall be regularly engaged in the design, installation, and servicing of wastewater treatment PCS.
- C. Shall demonstrate the ability to produce electrical and control logic diagrams in the level of detail required by this specification.
- D. Shall have previously executed a minimum of five (5) wastewater treatment PCS projects of similar size and complexity to this Project and incorporating PLCs and HMI platforms included in this Project.
- E. Shall have previously successfully executed Ethernet wireless and wired networked projects of comparable size and complexity to this Project.

- F. The person(s) performing the field I&C work as required by the Contact Documents shall have a minimum of five (5) years' experience on PLC-based systems.
- G. Provide, on-site, a field staff technician to commission the functional testing, start-up and training as required by the Contract Documents. The individual shall have authored and commissioned control logic for no fewer than three (3) projects of similar or greater complexity and shall have a demonstrated proficiency in authoring logic in PLC Function Block Language.
- H. Upon request of Owner and in addition to other specified requirements, Contractor shall provide a minimum of five (5) System Integrator references to confirm compliance with these requirements.

# 2.02 INSTRUMENTATION

- A. All instrumentation supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards for the water and wastewater industries.
- B. All electronic instrumentation shall be of the solid-state type and shall utilize transmission signals which conform to all FCC and local requirements.
- C. Outputs of equipment that are not of the standard signals as outlined shall have the output immediately converted to compatible standard signal as for remote transmission.
- D. All instruments shall be provided with mounting hardware and floor stands, wall brackets or instrument racks as shown on the drawings, or as required.
- E. Equipment installed in a hazardous area shall meet Class, Group and Division as shown on the contract electrical drawings to comply with the National Electrical Code.
- F. All indicators and readouts shall be linear in process units.
- G. Electronic equipment shall be of the manufacturer's latest design utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture, and fungus.

Solid state components shall be conservatively rated for their purpose to assure optimum long-term performance and dependability over ambient atmospheric fluctuations and 0 and 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

- H. All equipment, cabinets and devices furnished hereunder shall be heavy duty type designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.
- I. All electronic equipment shall be provided with radio frequency interference protection.

# 2.03 ELECTRICAL

- A. All equipment shall be designed to operate on a 60 Hz alternating current power source at a nominal 110 volts plus or minus ten percent (10%), except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- B. All analog transmitter and controller outputs shall be 4-20 milliamps into a minimum load range of 0-750 ohms, unless specifically noted otherwise. All switches shall have double pole, double throw contacts rated at a minimum of 600 VA, unless specifically noted otherwise. Material and equipment used shall be UL approved wherever such approved equipment and materials are available. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored. UPS System shall be provided under this Division for control panel (CP). Refer to Division 26 Specifications for UPS requirements.

# 2.04 LIGHTNING/SURGE PROTECTION

- A. Lightning/surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the analog and discrete signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation but shall be lower than the instrument surge withstand level and be maintenance free and self-restoring. Instruments shall be housed in a suitable metallic case, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical, each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate NEMA 4X junction box coupled to the enclosure. The units shall be as manufactured by Innovation Technologies or approved equal.
- B. Power Supply Protection of all alternating current (AC) instrument power supply lines shall be provided. Cabinet(s)/panel(s) and groups of field instruments, as approved by the Engineer, shall be protected by isolation transformers and surge suppressors. Individual field instruments shall be protected by individual gas tube surge suppressors.
- C. Signal Line protection of all field analog, discrete, digital, and telemetered signal lines shall be provided. Protection devices shall be installed at both ends and as close to the instrument being protected as possible. Where signal lines enter control rooms through an interface cabinet, the protection devices shall be mounted in the interface cabinet.
- D. Warranty A five-year warranty shall be provided by the surge/lightning suppression equipment manufacturer. The warranty shall cover the replacement of all protected equipment for a period of five (5) years after the date of acceptance.

