LAKE COUNTY
LEACHATE TANK REPLACEMENT
TECHNICAL SPECIFICATIONS
AND DRAWINGS

Project No. 12090-022-01

Owner:

LAKE COUNTY SOLID WASTE
13130 County Landfill Road
Tavares, Florida 32778-9438

Engineer:

JONES EDMUNDS & ASSOCIATES, INC.
730 NE Waldo Road
Gainesville, Florida 32641

Certificate of Authorization #1841

March 2010

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GENERAL REQUIREMENTS

SECTION 01000
PROJECT REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. 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 01100: 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:

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.

1. 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.

2. 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.

3. 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. No separate payment shall be made therefor.

4. 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.

5. 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.

6. 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.

7. 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 RELATED WORK (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED

1.08 DELIVERY, HANDLING, AND STORAGE (NOT USED)

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1.10 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 one (1) complete set of reproducible plans (22 inches by 34 inches), (11 inches by 17 inches), and one (1) set of PDF files on CD.

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 therefor 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 the Engineer 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 therefrom, 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.

1.11 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.

1.12 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. Five (5) copies 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. Electrical equipment shall meet all requirements for a UL rated system.

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 Contractors 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01100
SUMMARY OF WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

Unless otherwise expressly provided in the Contract Documents, the Work must be performed in accordance with best modern practice, with materials and workmanship of the highest quality to the satisfaction of the Owner.

A. The Project title is "Leachate Tank Replacement."

B. Furnish all labor, materials, equipment and incidentals required to demolish, furnish, and install two new leachate storage tanks and repair and replace associated existing mechanical and electrical equipment as shown on the Drawings and as specified herein.

C. The Work includes, but not necessarily limited to, the following:

1. Mobilization and demobilization.
2. Provide temporary facilities, including but not limited to sanitary facilities and water for tank testing and other construction activities. There is a fire hydrant available approximately 200’ from the site. (This is a City of Tavares hydrant and there will be a cost associated with it to the Contractor.)
3. Disconnect tank sidewall assembly from existing embedded starter ring assembly
4. Disassemble tank sidewall panels and roof assembly.
5. Remove existing embedded starter ring at concrete floor slab level.
6. Dispose of tank and roof panels, tank fasteners, and other non-reusable materials.
7. Salvage for reuse, existing items in reusable condition, as designated by the Owner and as acceptable to the tank manufacturer per Section 01200.
8. Maintain and manage leachate flow, storage, and collection operations at all times by keeping one tank in operation, and providing as necessary any bypass pumping, temporary piping, temporary electrical, and/or temporary control conduit and wiring.
9. Perform foundation modifications if necessary for the construction of the new tanks and complete concrete repairs.
10. Furnish and install two new tanks for leachate storage, one at a time.
11. Install salvaged or new fill pipes, overflow pipes, manways, ladder assemblies with platforms, and roof hatches and vents.

12. Reinstall all level sensors and controls, float switches, alarms, wiring, conduit, control panels, yard piping, valves, pumps, electrical equipment, etc. as may be required for the operation of the tank and to complete the installation.
13. Each tank will be disassembled and replaced individually. At no time can both tanks be out of service. The second tank disassembly will begin after the first tank has been replaced and is operational.
14. Install cathodic protection system if required.
15. Equipment certification, testing, start-up, troubleshooting, and training.
16. Cleanup and site restoration.
17. Project Closeout services including Record Drawing preparation.

D. The specification divisions and drawings are an integrated part of the contract documents and, as such, will not stand alone if used independently as individual sections, divisions, or drawing sheets. The drawings and specifications establish minimum standards of quality for this project. They do not purport to cover all details entering into the design and construction of materials and equipment.

1.02 RELATED WORK (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 WORK SEQUENCE

A. The Contractor shall be responsible for preparing and submitting a construction schedule and sequence of construction plan for review and approval by the Engineer and Owner. The sequence of construction schedule shall follow the approved sequence of the construction plan. All work shall be constructed, complete, and ready for service within the time stipulated in these Contract Documents.

B. The Contractor shall be solely responsible for the means, manpower, methods, techniques, schedule, sequences and procedures of construction, and all safety programs.

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE

A. Laws and Regulations: The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the work. If the Contractor observes that the Specifications or Drawings are at variance therewith, the Contractor shall give the Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate modification. If the Contractor performs any work knowing or having reason to know that it is contrary to such laws, ordinances,

rules, and regulations, and without such notice to Engineer, the Contractor shall bear all costs arising therefrom; however, it shall not be the Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules, and regulations.

B. Regulatory Requirements: The Contractor shall be responsible for obtaining a copy of all permits and for complying with any provisions or requirements that may relate to the conduct of construction activities.

1.07 WARRANTIES

A. Warranties shall be in accordance with General Conditions and Specification Section 01740, Warranties and Bonds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

B. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

1.09 QUALIFICATIONS (NOT USED)

1.10 GENERAL REQUIREMENTS

A. The Contractor shall obtain, maintain, and pay for all other permits, licenses and comply with building and construction codes and other authorizations required for the prosecution of the work, and bear the cost of all work performed in compliance with the terms and conditions of such permits, licenses, and authorizations, whether by himself or others.

B. Staging Area: The Owner will allow the Contractor to store equipment, pipe, and other materials on selected property within the project limits. All other outside storage or office sites are to be obtained and paid for by the Contractor at no additional cost to the Owner.

C. Protection of Adjacent Property: If adjacent property and existing drainage facilities, ditches, and canals are affected or endangered by any work done under this Contract, it shall be the responsibility of the Contractor to take whatever steps are necessary to

protect the adjacent property and drainage systems and to contact the Engineer detailing the resolution of any problems.

D. Taxes: The Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by him in accordance with the law of the place of the project.

E. Labor, Materials, and Equipment:

1. The Contractor shall provide competent, suitably qualified personnel to survey and layout the work and perform construction as required by the Contract Documents. The Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the work or property at the site or adjacent thereto, and except as otherwise indicated, all work at the site shall be performed during regular working hours, and the Contractor will not permit overtime work or the performance of the work on Sunday, or any legal holiday without the Owner's written consent given after prior written notice to the Engineer.

2. Unless otherwise shown, the Contractor shall furnish all materials, equipment, labor transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities, and all other facilities and incidentals necessary for the execution, testing, initial operation, and completion of the work.

3. The Contractor shall be responsible for all materials furnished by him and shall replace at his/her own expense all such material found to be defective in manufacture or damaged in handling. This shall include the furnishing of all materials and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work.

F. Contractor Use of Premises:

1. The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

2. The Contractor shall not enter upon other private property for any purpose without first securing the permission of the property owner in writing and furnishing the Engineer with a copy of said permission. This requirement will be strictly enforced, particularly with regard to such vacant properties as may be utilized for materials storage.

3. The Contractor shall conduct his/her work in such a manner as to avoid damage to adjacent private or public property. Any damage to existing structures or work of any kind, including permanent reference markers or property corner markers, or the interruption of a utility service, shall be repaired or restored promptly at no additional expense to the Owner.

4. The Contractor shall preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not reasonably interfere with the construction, as determined by the Engineer. The Contractor shall be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials, or tracking of grass by equipment. The Contractor shall be liable for, or shall be required to replace or restore at no additional expense to the Owner, all vegetation not protected or preserved as required herein that may be destroyed or damaged.

5. The Contractor will not be required to move or remove any utilities except as specifically required by the Drawings and Specifications.

6. During the progress of the work, the Contractor shall keep the premises free from accumulations of waste materials, rubbish, and other debris resulting from the work. At the completion of the work, the Contractor shall remove all waste materials, rubbish, and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by the Owner. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

7. The Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the Contractor subject any part of the work or adjacent property to stresses or pressures that will endanger it.

1.11 EQUIVALENT OR SOLE-SOURCE MATERIALS AND EQUIPMENT

A. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specified item mentioned shall be understood as establishing the type, function, and quality desired, unless specified in the plans and specifications as being necessary for the proper operation and function of the project. If so stated as a “sole-source” vendor and manufacturer, the Contractor shall match exactly the manufacturer, model, and type as shown in the plans. For materials not so stated, other manufacturers' products may be accepted provided sufficient information is submitted to allow Engineer to

B. Requests for review of equivalency will not be accepted from anyone except the Contractor.

1.12 ACCESS TO WORK AREAS

A. Owner will provide the access to the work areas. Contractor shall confine his/her construction operations within the areas for buried utilities and pipelines, tanks, and pump stations indicated on the drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to existing property and interference with plant operations.