# PART 3 - EXECUTION

# 3.01 GENERAL INSTALLATION

A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms, and similar devices shown on the drawing are approximate only. Exact locations shall be as approved by the Engineer during construction.

- B. Obtain in the field all information relevant to the relevant to the placing of process control work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- C. The instrumentation loop diagrams indicate the intent of the interconnections between the individual instruments. Any exceptions should be noted.
- D. The installation details on the drawings indicate the designed installation for the equipment specified. Where specific installation details are not specified or shown on the drawings, the American Petroleum Institute (API) Recommended Practice 550 shall be followed as applicable.
- E. All work shall be executed in full accordance with codes and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, the Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.
- F. All equipment used in areas designated as hazardous shall be designed for the Class,
  Group and Division as required on the electrical drawings for the locations. All installation shall be in strict accordance with codes.
- G. Unless specifically shown in the contract documents, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands as detailed on the installation detail drawings. All instrumentation connections shall be provided with shut off and drain valves. For the differential pressure transmitters, three-way stainless-steel valve manifolds shall also be provided. For slurries, chemical or corrosive fluids diaphragm seals with flushing connections shall be provided.
- H. All piping to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adapters and shut off valves.
- I. Field instruments requiring power supplies shall be provided with local electrical shut offs and fuses as required.

- J. Brackets and hangers required for equipment mounting shall be provided. They shall be installed in a workmanlike manner and not interfere with any other equipment.
- K. The system supplier shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the system supplier shall be required to ship his material in sections sized to permit passing through restricted areas in the building. The system supplier shall also investigate and make any field modifications to the allocated space for each cabinet, enclosure, and panel to assure proper space and access (front, rear, side).
- L. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment, but in no case shall more than one ground point be employed for each shield.
- M. Lifting rings from cabinets/assemblies shall be removed. Hole plugs shall be provided for the holes of the same color as the cabinet.
- N. The system supplier shall coordinate the installation, placing and location of system components, their connections to the process equipment panels, cabinets and devices subject to the Engineer's approval. He shall be responsible to ensure that all field wiring for power and signal circuits are correctly done in accordance with best industry practice and provide for all necessary system grounding to insure a satisfactory functioning installation. The Contractor hereunder shall schedule and coordinate his work under with that of the electrical work specified under applicable sections Division 26.

# 3.02 PLC INPUT/OUTPUT SIGNAL POWER SOURCE

- A. Except for 4-wire instruments, all analog loops shall be powered from respective process control panel.
- B. 120 volts alternating and direct current for Process Control System inputs shall be sourced from respective process control panel.
- C. 120 volts alternating and direct current for Process Control System outputs shall be sourced from respective location receiving control signal.

# 3.03 FUNCTIONAL DESCRIPTIONS AND CONTROL STRATEGIES

## A. Lift Station

- 1. General description
- 2. Triplex submersible pumps to maintain level within the wet well. The pumps will be powered by variable frequency.
- 3. Operating modes
  - a. The pumps shall operate in one of three modes as dictated by the position of the Hand-Off-Auto switch on the VFD/control panel.
  - b. OFF pump not running
  - c. HAND pump will run using the local potentiometer to control speed
  - d. AUTO pump start/stop, and speed control will be based on output from the RTU control panel to maintain wet well level
- 4. Alarms & Indications
  - a. PUMP RUN/FAIL
  - b. PUMP START/STOP
  - c. PUMP SPEED
  - d. VFD FAULT
- B. Backup Float Operation
  - 1. General description
  - 2. The wet well will have a level transducer for normal operation and floats for backup operation.
  - 3. Operating modes

- a. When high level alarm float is activated the pumps shall run full speed and alternate on/off based on float controls.
- b. OFF pump not running
- c. HAND pump will run full speed from VFD
- d. AUTO pump start/stop, at full speed based on output from the RTU control panel to maintain wet well level, based on on/off floats
- 4. Alarms & Indications
  - a. BACKUP FLOAT OPERATION STATUS
- C. Submersible Mixer
  - 1. General description
  - Submersible mixer powered by a motor starter in the pump control panel. Mixer to run 24/7 and RTU to monitor status and alarms.
  - 3. Operating modes
    - a. The mixer shall operate in one of three modes as dictated by the position of the Hand-Off-Auto switch on the pump control panel.
    - b. OFF mixer not running
    - c. HAND mixer will run full speed
    - d. AUTO mixer will run full speed
  - 4. Alarms & Indications
    - a. MIXER RUN/FAIL
- D. Odor Control
  - 1. General description
  - 2. Biological odor control unit with fan and recirculation pump with control panel provided by equipment manufacturer. RTU to monitor status and alarms.

#### 40 61 13-22

- 3. Operating modes
  - a. The mixer shall operate in one of three modes as dictated by the position of the Hand-Off-Auto switch on the pump control panel.
  - b. OFF fan and recirc pump not running
  - c. HAND fan and recirc pump will run full speed
  - d. AUTO fan and recirc pump will run full speed
- 4. Alarms & Indications
  - a. ODOR CONTROL RUN/FAIL
- E. Generator and ATS
  - 1. General description
  - 2. Permanent standby generator to have annunciator panel for communications to RTU system. RTU to monitor status and alarms.
  - 3. Operating modes
    - a. Generator control panel to provide controls for generator, ATS and fuel tank. RTU to monitor status and alarms.
  - 4. Alarms & Indications
    - a. GENERATOR RUN/FAIL
    - b. GENERATOR PRE-ALARM
    - c. GENERATOR ALARM
    - d. GENERATOR LOW FUEL
    - e. GENERATOR FUEL TANK LEVEL

### 3.04 FIELD QUALITY CONTROL

- A. Throughout Contract, Contractor shall provide protection for materials and equipment against loss or damage and the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Specific storage requirements shall be in accordance with the Engineer-reviewed System Integrator's recommendations.
- B. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish.
- C. Panels and panel-mounted devices shall be assembled as completely as possible at the System Integrator's factory. No work, other than correction of minor defects or minor transit damage, shall be done on the panels at the job site.
- D. Provide the services of a qualified technician to supervise and inspect equipment installation to ensure system is installed in accordance with System Integrator's recommendations.
- E. All materials, equipment, and workmanship shall be subject to observation at any time by Engineer's representatives. Correct any work, materials, or equipment not in accordance with

these Contract Documents or found to be deficient or defective. Make corrections in a manner satisfactory to Engineer at no additional cost to Owner.

- F. Supervise final power and signal connections by Contractor to all equipment provided under this Section. For all equipment provided under this Section and all other equipment interfaced by the system, the System Integrator shall verify and certify by written notice to Engineer, correctness of final signal connections and correctness of adjustment.
- G. Field calibrate equipment at time of complete startup on loop-by-loop basis. Submit calibration certification to Engineer for each piece of equipment. Make adjustments necessary to place equipment in satisfactory operation.
- H. During this startup period, Contractor's personnel are to thoroughly check all of the equipment and perform the on-site tests specified above.
- 3.05 TESTS
  - A. The Contractor shall furnish the services of the system suppliers' servicemen, all special tools, calibration equipment and labor to perform the tests. Certified copies of the tests shall be furnished in duplicate to the Engineer.
  - B. Following connections, check-out and final adjustment of all panels, instruments, meters, monitoring and control devices, a performance check shall be made on each. Analog instruments and system inputs shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, 100 percent, and 1001 percent of scale, as required. All status and alarm switches as well as all monitoring and control functions shall also be checked. Each device on the loop/logic diagrams must be signed off by the Engineer as being acceptable. Testing shall be done from the signal source (transmitter) to the Data Acquisition and Process Control System including all field wiring.
  - C. If, during running of the tests one or more points appear to be out by more than the specified amount, the system supplier's servicemen shall make such adjustments or alterations as are necessary to bring equipment up to Specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance.