1.13 NOTICES TO OWNER AND AUTHORITIES

A. Contractor shall notify the Owner and utilities when prosecution of the Work may affect them.

B. Utilities, the Owner, and other concerned agencies shall be contacted at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.14 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, the Contractor shall make all necessary connections for all local trailers, offices, or other temporary facilities to existing facilities, such as electric, telephone, water, and sewer. In each case, the Contractor shall receive permission from the Owner and the owning utility prior to undertaking connections, at no additional cost to the Owner. The Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities that are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.15 UNFAVORABLE CONSTRUCTION CONDITIONS

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his/her operations to work, which shall not be affected adversely by such conditions. No portion of the Work shall be constructed under

B. If the Contractor must discontinue work until the weather conditions improve, make all necessary provisions for public safety, such as covering all open excavations, providing barricades and orange construction netting, installing flashing lights, moving equipment back to the Contractor's yard, and other provisions, similar to closing the site for nighttime.

1.16 CLEANING UP

A. The Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. The Contractor shall provide adequate trash receptacles about the site and shall promptly empty the containers when filled.

B. The Contractor shall stockpile all construction materials in a neat and workman-like manner. The Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

C. Volatile wastes shall be properly stored in covered metal containers and removed daily.

D. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

E. The accumulation of dirt, stones, and other excavated materials away from trenches shall be controlled. All dirt shall be cleaned up and nearby paved areas swept prior to shutdown of daily operations, or as directed by the Engineer.

F. Adequate cleanup will be a condition for recommendation of progress payment applications.

G. The Owner shall reserve the right to limit the movement of construction crews when an area is not acceptably cleaned. Delays caused to the Contractor because of the Contractor's negligence in keeping the construction areas cleared shall be absorbed by the Contractor at no additional costs to the Owner in time or money.

1.17 APPLICABLE CODES

A. References in the Contract Documents to local codes mean Lake County codes, local municipality codes, FDOT regulations, and the Standard Building Code of the Southern Building Code Congress International, Inc.

B. Other standard codes, which apply to the Work, are designated in the specifications.

1.18 WORKING HOURS

A. Workdays shall consist of ten (10) hours maximum, between 7:00 am and 5:00 pm.

B. Work under this contract shall not be prosecuted on Sundays or on state and/or national holidays, except in time of emergency, and then only under written permission from the Owner who shall be the sole judge as to the urgency of that situation. On weekdays and Saturdays, the workday shall be limited to daylight hours.

C. Should the Contractor deem it necessary to work on Sundays, holidays, or beyond daylight hours in order to comply with his construction schedule or because of an emergency, the Contractor shall request permission of the Owner to do so. If, in the opinion of the Owner, the need is bona fide, he will authorize the Contractor to work such hours as may be necessary.

1.19 ORDINANCES, REGULATIONS, STANDARDS, AND CODES

Reference in the specifications to known standards, codes, specifications, etc., promulgated by professional or technical associations, institutions, and societies, is intended to mean the latest edition of each such standard adopted and published as of the date of the Advertisement for Bid on this project except where otherwise specifically indicated. Each such standard referred to shall be considered a part of the specifications to the same extent as if reproduced herein in full. The following is a list of applicable documents that apply to this contract.

American Association of State Highway and Transportation Officials (AASHTO)
Formerly (AASHO)

American Concrete Institute (ACI)

American Institute of Steel Construction (AISC)

American Iron and Steel Institute (AISI)

American National Standards Institute (ANSI)

American Standards Association (ASA)

American Society of Mechanical Engineers (ASME)

American Society of Testing and Material (ASTM)

American Water Works Association (AWWA)

American Welding Society (AWS)

Anti-Friction Bearing Manufacturer's Association (AFBMA)

Building Officials and Code Administrators International, Inc. (BOCA)

Construction Specifications Institute (CSI)

Federal Specification (FS)

Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, Latest English Edition (Standard Specifications)

FDOT Roadway and Traffic Design Standards Latest English Edition (FDOT Index)

National Bureau of Standards (NBS)

National Electrical Manufacturer's Association (NEMA)

National Fire Protection Association (NFPA)

Portland Cement Association (PCA)

Occupational Safety and Health Act (Public Law 91-596), U.S. Department of Labor (OSHA)

Steel Structures Painting Council (SSPC)

Southern Standard Building Code (SSBC)

Underwriters' Laboratories, Inc. (UL)

United States of America Standards Institute (USASI)

Regulations of Florida Industrial Commission Regarding Safety

All local, state, county, or municipal building codes requirements of the Owner's Insurance

1.20 SAFETY AND PROTECTION

A. The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

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

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

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

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

C. All damage, injury, or loss to any property referred to in Paragraph 1.20.A.2 or 1.20.A.3 caused, directly or indirectly, in whole or in part, by the 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 the 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 the Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. The 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 the Engineer has issued a notice to the Owner and the Contractor that the Work is acceptable.

1.21 SAFETY REPRESENTATIVE

A. The 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.

1.22 HAZARD COMMUNICATION PROGRAMS

A. The 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.

1.23 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, the Contractor is obligated to act to prevent threatened damage, injury, or loss. The Contractor shall give the Engineer prompt written notice if the 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 the Engineer determines that a change in the Contract Documents is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01200
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section covers methods of measurement and payment for items of work under this Contract.

B. The total Contract Price shall cover all work required by the Contract Documents. All cost in connection with the proper and successful completion of the work, including furnishing all materials, equipment, and tools and performing all necessary labor and supervision to fully complete the work, shall be included in the unit price and lump-sum Bid prices. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary/ancillary obligation of the Contractor and all costs in connection with these subsidiary/ancillary obligations shall be included in the Bid(s) to provide a complete and functional Project.

1.02 LUMP SUM

A. For lump-sum items, payments shall be made to the Contractor in accordance with an accepted Progress Schedule of Values on the basis of actual work completed and accepted by the Owner at the final completion of the Project.

1.03 UNIT PRICE

A. For unit price items, payment shall be made based on the actual amount of work accepted by the Owner and for the actual amount of materials in place at the final completion of the Project, as confirmed by the final measurements.

B. After the work is completed and before final payment is made, the Engineer will make final measurements, with all required assistance from the Contractor, to determine the quantities of various items of work accepted as the basis for the final unit price payment.

1.04 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of unit price work not requiring a Change Order(s), as herein provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract unit price multiplied by the actual quantities of work constructed and accepted by the Owner at the completion of the project.

B. The actual percentage of each lump sum bid item completed by the Contractor and accepted by the Owner at the final completion of the Project will be paid to the Contractor.

1.05 DELETED ITEMS

A. Should any items contained in the Bid Form(s) be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract. This action shall in no way invalidate the Contract and no financial allowance or compensating payment for anticipated profit, overhead, etc. will be made for items so eliminated in making final payment to the Contractor.

1.06 PARTIAL PAYMENTS

A. Partial payments shall be made monthly as the work progresses based on the Schedule of Values.

1.07 PAYMENT FOR STORED MATERIAL DELIVERED TO THE PROJECT

A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable materials and equipment to be incorporated into bid items, which have not been used, and which have been delivered to the construction site or placed in storage places acceptable to the Owner. The Contractor shall provide receipts for all stored material items requested for reimbursement which clearly identify the stored material item, where it is to be constructed, the unit cost of the item, as well as the total cost of the delivered item(s), the quantity of the item, the brand name of the item, and the supplier. Note that there are additional documentation requirements and storage requirements within the Contract Documents that must also be met before the Contractor can be reimbursed for these stored materials.

B. No payment shall be made for fuels, supplies, installation or connection hardware, lumber, false work, or other similar materials or on temporary structures or other work (items) of any kind which are not a permanent part of the Contract. Items having a value of less than $2,500 shall not be compensated for as a stored material item.

1.08 FINAL PAYMENT

A. If requested by the Engineer, the Contractor shall field verify all quantities in dispute by using visual observation, taped measurements, or other methods designated by the Engineer. The field verification shall be made in the presence of the Engineer and agreed to by both the Engineer and the Contractor. The Engineer will prepare a final adjusting Change Order which will adjust the final quantities of the project Bid Form

to reflect the actual work accepted by the Owner and for which the Contractor will be compensated.

1.09 SCHEDULE OF VALUES

A. A schedule of values for the lump-sum bid items shall be submitted and accepted before the first pay request is approved by the Engineer. The schedule of values shall be based on the prices bid in the Bid Form(s). Prices bid in the Bid Form(s) cannot be changed in the schedule of values; they can only be broken down into more detail so that the Engineer can more accurately pay the Contractor for the completed work.

1.10 MISCELLANEOUS CONSTRUCTION ITEMS

A. The Contractor shall take all precautions necessary to protect existing utilities, roads, and miscellaneous items from damage during construction.

B. The Contractor shall repair, relocate, or replace existing utilities, roadways, and miscellaneous items to pre-construction conditions.

C. All repairs, relocations, and replacements necessary are considered incidental to the work and will be at the Contractor’s cost, with no cost to the Owner.