### 3.06 INSTRUCTION

A. The Contractor shall furnish a system supplier's representative for a field training program to be run at the Owner's plant site and consist of up to two (2) days instruction for two of the Owner's personnel. The program shall cover instrumentation debugging, troubleshooting, calibration and maintenance procedures and system operation. This training program will be held at a time chosen by the Owner and will be exclusive of any instruction given at the time of system start-up.

### 3.07 SUBSTANTIAL COMPLETION

- A. Completion shall require the following process instrumentation and control work is successfully completed:
  - 1. Owner's receipt of required site documentation including required O&M material.
  - 2. Owner's receipt of Fiber testing submittal.
  - 3. PLC and panel spare parts.
  - 4. "As Built" drawings
  - 5. Fully commented PLC program.
  - 6. Completion of specified training associated with equipment provided.
  - 7. Successful completion of the specified demonstration period.
  - 8. Owner's receipt of required tools.

### END OF SECTION

# SECTION 44 31 31 ODOR CONTROL BIOTRICKLING FILTER

## PART 1 - GENERAL

- A. The work specified shall include furnishing and testing of all equipment and materials necessary to provide the Owner with a completely operational Biotrickling Filter (BTF) for removal of hydrogen sulfide (H2S) and other volatile organic compounds (VOC's) from the treated air.
- B. The Biotrickling Filter Odor Control System shall consist of a fiberglass biotrickling filter vessel, synthetic media and media support system, spray header pipe and nozzle(s), odorous air blower and process control system skid. All major system components, vessels, blower, controls and interconnecting duct between the biotrickling filter and the carbon polisher shall be from the same supplier for single source responsibility.
- C. The odor control system shall include all interconnecting ductwork between the blower and biotrickling filter vessel.

### 1.01 PROCESS DESCRIPTION

- A. The system shall perform in accordance with the design basis. It shall be designed for continuous operation in a highly corrosive environment.
- B. The biotrickling filter odor control system shall utilize a high surface area synthetic/inert media to provide an optimal site for growth of microorganisms (aka: biomass). This media has a high surface/high void area for optimal treatment in a small footprint. A blower conveys the odorous air from the odor source to the bottom plenum of the vessel where the air then passes upward through the vessel and media bed. As the odorous air travels upward, it contacts the biomass where non-pathogenic sulfur oxidizing bacteria that are immobilized on the synthetic media remove H2S and other odorous VOCs. The counter-current flow of air and water/nutrients enhance the mass transfer to the bacteria

where the biological sulfide oxidation takes place and odorous compounds are converted to weak sulfuric acid and other soluble sulfates and are removed in the drain water. To maintain a healthy biological population, water and nutrients are conveyed from the nutrient feed panel to the spray header above the media bed via plant water pressure and/or a recycle pump. Neutralizing or oxidizing chemicals shall not be utilized to accomplish odor control within the biotrickling filter.

### 1.02 MANUFACTURERS

- A. The biotrickling filter supplier shall be experienced in the design, construction and successful operation of biotrickling filter odor control systems for the removal of hydrogen sulfide gas and other odor producing compounds from air ventilated from wastewater treatment systems.
- B. The biological odor control system shall be designed and manufactured by
  - 1. Heyward Florida Incorporated.
  - 2. Evoqua Water Technologies
  - 3. Or Engineer Approved Equal
- C. Systems utilizing organic, lava rock, stone or PUF media shall not be accepted.
- D. Vessels shall be fiberglass construction only. Systems using HDPE, PVC, Polypropylene, or PVC overlays shall not be accepted.

### 1.03 WARRANTY

A. The complete biological odor control system and all components shall carry a 3year "Full Replacement Warranty" that shall begin once the unit has been started and is meeting all performance requirements. The synthetic/inert biological media and support grating shall carry a 10-year non pro-rated full replacement warranty. Cost of removal and replacement of media shall be by Owner.

### 1.04 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The manufacturer shall provide the services of a qualified service technician that is a direct employee of the manufacturer. The technician shall adequately supervise the installation and testing of all equipment furnished under this contract and instruct operating personnel in its proper maintenance and operation. The manufacturer shall provide service technician for the following:
  - a. One trip for a pre-installation orientation review.
  - b. One trip for pre-startup readiness inspection.
  - c. One trip one day on site for start-up and training.
  - d. Two trips to check and optimize the system.
  - e. One trip for two days on site for performance testing.
  - f. Two trips during the first year to ensure proper operation.
  - g. Emergency 24-hour call back response and 5 business day for on-site visit if needed during the first year.
- B. The biotrickling filter system with other associated equipment such as the blower, piping and controls shall be field-tested by a direct employee of the manufacturer.
- C. Manufacturer shall supply all nutrients required for startup and testing and provide a 3-month supply after acceptance by owner. Owner shall be responsible for providing 20 25 gallons of seed sludge during startup.
- D. The startup and testing shall meet the performance guarantees described under performance requirements listed herein. All equipment shall show evidence of mechanical soundness, no evidence of liquid or gas leaks, no undue vibration and generally be structurally rigid when being tested.
- E. The odor control system supplier service technician performing the system startup and field test shall furnish the consulting engineer a written report certifying that the unit is operating according to specifications.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. The biotrickling filter shall be a cylindrically shaped fiberglass vessel with upflow air passage and countercurrent liquid flow. The biotrickling filter vessel shall include an engineered baffles to ensure 0% bypass of the air stream around any of the media bed.
- B. The vessel shall be constructed from UV resistant fiberglass reinforced plastic (FRP) composite materials suitable for an internal environment containing low grade sulfuric acid. The resin used shall be Vipel F701 isophthalic polyester as manufactured by AOC, or equal.
- C. The finished laminate shall be free from visual defects such as foreign inclusion, dry spots, air bubbles, pin holes, pimples, delamination, exposed reinforcement (glass fibers), and runoff. The exterior surface shall be smooth, with no sharp projections. Care shall be taken to fill voids and crevices at joints and fittings.
- D. The vessel shall include a structural media support system that supports the media bed under dry and wet conditions, fiberglass grating and plastic retaining mesh.
- E. The vessel shall include two (2) cover lifting lugs, three (3) vessel lifting lugs, and eight (8) anchor clips.
- F. The biotrickling filter media shall consist of high service area, non-plugging, nondegradable synthetic polyethylene balls. Systems utilizing organic media, lava rock, stone, glass or PUF foam media shall not be accepted.
- G. The vessel shall include a 2" diameter Sch 80 PVC spray header with at least one nozzle that evenly distributes water and nutrients across the entire surface of the media bed.
- H. The vessel shall include two (2) 1.5" drain fittings, a 6" diameter plain end inlet, a 6" diameter plain end PVC outlet at the top, and two (2)  $\frac{1}{2}$ " differential pressure

sensing fittings; one fitting above the spray header and one in the plenum. The pressure sensing fittings and one of the drain fittings shall be provided with a threaded plug.

- I. The vessel shall include one (1) 18" top hatch and three (3) sidewall 12" diameter observation/access hatches; one at the level of the spray header, one at the bottom of the biological media bed, and one in the plenum.
- J. The discharge pipe shall include a 1" air sampling fitting with an internal nipple and elbow that extends the inlet into the center of the discharge pipe. The contractor shall install 1" Schedule 80 PVC pipe from the air sampling fitting down to the side of the vessel within 5' of grade elevation including stainless steel floor mounted support.
- K. All materials of construction including miscellaneous hardware shall be resistant to attack by the corrosive compounds present in the air stream, as well as those present in the recirculating liquid, including biodegradation by-products. Nuts, bolts, and washers, lifting lugs, and anchor clips shall be 316 stainless steel. All exposed parts shall be suitable for direct sunlight.
- L. All components of the odor control system shall be installed in strict accordance with the supplier's instructions and under the guidance of supplier's field service representative.