PART 2 PAY ITEM DESCRIPTIONS

2.01 BID

The descriptions provided in the following paragraphs are to be used by the Bidder in preparing the Bid Form. They generally indicate how the major workscope items and their respective costs are to be separated into the line items listed in the Bid Form. These descriptions are not fully representative nor all inclusive of the work required to complete the project in accordance with the Contract Documents. It is the Bidder's responsibility to include all required costs within the most appropriate bid items. Monthly partial payment for each bid item shall be agreed upon by the Owner, Engineer, and Contractor.

2.02 MEASUREMENT OF QUANTITIES

A. Measurement

1. Payment and Performance Bonds
2. Mobilization/Demobilization/Cleanup shall be measured on a lump sum basis.
3. Civil work shall be measured on a lump sum basis.
4. Mechanical work shall be measured on a lump sum basis.

5. Electrical work shall be measured on a lump sum basis.
6. Related work shall be measured on a lump sum basis.

B. Payment

1. Payment for the lump sum price bid in the Bid Form for Item No. 1 shall be full compensation for providing payment and performance bonds as required by this contract.

2. Payment for the lump sum price bid in the Bid Form for Item No. 2, Mobilization/Demobilization/Cleanup shall be full compensation for furnishing all labor, materials, and equipment required to do all related work of this Contract including but not limited to insurance, bonds, submittals, permits, work schedule, site-specific health and safety plan, record information, daily and final cleanup, and site demobilization. Partial payments shall be based on the breakdown loaded to the schedule activities.

3. Payment for the lump sum price bid in the Bid Form for Item No. 3, Civil work shall be full compensation for furnishing all labor, materials, and equipment required to do all related work of this Contract including demolishing, replacing, maintaining operation, and placing each leachate storage tank back into operation, including, but not limited to the following:

   a. Maintain one leachate storage tank in operation at all times.

   b. Demolish existing leachate storage tanks.

   c. Salvage reusable materials as designated by the Owner and as acceptable to the tank manufacturer.

   d. Modify foundation as required for selected tank replacement per Section 02050 paragraph 1.07 B.

4. Payment for the lump sum price bid in the Bid Form for Item No. 4, Mechanical work shall be full compensation for furnishing all labor, materials, and equipment required to do all related work of this Contract including, but not limited to furnishing and installing new leachate storage tanks with required accessories, disassembling and reconnecting or replacing tank ladders, inlet, outlet, and overflow piping, and leak testing new leachate storage tanks.

5. Payment for the lump sum price bid in the Bid Form for Item No. 5, Electrical work shall be full compensation for furnishing all labor, materials, and equipment required to do all electrical work of this Contract including,

but not limited to disassembling and reconnecting or replacing, tank instrumentation, electrical panels, conduits, grounding, and supports.

6. Payment for the lump sum price bid in the Bid Form for Item No. 6, Related Work shall be full compensation for furnishing all labor, materials, and equipment required to do all related work of this Contract including, but not limited to erosion control, shoring, bracing, dewatering, replacement of unsuitable material, pipe and conduit material, temporary facilities, leachate/sludge management related to the tank demolition, equipment certification, testing, start-up, troubleshooting, Owner training, and incidental work.

END OF SECTION

SECTION 01340
SUBMITTALS AND ACCEPTANCE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall submit documentation that describes the Work to be performed under the Contract as required in this Section. This documentation will be for the Engineer and Owner's review and use. The documentation furnished by the Contractor must enable the Engineer and Owner to verify the Contractor's performance and compliance with Contract requirements. Documentation shall cover all services and deliverables required and secured by the Contract Documents.

1.02 RELATED WORK

A. The Contractor shall prepare documentation and submittals required by other sections of the Contract. The format of documents and submittals required by other sections shall conform to the requirements of this Section.

1. General Terms and Conditions

2. Section 01780, Operations and Maintenance Manuals

3. Section 01785, Record Documents

4. All Sections and Divisions that require submittal of documents

1.03 SUBMITTALS

A. General—The Contractor shall submit the following:

1. The project documentation will be for the Engineer and Owner's internal use and shall include all information that will be essential for the Facilities operations, maintenance, training, and repair of equipment and facilities supplied by the Contractor. The Contractor shall submit all documentation necessary to ascertain compliance with technical/contractual provisions.

2. Shop drawings: Drawings, schedules, diagrams, warrant, and other data prepared specifically for this Contract by the Contractor or through the Contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor to illustrate a portion of the Work.

3. Product data: Preprinted materials such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the Work, but not prepared exclusively for this Contract.

4. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portions of the Work, illustrating portions of work, or establishing standards for evaluating appearance of finished work or both.

5. Administrative submittals: Data presented for reviews and acceptance to ensure that administrative requirements of the project are adequately met but not to ensure directly that work is in accordance with the design concept and in compliance with Contract Documents.

6. Mockups: Before installing work requiring mockups, build mockups for each form of construction and finish required using materials indicated for the completed Work, as follows:

   a. Build mockups in the location and of the size directed by the Engineer.

   b. Notify the Engineer seven days in advance of dates and times when mockups will be constructed.

   c. Demonstrate the proposed range of aesthetic effects and workmanship.

   d. Obtain the Engineer's acceptance of mockups before starting work, fabrication, or construction.

   e. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

   f. Demolish and remove mockups when directed by the Engineer.

B. Coordination

Submittals and schedules shall be checked and coordinated with the Work of all trades involved before they are submitted 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.

C. Start of Work

1. Within 30 calendar days after the notice to proceed for the project, the Contractor shall submit to the Engineer a Contract Data Requirements List that defines all data to be submitted under this Contract. Included in this list shall be the names of all proposed manufacturers furnishing specified items to the extent known. Review of this list by the Engineer shall in no way relieve the Contractor from providing materials, equipment, systems, and structures fully in accordance with the Specifications.

D. General Requirements

1. The Contractor shall prepare, assemble, and submit all documents as described herein. The Contractor shall submit certification that the documents prepared conform to the Contract requirements and will result in a complete and operable project. The Engineer and Owner shall review the Contractor's documents for conformance to the Contract requirements and may comment on the documents.

2. The Contractor shall approve and certify all project documents. The Contractor's failure to certify the documents, or failure to provide documents that demonstrate conformance to the Contract requirements, are grounds for rejection. The Contractor shall be responsible for and bear all costs for proceeding with any part of the Work that fails to meet the Contract requirements.

3. Submittal of documents for the Engineer's review shall in no way relieve the Contractor of full responsibility for providing a complete, safe, reliable, operating, and coordinated Work (system/equipment/facilities) that is in compliance with these Contract documents.

E. Requests for Substitution: All requests for substitution shall clearly and specifically indicate any and all differences or omissions between the products specified as basis of design and the product proposed for substitution. Data shall include but not be limited to differences as follows for both the specified and substituted products:

1. Principle of operation
2. Materials of construction or finishes
3. Thickness or gauge of materials
4. Weight of item
5. Deleted features or items
6. Added features or items
7. Changes in other work caused by the substitution

8. If the substitution contains differences or omissions not specifically called to the attention of Engineer, Engineer reserves the right to require equal or similar features to be added to the substituted product at Contractor's expense.

F. Submittal Requirements and Procedures

1. Drawing Formats and Requirements

a. Drawings - All Drawings and Shop Drawings shall be prepared on 22-x-34-inch paper and shall have a blank area of 3 x 4 inches in the lower right hand corner above the title block. Each drawing shall indicate the following information in the title block:

(1) Title and Drawing Number.
(2) Date of Drawing or Revision.
(3) Name of Building or Facility.
(4) Name of Contractor or subcontractor.
(5) Drawing contents and locations.
(6) Specification Section and Subsection Numbers.

b. Required Copies - All drawings submitted shall have a minimum of 8 copies distributed in the following way:

(1) 2—Owner
(2) 4—Jones Edmunds
(3) 2—Returned

2. Product Data

a. Requirements - Product data shall include all catalog cuts, performance surveys, test reports, equipment lists, material lists, diagrams, pictures, and descriptive material. All product data shall be submitted on either 8.5 x 11 inches or folded 11 x 17 inches size paper of 20 lb. (9.072 kg) weight. The submittal information shall show the standard and optional product features, as well as all performance data and specifications. Manufacturer’s recommendation for special tools shall be supplied.

3. Samples—The Contractor shall furnish, for review by the Engineer, samples required by the Contract Documents. Samples shall be delivered to the Engineer as specified or directed.

a. All samples shall be of sufficient size and quantity to illustrate clearly the functional characteristics of the product, with integrally related parts and attachment devices. The samples shall show the full range of color, texture, and pattern.

b. The Contractor shall submit a minimum of four samples of items submitted. All samples shall be marked with required submittal information, as specified above.

4. Color, Texture, and Pattern Charts

a. The Contractor shall submit color, texture, or pattern charts of all required finishes.

b. A minimum of four charts of each item shall be submitted.