# 2.02 BIOTRICKLING FILTER PROCESS CONTROL SKID

- A. A process control system skid shall be provided to operate the exhaust fan, nutrient pump, actuator valve, recirculation pump, instrumentation, and all other system components. A 3ph/60hz/208-230/460V AC power feed and a suitable irrigation water source shall be supplied to the skid by the contractor.
- B. The skid shall be fabricated of non-corrosive materials such as polyethylene, fiberglass, aluminum, or stainless steel. It shall house the Power Distribution Panel, the Water/Nutrient Feed System, the Water/Nutrient Timer Panel, a step-down transformer, blower VFD, the recirculation pump, and the nutrient storage

tank all pre-piped and pre-wired at the factory. The nutrient tank shall be sized to provide 30 days of nutrient solution storage. The skid shall also include an integral sun and rain shield.

- C. The process control system control panels shall be rated NEMA 4X or NEMA 3R stainless steel or FRP with all stainless steel mounting hardware as necessary. The Power Distribution Panel shall contain the main power disconnect switch, circuit breakers and power distribution terminal blocks. The Water/Nutrient Feed System shall include a peristaltic-type nutrient feed pump, electric actuated control valve, pressure reducing valve, manual flow control valve, flow meter, and pressure gauge. The Water/Nutrient Timer Panel shall contain the cycle timer, the water valve timer, the nutrient feed pump timer the recirc pump motor starter and overload.
- D. The components on the process control skid shall be connected using Asahi America Schedule 80 PVC piping and ball valves, and all the components necessary for a complete packaged system for operational process control of the biotrickling filter system. Installation shall only require connection of 3-phase power to the Power Distribution Panel, and from the VFD to the blower. It shall also require field installation of a 1.5" water supply line to the inlet water connection on the skid, and a 1.5" line from the irrigation water outlet to the irrigation spray header connection on the biotrickling filter vessel.
- E. The water control system shall be capable of "Dual Mode" operation with the flexibility to operate in a constant liquid recirculation mode (uniform media bed pH) or intermittent freshwater mode (stratified media bed pH) to allow for wider operational control of site-specific odor streams.
- F. The system supplier shall provide a prefabricated Schedule 80 PVC overflow/sampling assembly that shall be installed downstream of one of the 2" drain fittings on the biotrickling filter vessel. Upstream of this assembly, the contractor shall install a schedule 80 PVC tee, and a 1.5" recirculation pump feed line shall be run to the recirc pump inlet connection on the process equipment skid for use during system acclimation and constant recirculation mode of operation. Downstream of this assembly a 1.5" drain line shall be routed to a drain for gravity drainage of the vessel during intermittent freshwater mode of operation.

- G. System supplier shall include all parts and components necessary for start-up, acclimation, and successful operation of the system. All these parts and components shall be left with the owner.
- H. Spare Parts (to include but not limited to)
  - a. Nutrient pump rebuild kit
- I. The system may receive plant effluent water, if available, for nutrient supply provided the maximum chlorine residual is less than 5-ppm. Otherwise, a potable water source shall be utilized.
- J. Contractor shall be responsible for the PVC pipe from the wet well to the suction side of the blower and from the blower to the biotrickling filter vessel.