5. Submittal Information Requirements

a. When used in the Contract Documents, the term "Submittal Information" shall be considered to mean the following information at a minimum:

(1) Contract Name
(2) Contract Number
(3) Location within Facility
(4) Date Submitted

b. Drawings—The Contractor shall mark submittal information on all drawings in the left half of the 4-x-3-inch block as described above.

c. Product Data and Manufacturer's Literature

The Contractor shall mark all product data and manufacturer's literature with submittal information and note which item is being furnished. The Contractor shall mark the option and supplies to be furnished with the item. At least one original manufacturer product data sheet must be submitted; the balance can be copied. Do not submit manufacturer's general catalog: submit only items being installed or delivered. When manuals are being submitted, the Contractor shall mark submittal information on both the cover and title page. If manuals being submitted contain more than just one item, each item must be marked and only Contract name and number is to be marked on the cover and title page.

6. Training, Operational, and Maintenance Manual

The Contractor shall submit to the Engineer for review and acceptance of manufacturer's installation, operational, lubrication, maintenance, and training manuals for all equipment installed or delivered under this Contract. All manuals shall have submittal information marked on the front cover, title page, and three places inside manual. If the manual being submitted is for different components, mark front cover and title page only. Each component section must be marked with Specification section and subsection numbers. Operation and Maintenance Manuals shall conform to requirements defined in Section 01780, Operation and Maintenance Manual.

G. Required Submittals

1. Architectural and Structural Submittals

This section specifies general procedural requirements for contractual submittals for the following architectural and structural schedules, product data, samples, and manufacturer's certificates.

a. Product Data - The Contractor shall provide product data for all architectural and structural items, options, and other data; provide supplemental manufacturer's standard data for information unique to the Work and installation. The submittals shall reflect all items delivered or installed under this Contract.

b. Samples – The Contractor shall provide all samples required under this Specification including color charts and product samples.

c. Material, equipment, and installation and demolition Specifications.

2. Mechanical and Electrical System Submittals

This section specifies general procedural requirements for mechanical schedules, performance data, control diagrams, and other submittal data.

The Contractor shall submit the following:

a. Performance Data

b. Power and Riser Diagrams - Single line riser, power diagrams, and all conduit runs shall be provided for all equipment and facilities.

c. Wiring Diagrams - Elementary controls diagrams and separate wiring diagrams for mechanical and electrical unit/subsystem. Drawing for starting and shutdown of equipment including controls shall be provided, including a comprehensive description of operation.

d. Finished Data - Complete surface preparation and finished data for all mechanical and electrical unit/subsystems shall be provided, including a complete list of cleaning instructions.

e. Factory Testing - Detailed description of factory testing procedures, reporting procedures and criteria for test passing or failing shall be provided for all mechanical and electrical units/subsystems. Testing shall comply with General Requirements and Technical Requirements Sections.

f. Site (Field) Testing and Acceptance - Detailed description of site testing and acceptance tests including descriptions of procedures, testing equipment, reporting procedures, and criteria for passing or failing tests shall be provided for all mechanical and electrical units/subsystems. Testing shall comply with General Requirements and Technical Requirements.

g. Factory Test Report - After fabrication and testing, the Contractor shall submit the results of tests. No shipment of any mechanical and electrical unit/subsystem shall be allowed without the written certification from the Contractor that the equipment conforms to the Contract requirements.

h. Site Test and Acceptance Report - Site test and acceptance report shall be submitted to the Owner and Engineer.

i. Operations and Maintenance Manuals - The Contractor shall furnish manuals for all mechanical and electrical equipment specified under this Contract. Each manual shall include the following at a minimum:

(1) Description of equipment.
(2) Record shop drawing.
(3) Operation and maintenance instructions.
(4) Part lists.
(5) Equipment ratings.
(6) Valve list.
(7) Lubrication instructions.

Compliance with this section does not relieve the Contractor from compliance with the requirement of Section 01780, Operations and Maintenance Manuals.

H. Submittal Review

1. The Engineer's review of the Contractor's documents shall not relieve the Contractor of the responsibility for meeting all of the requirements of the Contract nor of the responsibility for correcting the documents furnished. The Contractor shall have no claim for additional cost or extension in time because of delays due to revisions of the documents that may be necessary for ensuring compliance with the Contract.

2. The Engineer will review a submittal or re-submittal once, after which the cost of review shall be borne by the Contractor. The cost of Engineering shall be equal to the Engineer's full cost.

3. No partial submittals will be reviewed. A submittal or re-submittal not complete will be returned to the Contractor for completing and re-submittal.

4. Documents submitted by the Contractor for approval by the Engineer will be returned bearing a project-specific stamp bearing the dated signature of the reviewer and one of four boxes checked:

   a. NO EXCEPTIONS NOTED—This indicates that the submittal appears to be in compliance with the requirements of the performance specifications and that the Work may proceed.

   b. MAKE CORRECTIONS NOTED—This indicates that the reviewer has added a minor correction to the submission and that the Work (modified in accordance with the correction comment) may proceed. The Contractor shall accept the responsibility of the modified document and resulting Work with no additional compensation.

   c. AMEND AND RESUBMIT—This indicates that the submittal will require Contractor modifications based on the reviewer's comments that accompanied the returned submittal. The Contractor will be cautioned that work may not proceed under this review status.

   d. REJECTED - This indicates that the submittal is not in conformance with the requirements of the performance Specifications and cannot be modified to gain compliance. A new submittal will be required in the instance of a "reject" status and the Contractor will be cautioned that work may not proceed under this condition.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SUBMITTAL PROCEDURES

A. Before submitting documents for the Engineer's review, the Contractor shall review the documentation for conformance to the Contract requirements. Submittals shall be complete and comprise a logical division of the Contract Work.

B. All documentation submitted by the Contractor to the Engineer shall be accompanied by a letter of transmittal and shall be submitted in a sequence that allows the Engineer to have all of the information necessary for checking and accepting a particular document at the time of submittal.

C. Each document shall be identified by a document number, Contract number, Contract name, location, Specification section, subsection numbers, and submittal date. Where a manual/drawing is revised to reflect a change in design, or a change for any other reason, each such revision shall be shown by a revision number, date, and subject in a revision block. Indication of official approval by the Contractor's Project Manager shall also be included. To permit rapid location of the revision, additional notation shall be made in the manual opposite the line or area where the change was made and identified by the corresponding revision number.

3.02 DOCUMENTATION CONTROL AND SUBMITTAL SEQUENCING

A. The Contract Data Requirements List shall be updated and resubmitted to the Engineer monthly, throughout the duration of the Contract. This list shall identify the Contractor's submittal number, proposed and actual submittal date, Contract Specification Section Number, Paragraph, Item of the Work, and type of document.

B. The Contractor shall work with the Engineer to provide a regulated flow of submittals that allows the Engineer to review the submittals in the defined time frame without undue delays. Monthly the Contractor shall provide the Engineer a schedule of the approximate quantities and delivery dates for all submittals due for the next 120 days.

3.03 FINAL RECORD DRAWINGS

A. The Contractor shall submit the Final Record Drawing Package to the Engineer for review 30 days before Final Completion. The Contractor shall be provided with CADD files (AutoCAD Version 2007). Final record drawings shall be printed on 22 x 34 inch sheets and on CDs, AutoCAD Version 2007.

3.04 REQUIREMENTS FOR SUBMITTAL

A. Additional documents, drawings, interface data, and other pertinent project submittal data are listed in specific sections of this Contract.

3.05 RECORD PRINTS

A. The Contractor shall submit one set of all record prints before final completion. The record print or project records shall include submittals, catalog cuts, drawings, calculations, test reports, manufacturer's data, maintenance manuals, installation instructions, and operating manuals. All "record prints" shall be delivered to the Engineer in 3-ring binders with dividers and shall be placed in order by Specification section.

END OF SECTION

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of Florida and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

_____.
(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____

_____, that said design is in conformance
(Name of Project)

with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Owner or Owner's representative within seven days following written request by the Owner for this information.

_____	_____
P.E. Name	Contractor's Name
_____	_____
Signature	Signature
_____	_____
Address	Title
_____	
Address	

SECTION 01350
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work covered by this Section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations during and as the result of construction operations under this Contract. For the purpose of this Section, *environmental pollution* is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires considering air, water and land and involves managing noise and solid waste as well as other pollutants.

C. The Contractor shall schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. The Contractor shall provide erosion-control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments that are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion-control measures shall be in place in an area before any construction activity in that area.

D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.

E. All phases of sedimentation and erosion control shall comply with and be subject to the laws of the State of Florida. The Contractor shall prepare a sedimentation and erosion-control drawing meeting the requirements of the law and furnish two copies of the approved Drawing to the Engineer.

1.02 RELATED WORK

A. Summary of Work as specified in Section 01100.

1.03 SUBMITTALS (NOT USED)

1.04 WORK SEQUENCE

A. Before beginning the work, the Contractor shall meet with the Engineer to establish agreed upon compliance with these provisions and administration of the environmental pollution control program.

B. The Contractor shall remove temporary environmental control features when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

1.05 REFERENCE STANDARDS

A. Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time.

B. Comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS

2.01 GENERAL

A. Open mesh biodegradable mulching cloth.

B. Fertilizer shall be 10-10-10 grade or equivalent.

C. Lime shall be Dolomitic Agricultural Ground limestone, per FDOT Section 982.

D. Silt fence shall consist of non-biodegradable filter fabric (Trevira, Mirafi, etc.), per FDOT Section 985, wired to galvanized wire mesh fencing and supported by wood or metal posts.

E. Floating or staked turbidity barriers per FDOT Section 985 and FDOT Standard Index 103.

F. Erosion Stone: FDOT Section 530

1. Sand-cement riprap
2. Concrete block
3. Rubble 20 to 300 pounds each

G. Filter Fabric for placement under riprap shall meet the requirements FDOT Section 985.

H. Baled hay or straw in accordance with FDOT Section 104.

PART 3 EXECUTION

3.01 EROSION CONTROL

A. The Contractor shall provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion-control measures, such as siltation basins, hay check dams, mulching, jute netting, and other equivalent techniques shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around the construction area shall also be used to carry away water resulting from dewatering excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to its original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Care shall be taken to prevent or reduce to a minimum any damage to any stream or surface water from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing or that contains oils or sediments that will reduce the quality of the water in the stream shall not be directly returned to the stream. Such waters shall be diverted through a settling basin or filter before being directed into streams or surface waters.

B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water, or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Florida Department of Environmental Protection and the US EPA. The Contractor shall submit two copies of approved contingency plans to the Engineer.

D. Water being flushed from structures or pipelines after disinfection with Cl_2 shall be treated with a dechlorination solution approved by the Engineer before discharge.

3.03 PROTECTION OF LAND RESOURCES

A. After completion of construction, the Contractor shall restore land resources within the project boundaries and outside the limits of permanent work to a condition that will appear to be natural and not detract from the appearance of the project. All construction activities shall be confined to areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, the Contractor shall first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

C. The Contractor shall protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping, or other operations by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Owner will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and, in the opinion of the Owner, are beyond saving shall be immediately removed and replaced.

E. The Contractor's storage and other construction buildings required temporarily in the performance of the work shall be located in cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. Preserving the landscape shall be required in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for the Engineer's approval.

F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, the Contractor shall submit the following for approval at least 10 days before the scheduled start of such temporary work:

1. A layout of all temporary roads, excavations, embankments, and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.

4. Landscaping drawings showing the proposed restoration of the area. The proposed removal of any trees and shrubs outside the limits of the existing clearing area must be indicated. Locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged must also be indicated. The drawings shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation, or embankment construction including disposal areas will be permitted.

G. The Contractor shall remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess waste materials, or any other vestiges of construction as directed by the Engineer. The disturbed areas shall be prepared and seeded as approved by the Engineer or Owner.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning—Burning will not be permitted at the project site for the disposal of refuse and debris.

B. Dust Control—The Contractor shall maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or outside the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.

D. To be approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Owner.

3.05 NOISE CONTROL

A. The Contractor shall make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION-CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this contract, the Contractor shall maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. General

1. The purpose of this Section is to define minimum requirements for the Quality Assurance (QA) program to be provided by the Contractor. The deliverable documents are defined, along with the method of execution of the QA program.

2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with the Contract Document requirements.

3. Specified tests, inspections, and related actions do not limit the Contractor's Quality Control procedures that facilitate compliance with the Contract Documents.

B. Definitions

1. Quality Assurance services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with Contract requirements.

2. Quality Control services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements.

C. Payment

Separate payment will not be made for providing and maintaining an effective Quality Assurance and Quality Control program, and all costs associated therewith shall be included in the applicable unit prices, lump-sum prices, or allowances contained in the Contract Price Breakdown.

1.02 RELATED WORK

A. Section 01000—Project Requirements

1.03 SUBMITTALS (NOT USED)

1.04 WORK SEQUENCE

A. Conform to reference standard by date of issue current on date for receiving bids, except where a specific date is established by code.

B. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable code.

C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE

A. All materials and equipment shall be installed in a neat and first-class workman-like manner.

B. The Contractor shall replace all existing paving, stabilized earth, curbs, driveways, sidewalks, fences, signs, and other improvements with the same type of material that was removed during construction or as directed by the Engineer without increase in the Contract Price or Contract Time.

C. The Engineer reserves the right to direct the removal and replacement of any items which, in his opinion, do not present an orderly and reasonably neat or workman-like appearance, provided such an orderly installation can be made using customary trade methods. The removal and replacement shall be done when directed in writing by the Engineer at the Contractor's own expense and without additional expense to the Owner.

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

1.10 TOLERANCES

A. Monitor tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.11 FIELD SAMPLES

A. Furnish field samples at the site as required by individual Specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample had been accepted by Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Documents. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The system shall cover all Work and shall be keyed to the proposed design and construction sequence. The project QC Officer will be held responsible for the quality of work on the job and is subject to removal by the Engineer for non-compliance with quality requirements specified in the Contract. The project QC Officer in this context shall mean the individual with the responsibility for the overall management of the project quality.

3.02 SUBMITTALS

A. Submittals shall be made as specified in Section 01340, Submittals and Acceptance. The Contractor shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.03 TESTS

A. Testing Services:

1. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to the Owner. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.

2. Testing services provided by the Owner are for the sole benefit of the Owner; however, test results shall be available to the Contractor. Testing necessary to satisfy the Contractor's internal Quality Control Procedures shall be the sole responsibility of the Contractor.

3. The Contractor shall interrupt its Work for Owner sampling and testing, when necessary. The Contractor shall have no Claim for increase in Contract Price or Contract Time due to such interruption. The Contractor shall cooperate in these testing activities, as needed.

4. Testing, including sampling, will be performed by the testing firm's laboratory personnel, in the general manner indicated in the Specifications.

B. Transmittal of Test Reports:

1. Written reports of tests and engineering data furnished by the Contractor for the Engineer's review shall be submitted as specified for Shop Drawings.

C. Manufacturer's Field Services:

1. Manufacturer's field services will be specified in the respective equipment Sections.

2. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are indicated shall visit the Site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the Site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

3. Each manufacturer's representative shall furnish to the Owner, through the Engineer, a written report certifying that the equipment has been properly

installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; has been operated under full load conditions and that it operated satisfactory.

3.04 MOCKUPS

A. Before installing work requiring mockups, build mockups for each form of construction and finish required, using materials indicated for the completed Work, as follows:

1. Build mockups in the location and of the size directed by the Engineer.

2. Notify the Engineer seven (7) days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain the Engineer's approval of mockups prior to starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed by the Engineer.

3.05 COMPLETION INSPECTION

A. Final Completion Punch List: Near the completion of all Work the QC Officer shall conduct an inspection of the Work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the QC documentation and shall include the estimated date by which the deficiencies will be corrected. The QC Officer or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished the Contractor shall notify the Engineer that the Facility is ready for the Engineer's final inspection.

B. Final Inspection and Acceptance: The Contractor's Quality Control Officer and the Engineer will be in attendance at this inspection. Additional Engineer personnel may also be in attendance. The final acceptance inspection will be formally scheduled by the Engineer when all punch list deficiencies have been corrected. Notice will be given to the Engineer at least 14 days prior to the final inspection and must include the Contractor's assurance that all punch list items will be complete and acceptable by the date scheduled for the final inspection. Failure of the Contractor to have all

Contract Work acceptably complete for this inspection will be cause for noncertification of final payment by the Engineer.

3.06 NOTIFICATION OF NONCOMPLIANCE

A. The Engineer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

3.07 REPAIR AND PROTECTION

A. On completion of testing, inspection, sample taking, and similar services, the Contractor shall repair damaged construction and restore substrates and finishes.

B. The Contractor shall protect all construction exposed by or for Quality Control service activities.

C. The repair and protection are the Contractor's responsibilities, regardless of the assignment of responsibility for Quality Control services.

END OF SECTION

SECTION 01505
MOBILIZATION

PART 1 GENERAL

1.01 DEFINITION AND SCOPE

A. Mobilization shall include the obtaining of all permits, insurance, and bonds and moving onto the site all materials, supplies, personnel, and equipment, all as required for the proper performance and completion of the Work. Temporary utilities, structures, and buildings and other construction facilities shall be included in the price bid for Item No. 6 Related Work. Mobilization shall include, but not be limited to, the following principal items:

1. Move onto the site all Contractor's materials, supplies, structures, buildings, and equipment required for 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 on-site sanitary facilities and potable water facilities as specified.
6. Arrange for and erect Contractor's work and storage yard and employees' parking facilities.
7. Submit all required insurance certificates and bonds.
8. Obtain all required permits.
9. Post all OSHA, Environmental Protection Agency, Department of Labor, and all other required notices.
10. Have Contractor's superintendent at the job site full time.
11. Submit a detailed construction schedule acceptable to the Engineer as specified.
12. Submit a finalized schedule of values of the Work acceptable to the Owner and/or his Project Representative.
13. Submit a finalized schedule of submittals.
14. Construct, maintain, and restore temporary access and haul roads.