### 2.03 PERFORMANCE REQUIREMENTS

A. The odor control system shall be designed for the following operating conditions and criteria:

Specified Air Flowrate (CFM)	600
Minimum EBRT (Empty Bed Residence Time)	20 seconds
at specified air flow flow rate *	
H <sub>2</sub> S In, ppmv (maximum)	500
H <sub>2</sub> S In, ppmv (average)	250
Minimum H2S Removal Efficiency / 24 hr Avg.	99 %
Max. Pressure Loss Across Biological Reactor	2.0" wc

## 2.04 BLOWERS

A. Blowers shall be corrosion resistant cast aluminum or FRP direct/indirect drive.

- B. All internal and external blower hardware shall be 316 stainless steel.
- C. Motors shall be high-efficiency, 1.15 service factor, 3phase/60hz 208-230/460V. Motors shall be stainless steel washdown/inverter duty induction type motors with sealed lubricated bearings mounted on a corrosion resistant aluminum or stainless steel motor pedestal.
- D. Blower impeller shall be dynamically balanced prior to assembly.
- E. The blower motor shall be energized by a VFD mounted within an integral NEMA 4X enclosure on the process equipment skid. A PVC isolation damper, provided by the odor control system supplier, shall be used to isolate the blower from the wet well during periods of maintenance.
- F. Fan inlet/outlet shall be provided with a flexible rubber boot or expansion joint with stainless steel band or attachment hardware. The fan shall be anchored to the concrete pad without the need for vibration isolators.

Exhaust Fan Design Requirements	Value
Air Flow Rate / cfm	600
Total Pressure Drop (Biotrickling Filter, Duct Work)/inches w.c.	6
Motor HP (stainless steel washdown/inverter duty induction type)	2

# PART 3 - EXECUTION

# 3.01 GENERAL

A. All parts for the odor control system shall be installed in strict accordance with the manufacturer's requirements and under the guidance of the manufacturer's field representative.

### 3.02 WORKMANSHIP (Fiberglass)

A. Fiberglass Vessels: The finished laminate shall be free from visual defects such as foreign inclusion, dry spots, air bubbles, pin holes, pimples, delamination, exposed reinforcement (glass fibers), and runoff. The exterior surface shall be smooth, with no sharp projections. Care shall be taken to fill voids and crevices at joints and fittings. Upon request, representative laminate samples shall be sent to the Engineer prior to fabrication for approval of surface finish and visual defects. The installed, fabricated work shall be identical in surface finish and visual defects.

# 3.03 FIELD ACCEPTANCE TESTS

- A. General
  - 1. The biotrickling filter system with other associated equipment such as the blower, fan, recirculation pump, piping and controls shall be field-tested.
  - 2. The contractor shall furnish all labor and equipment to the manufacturer's technical representative for conducting the tests.
  - 3. The test shall meet the performance guarantees described under performance requirements listed herein. All equipment shall show evidence of mechanical soundness, no evidence of liquid or gas leaks, no undue vibration and generally be structurally rigid when being tested.
  - 4. The Manufacturer representative witnessing the Biotrickling filter system field test shall furnish the Owner a written report certifying that the unit is operating according to specifications.
- B. Test Procedures
  - 1. The performance tests shall be conducted after installation with odorous air streams present in wet well and without the need of supplemental H2S.

- 2. The biotrickling filter odor control system shall be allowed a minimum of 4 weeks of continuous and uninterrupted operation for the bacteria to acclimate and for any adjustments that may be needed prior to conducting performance testing.
- 3. The odor control system shall be tested under actual operating conditions to demonstrate that it will perform as required. At which time air flow rates, water and nutrient feed rates, and other controllable parameters must remain constant and recorded.
- 4. The test shall last at least twenty-four (24) consecutive hours with intermittent data logging from the inlet and outlet of the scrubber system using an OdaLog portable gas detection instrument. Instantaneous performance testing will also be required and recorded during the post startup quarterly visits as described previously.
- 5. Hydrogen sulfide concentration shall be measured in the biotrickling filter inlet and outlet using freshly calibrated OdaLog meters.
- 6. A description of the performance test and written report shall be submitted to consulting engineer documenting proper operation and performance. The hydrogen sulfide removal efficiency shall be as specified in the performance requirements listed herein.
- 7. Any additional time required to achieve successful operation shall be at the expense of the odor control system supplier and not the customer.

# END OF SECTION