1.02 DEMOBILIZATION

A. All costs for Demobilization shall be included in the price bid for Mobilization\Demobilization/Clean Up, and shall include:

1. Removal of Contractor's and Subcontractor's equipment, materials, structures, buildings, debris, and personnel from the project site.
2. Removal of Engineer's Trailer/Office, if required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01640
QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation
B. References
C. Field samples
D. Mock-up
E. Inspection and testing laboratory services
F. Manufacturers' field services and reports

1.02 RELATED SECTIONS

A. Section 01340—Submittals and Acceptance

1.03 CERTIFICATION

A. The materials and equipment used in the construction of the Project shall be subject to adequate certification and testing in accordance with generally accepted standards, as required and defined in the Contract Documents. The Contractor shall provide, at his expense, all tools, testing apparatus, materials, and labor as necessary to provide certification required by the Contract Documents.

1.04 OUTSIDE AGENCY

A. If the Contract Documents, laws, ordinances, rules, regulation or orders of any public authority having jurisdiction require any work to be certified, tested, or approved by someone other than the Owner, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Owner the required certification and/or testing certificates for approval.

1.05 LIMIT OF APPROVALS

A. Certifications, tests, or approvals by the Owner, Engineer, or others shall not relieve the Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

1.06 ACCESS TO WORK SITE

A. The Contractor shall provide the Owner and his representatives with uninterrupted access to entire project construction site within the Lake County Central Landfill. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted access to all Work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work.

1.07 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.08 QUALITY CONTROL

A. Contractor's Quality Control Plan: The Contractor shall, before starting work, submit to the Engineer for approval a Contractor's Quality Control Plan outlining the procedures, instructions, forms, and equipment to be used as follows:

1. Names and qualifications of inspection personnel.

2. Authority and responsibility of inspection personnel.

3. Schedule of inspections for each class of work, coordinated with the Contractor's overall schedule of operations.

4. Sample forms for reports of inspections (checklists).

5. Facilities, instruments, and testing devices required.

B. Preparatory Inspection: The Contractor shall perform a preparatory inspection prior to beginning any work, including:

1. A review of Contract Requirements with the supervisors directly responsible for the performance of the work; noting of safety hazards and appropriate safety measures.

2. A check to ensure that materials, products, and equipment have been tested, submitted, and approved.

3. A check to ensure that provisions have been made for any required control testing.

4. An examination of the work area to ascertain that preliminary work has been completed.

5. A physical examination of materials and equipment to ensure that they are on hand and conform to the Shop Drawings, and that the equipment is in proper operating condition, with no badly worn, deformed, defective, or missing parts.

C. Initial Inspection: The Contractor shall perform an initial inspection of each class of work under this Contract as soon as a representative portion of such work has been completed, to ensure that the work as performed will be able to meet all Contract requirements, and that appropriate safe work practices are being employed.

D. Follow-Up Inspections: The Contractor shall perform follow-up inspections of each class of work under his Contract on a continuing basis to ensure continuing compliance with all Contract requirements and safe work practices.

E. Inspection Personnel: Each inspection shall be performed by a principal or employee of the Contractor, who has at least five years experience in performing, supervising, or inspecting that class of work in an industrial plant or equivalent environment.

F. Reports: Reports of inspections performed shall be prepared during inspection using approved forms, signed by the qualified person performing the inspection, and maintained on file by the Contractor for the duration of the project. Work found to be defective shall be noted, together with a statement of corrective measures ordered. Follow-up inspections shall note whether defective work has been corrected in a satisfactory manner. The file of reports of inspections shall be

G. Summary: The Contractor shall prepare a summary of inspections performed for submission at each scheduled Progress Meeting. Each summary shall include a certification by the Contractor that all classes of work begun or continued up to seven working days before the Progress Meeting have been inspected, and that no defective work has remained uncorrected except as noted.

H. Safety: The Engineer's review of the Contractor's Quality Control Plan does not include a review of the adequacy of the Contractor's proposed safety program or practices, nor does it relieve the Contractor of his full responsibility for any injuries to persons or damage to property as a result of his operations.

1.09 REFERENCES

A. Conform to reference standard by date of issue current on date of Owner Bids.

B. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.10 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Engineer.

1.11 MOCK-UP

A. Tests will be performed under provisions identified in this Section.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Where mock-up is specified in individual sections to be removed, clear area after mock-up has been accepted by Engineer.

1.12 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer and Owner.

B. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within 30 days of observation to Engineer for review.

PART 2 PRODUCT (NOT USED)

PART 3 EXECUTION

3.01 ACCESS

A. The Contractor shall allow the Owner and Engineer to perform a thorough examination of the Work at all times, including all labor performed and materials furnished, delivered, or intended to be used in the Work, including manufacture, preparation, and testing. The Contractor shall not use any material which has not been tested and accepted. The Contractor shall keep the Engineer advised of the progress of the Work away from the site requiring certification or witnessing of tests to ensure that scheduling conflicts or delays do not develop.

3.02 ACCEPTANCE TESTS

A. Tests or acceptance of any materials prior to shipment shall not be deemed as a final acceptance of the materials. The Owner may require tests or analysis of any portion of the materials at any time. Any material which is found to be defective or which does not otherwise conform to the requirements of the specifications shall be rejected and removed forthwith from the site, as provided in the Contract.

3.03 RIGHT TO EXAMINE WORK

A. The Owner and the Engineer shall have the right to examine all materials and Work done during any phase of construction, fabrication, or manufacture. The

Contractor shall furnish all reasonable facilities and aid to the Engineer and safe and convenient means for the examination of any part of the Work. No Work shall be closed or covered until it has been duly examined and approved.

3.04 FINAL APPROVAL

A. Final approval of the Work shall be made by the Owner and the Engineer and shall be contingent upon the findings of a thorough examination of the Work. Such examination shall be made within ten (10) working days after receipt of the Contractor's written request therefore. The Work will be accepted and deemed completed as of the date of such examination; if upon such examination, the Engineer and Owner find that no further Work remains to be done at the site. If the examination reveals items of Work still to be performed, the Contractor shall promptly perform them and request a re-examination. If upon any reinspection the Engineer and Owner determine that the Work is complete, the date of completion shall be deemed to be the actual date of such re-examination.

END OF SECTION

SECTION 01665
EQUIPMENT TESTING AND STARTUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide a competent field services technician of the manufacturers of all equipment furnished under Divisions 13 to supervise installation, adjustment, initial operation and testing, performance testing, final acceptance testing, and startup of the equipment.

B. Perform specified equipment field performance tests, final acceptance tests, and startup services.

1.02 RELATED WORK

A. Section 01000—Project Requirements
B. Section 01340—Submittals and Acceptance
C. Section 01400—Quality Requirements
D. Section 01600—Materials and Equipment
E. Section 01780—Operations and Maintenance Manuals

1.03 SUBMITTALS

Before tank start-up, the Contractor shall have completed each of the following:

A. Verified that all final acceptance tests have been performed.

B. Certified equipment compliance as required under Section 01600.

C. Verified that all required lubrication equipment and materials are provided.

D. Verified that all piping and valves have been properly installed.

E. Verified that landfill personnel agree that other landfill components are ready for start-up.

F. Submitted a written report in accordance with Sections 01340 and 01400 that all equipment has been properly installed and is ready for plant start-up.

G. Verified that all safety equipment is installed and fully functional.

H. Verified that all indicating and annunciating systems are installed and fully functional.

I. Verified that all utilities are operable.

J. Verified that all equipment O&M Instruction books are available to the Owner.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE

A. Field service technicians shall be competent and experienced in the proper installation, adjustment, operation, testing, and startup of the equipment and systems being installed.

B. Manufacturers' sales and marketing personnel will not be accepted as field service technicians.

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

1.10 PRELIMINARY REQUIREMENTS

A. After installation of the equipment has been completed and the equipment is presumably ready for operation, before it is operated by others, the manufacturer's field service technician shall inspect, operate, test, and adjust the equipment. The inspection shall include at least the following points where applicable:

1. Soundness (without crack or otherwise damaged parts).

2. Completeness in all details, as specified and required.

3. Correctness of setting, alignment and relative arrangement of various parts.

B. The operation, testing, and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

C. Upon completion of this work, the manufacturer's field service technician shall submit a signed report of the results of his/her inspection, operation, adjustments, and tests.

D. Shop tests or factory tests may be witnessed by the Owner and/or Owner's representatives, as required by the various equipment specifications.

E. Field performance and acceptance tests shall be performed in the presence of the Owner, the Owner's designated personnel and/or Owner's representatives.

1.11 STARTUP AND ACCEPTANCE OF THE LEACHATE STORAGE TANKS AND RELATED SYSTEMS

A. General Requirements

1. Successfully execute the step-by-step procedure of startup and performance demonstration specified hereinafter.

2. The startup and performance demonstration shall be successfully executed before Substantial Completion and acceptance by the Owner of the treatment plant and its related systems.

3. All performance tests and inspections shall be scheduled at least five working days in advance or as otherwise specified with the Owner and the Engineer. All performance tests and inspections shall be conducted during the work week of Monday through Friday, unless otherwise specified.

B. Preparation for Startup

1. All mechanical and electrical equipment shall be checked to insure that it is in good working order and properly connected. All systems shall be cleaned and purged as required.

2. All instruments and controls shall be calibrated through their full range. All other adjustments required for proper operation of all instrumentation and control equipment shall be made.

3. Perform all other tasks needed for preparing the facilities for proper operation.

4. No testing or equipment operation shall take place until it has been verified by the Owner or Engineer that all specified safety equipment has been installed and is in good working order.

5. No testing or equipment operation shall take place until it has been verified by the Owner or Engineer that all lubricants, tools, maintenance equipment, spare parts, and approved equipment operation and maintenance manuals have been furnished as specified.

C. Facilities Startup

1. Startup period shall not begin until all piping connections have been made and tank related equipment have been tested and made ready for operation. The Owner shall receive spare parts, safety equipment, tools and maintenance equipment, approved operation and maintenance data, and the specified operation and maintenance instruction prior to introducing leachate into storage tanks.

2. Demonstrate a seven consecutive 24-hour day period of successful operation of the facility as a prerequisite of Substantial Completion and Acceptance.

3. In the event of failure to demonstrate satisfactory performance of the facility on the first or any subsequent attempt, all necessary alterations, adjustments, repairs and replacements shall be made. When the facility is again ready for operation, it shall be brought on line and a new test shall be started. This procedure shall be repeated as often as necessary until the facility has operated continuously to the satisfaction of the Owner and Engineer, for the specified duration.

4. The Owner will furnish all operating personnel (other than vendor's or subcontractor's service personnel) needed to operate equipment during the final test period; however, said personnel will perform their duties under Contractor's direct supervision. Until performance tests are completed and units and systems are accepted by the Owner as substantially complete, the Contractor shall be fully responsible for the operation and maintenance of all new facilities.

5. The Owner will provide electricity. However, the Contractor shall provide all necessary personnel of the various construction trades, i.e., electricians, plumbers, etc, and field service personnel of the major equipment suppliers on an eight hour per day basis at the facilities and on a 24-hour per day basis locally during the startup period. Major equipment suppliers shall include, but not be limited to, the following:

   a. Storage Tank Equipment

   b. Cathodic Protection Equipment

6. At no time during startup shall the Contractor allow the facility to be operated in a manner which subjects equipment to conditions that are more severe than the maximum allowable operating conditions for which the equipment was designed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

_____ Installed in accordance with Manufacturer's recommendations.

_____ Inspected, checked, and adjusted.

_____ Serviced with proper initial lubricants.

_____ Electrical and mechanical connections meet quality and safety standards.

_____ All applicable safety equipment has been properly installed.

_____ System has been performance tested, and meets or exceeds specified performance requirements (when complete system of one manufacturer).

Comments: _____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorize to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20____

Manufacturer: _____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

END OF SECTION

SECTION 01730
CUTTING, CORING, AND PATCHING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide all cutting, coring, fitting, and patching, including attendant excavation and backfill, required to complete the work or to accomplish the following:

1. Make its several parts fit together properly.

2. Rework existing items to provide for new construction.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

5. Remove samples of installed work as specified for testing.

6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.02 RELATED WORK

A. Summary of Work is included in Section 01100.

B. Concrete is included in Division 3.

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1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01340, Submittals and Acceptance.

B. The Contractor shall submit a written request well in advance of executing any cutting or alteration which affects the following:

1. Work of the Owner or any other Contractor.

2. Structural value or integrity of any element of the project.

3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

4. Efficiency, operational life, maintenance, or safety of operational elements.

5. Visual qualities of sight-exposed elements.

C. The written request shall include the following:

1. Identification of the project.

2. Description of affected work.

3. The necessity for cutting, altering, or excavating.

4. The effect on work of Owner or any other Contractor or on structural or weatherproof integrity of project.

5. Description of proposed work:

a. Scope of cutting, patching, alteration, or excavation.

b. Trades which will execute the work.

c. Products proposed to be used.

d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any other Contractor whose work will be affected.

D. The Contractor shall submit written notice to the Engineer designating the date and the time the work will be uncovered.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete and grout for rough patching shall be as specified in Division 3.

B. Materials for finish patching shall be equal to those of adjacent construction.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products or performance of work.

C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

D. All cutting and coring shall be performed in such a manner as to limit the extent of patching.

E. All holes cut through concrete and masonry walls, slabs, or arches shall be core-drilled unless otherwise approved. No structural members shall be cut without approval of the Engineer, and all such cutting shall be done in a manner directed by the Engineer. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

F. If holes are cored through floor slabs, they shall be drilled from below.

G. Rough patching shall be such as to bring the cut or cored areas flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to ensure the structural value or integrity of the affected portion of work.

B. Provide devices and methods to protect other portions of the project from damage.

C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work and maintain excavations free from water.

D. Perform coring with approved non-impact rotary tools with diamond core drills. The size of the holes shall be suitable for pipe, conduit, sleeves, and equipment or mechanical seals to be installed.

E. Ensure that all equipment conforms to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring, and maintenance.

F. Provide protection for existing equipment, utilities, and critical areas against water or other damage caused by drilling operation.

G. Following drilling, vacuum or otherwise remove from the area all slurry or tailings resulting from coring operations.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Employ the original installer or fabricator to perform cutting and patching for the following:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

D. Install adequate bracing of the area to be cut before cutting starts. Check the area during sawing operation for partial cracking and provide additional bracing as required to prevent a partial release of the cut area during sawing operations.

E. Provide equipment of adequate size to remove cut panel.

F. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

G. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

END OF SECTION

SECTION 01740
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Compile specified warranties and bonds.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the Engineer for review.

1.02 RELATED WORK

A. General Conditions of the Contract

B. Section 01600—Materials and Equipment

1.03 SUBMITTALS

A. Assemble warranties, 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 sequence of the Specifications. Provide completion information for each item as follows:

1. Product or work item

2. Firm, address, telephone, fax and E-mail number, and name of principal

3. Scope

4. Date of beginning of warranty, bond, or service and maintenance contract

5. Duration of warranty, bond, or service and maintenance contract

6. Provide information for Owner's personnel:

a. Proper procedure in case of failure.

b. Instances that might affect the validity of warranty or bond.

7. Contractor, with address, telephone, faxes and E-mail numbers, and the name of responsible principal

D. Submittal of warranties, bonds, and service and maintenance contracts shall be included in submittals for review and prior to Final Completion with actual dates included.

E. The Contractor's obligation to correct defective or nonconforming Work shall run for a period of 12 months (or such longer period of time as may otherwise be specified in the Contract Documents) commencing from the date Substantial Completion is achieved.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES

A. All structural, mechanical, and electrical equipment, together with devices of whatever nature and all components, which are furnished and/or installed by the Contractor shall be guaranteed.

B. The guarantee shall be against the manufacturing and/or design inadequacies, materials, and workmanship not in conformity, improper assembly, hidden damage, failure of devices and/or components, excessive leakage, or other circumstances which would cause the equipment to fail under normal design and/or specific operating conditions for a period of 12 months or such longer period as may be shown and/or specified from and after the date of Substantial Completion.

C. Each piece of equipment, device or component which fails within the above specified term of the guarantee shall be replaced and installed with reasonable promptness by the Contractor without increase in the Contract Price. Failure of the Contractor to provide timely repairs as specified herein shall result in a claim being issued by the Owner against the Contractor's Bond. In some instances, if approved by the Owner, the Contractor may be allowed to repair the equipment.

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01780
OPERATIONS AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Compile product data and related information appropriate for the Owner's maintenance and operation of products furnished under the Contract.

1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of the Specifications. The data presented in the O&M Manuals shall be specifically related to this Contract and application.

2. Incorporate maintenance and operation data furnished by the Owner, if any.

B. The Contractor shall furnish all labor, equipment, materials, and all other items to supply and deliver, to the Engineer, O&M Manuals for the Work in accordance with the requirements of this Section.

C. The Contractor shall provide O&M Manuals for all equipment, including instrumentation, and electrical.

1.02 RELATED WORK

A. Section 01000—Project Requirements

B. Section 01785—Record Documents

1.03 SUBMITTALS

A. In general, the manuals shall have an individual component level.

1. The individual component level shall contain:

a. Storage requirements.

b. Installation instructions.

c. Alignment instructions and tolerances.

d. Operating instructions.

e. Troubleshooting instructions.

f. Lubrication requirements.

g. Maintenance instructions.

h. Parts list.

i. Recommended spare parts list and how to obtain same.

B. Format:

1. Size: 8 1/2 x 11 inch (21.59 x 27.94 cm).

2. White paper: 20-lb (9.072 kg) minimum.

3. Text: Manufacturer's printed data, or neatly word-processed.

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 11 x 17 inch (27.94 x 43.18 cm).

c. All drawings shall be placed at end of each section and drawing shall be printed on one side only.

5. Provide a flyleaf for each separate product, or each piece of operation equipment.

a. Provide word-processed description of product, and major component parts of equipment.

b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title, "OPERATION AND MAINTENANCE INSTRUCTIONS", listing:

a. Title of Project

b. Identity of separate structure as applicable

c. Identity of general subject matter covered in the manual

C. Media

1. Original word processed CD shall be delivered to the Engineer.

2. All word processing must be done using the latest version of Microsoft Word or as directed by the Engineer.

3. All drawings except control system configuration drawings must be submitted on CD using AutoCAD.

D. Binders

1. Filled to not more than 75 percent capacity.

2. When multiple binders are used, arrange the data into related consistent groupings.

E. The Contractor shall submit the following:

1. Equipment Manuals. Five (5) copies of the O&M Instruction Manual for each piece of equipment shall be submitted to the Engineer with delivery of the equipment. O&M manuals shall include manufacturer's test results and record specifications.

2. The cost of these Manuals submitted shall be included in the total Contract Price.

F. Any modifications required after final O&M submission shall be made to the manuals by issuance of addenda in the form of change pages to the manual. The addenda will identify where the new data is to be inserted, what data is to be removed, and new index sheets as necessary and list of shop drawings and submittals.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

A. American National Standard Institute Waste Equipment Standards ANSI Z245

1.06 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 a draftsman competent to prepare required drawings.

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

1.10 CONTENTS, EACH VOLUME

A. Neatly word-processed table of contents for each volume, arranged in systematic order, to include the following:

1. Contractor, name of responsible principal, address, fax number, 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, fax number and telephone number of:

a. Subcontractor or installer.

b. A list of each product to be included, indexed to content of the volume.

c. Identify area of responsibility of each subcontractor or installer, if more than one.

d. Local source of supply for parts and replacement.

e. Manufacturer.

4. Identify each product by product name and other identifying symbols as set forth in the Contract Documents.

B. Product Data

1. Include only those sheets that are pertinent to the specific product.

2. Annotate each sheet to:

a. Clearly identify specific product or part installed

b. Clearly identify data applicable information

c. Delete references to inapplicable information

C. Drawings

1. Supplement product data with drawings as necessary to illustrate clearly:

a. Relations of component parts of equipment and systems

b. Control and flow diagrams

c. Include Owner Tag Numbers

2. Coordinate drawings with information in Record Documents to assure correct illustration of completed installation.

3. Record Documents shall not be used 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 for each procedure.

3. Describe how complete system is to operate.

E. Copy of pertinent information related to warranty, bond, and service Contract issued.

1. Provide information sheet for Owner's personnel, give:

a. Proper procedures in event of failure

b. Instances that might affect validity of warranties or bonds

F. Training manuals used in training courses will become part of this Manual.

1.11 MANUAL FOR MATERIALS AND FINISHES

A. Content, for architectural products, applied materials, and finishes:

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.

b. Color and texture designations.

c. Information required for re-ordering 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 that are detrimental to product.

c. Recommended schedule for cleaning and maintenance.

B. Content, for moisture-protected 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.

C. Additional requirements for maintenance data as required by other sections of the Specifications.

1.12 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each electrical, mechanical, instrumentation, and communication system, as appropriate:

1. Make a table identifying each piece of equipment, each associated control or instrument, the location of the control or instrument, and the function of the control or instrument.

2. Description of system and component parts

    a. Function, normal operating characteristics, and limiting conditions for both the system, sub-system and the component parts

    b. Performance curves, engineering data and tests

    c. Complete nomenclature and commercial number of replaceable parts

3. Circuit directories of panel boards

    a. Electrical service

    b. Controls

    c. Communications

4. As-installed color-coded wiring diagrams

5. Instrument loop diagrams showing the path that a control or instrumentation signal takes from its origin to the action it takes.

    a. An electrical schematic for each item.

    b. A chart listing the controls/instruments in a loop identifying the equipment's abbreviated symbol, a description of the symbol, design criteria, process flow, quantity supplied, and manufacturer's model and serial number.

6. Operating procedures

    a. Routine and normal operating instructions

    b. Sequences required

    c. Special operating instructions

7. Maintenance procedures

    a. Routine operations

b. Guide to "trouble-shooting"

c. Disassembly, repair and re-assembly

d. Alignment, adjustment and checking

8. Manufacturer's printed operating and maintenance instructions

9. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage

10. Other data as required under pertinent sections of Specifications

11. Abnormal and emergency operations

a. Potential overloads

b. Procedures for equipment breakdown

c. Action to be taken in a power outage

d. Identify alarms by equipment location and action to correct

e. Equipment safety features, requirements, and potential hazards

12. Programming manuals for programmable devices including list of standard programming.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts

a. Function, normal operating characteristics, and limiting conditions

b. Performance curves, engineering data and tests

c. Complete nomenclature and commercial number of replaceable parts

d. Model number and name plate data for each piece of equipment

e. Assembly drawings

f. List of all special tools required to service equipment and/or systems including where they are stored

2. Operating procedures

a. Start-up, break-in, routine and normal operating instructions

b. Regulation, control, stopping, shut-down, and emergency instructions

c. Summer and winter operating instructions

d. Special operating instructions

e. Control settings and ranges

3. Maintenance Procedures

a. Identify type and frequency of preventive maintenance activities required for each piece of equipment

b. Guide to "trouble-shooting"

c. Disassembly, repair, and re-assembly

d. Alignment, adjusting, and checking

4. Servicing and lubrication schedule

a. List of lubricants required

b. Period between lubrications

5. Manufacturer's printed operating and maintenance instructions. (This is not to be a generalized catalog of the entire product line.)

6. Description of sequence of operation

7. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance

a. Predicted life of parts subject to wear

b. Items recommended to be stocked as spare parts

8. As-installed control diagrams

9. Each Contractor's coordination drawings

10. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage

11. Other data as required under pertinent sections of Specifications

12. Charts of equipment, instrument, and valve tag numbers with location and function

    a. Reference drawing which shows equipment, instrument or valve location

    b. Manufacturer's model and serial number

    c. Valve actuator type (manual, hydraulic, electric or pneumatic).

13. Local services (process water and air, drains, HVAC, natural gas and steam)

C. Prepare and include additional data when the need for such data becomes apparent during instruction of the Owner's personnel.

D. Additional Requirements for O&M Data required by sections of Specifications.

PART 2 PRODUCTS

2.01 O&M MANUALS

A. Binders: The manuals shall be supplied in binders that are the same as those provided in paragraph 1.03 D. above.

B. Electronic Version: Word-processed portions of the manuals shall also be provided on word processor diskettes. The electronic version manuals must be capable of being read, edited, and printed with Microsoft Word. The format will be provided to the Contractor upon request. All drawings shall be generated using personal computer and plotter with the software package program from AutoCAD.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01785
RECORD DOCUMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section details the minimum requirements for the Contractor for maintenance and recording of Record Documents.

1.02 RELATED WORK

A. Section 01000, Project Requirements

1.03 SUBMITTALS

A. The Contractor shall store documents and samples in the Contractor's field office apart from documents used for construction and shall provide the following:

1. Files and racks for storage of documents

2. Cabinet or secure storage space for storage of samples

B. The Contractor shall institute a computerized record control program.

C. The Contractor shall make documents and samples available at all times for inspection by the Engineer.

D. At Contract closeout, the Contractor shall transmit Record Documents and samples with cover letter to the Engineer, listing the following:

1. Date
2. Project title and number
3. Contractor's name and addresses
4. Number and title of each Record Document
5. Signature of Contractor or its authorized representative
6. Contract Section and Subsection numbers
7. Location

E. Before assembling and submitting records, the Contractor shall review for completeness the records maintained by its subcontractors.

F. Tracings of all Construction Documents and Shop Drawings made by the Contractor, subcontractors, and suppliers of materials or equipment shall be corrected to show the Work as actually completed or installed.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROJECT RECORD

A. The Contractor shall label and file Record Documents and samples in accordance with the corresponding Specification Section number. Each document shall be labeled "PROJECT RECORD" in neat, large, printed letters. Record Documents shall be maintained in a clean, dry, and legible condition. Record documents shall not be used for construction purposes.

3.02 RECORDING

The Contractor shall record construction information as follows:

A. Record and update daily record information from field notes on a set of opaque drawings and to the satisfaction of the Engineer.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Record information concurrently (daily) with construction progress. Work shall not be concealed until required information is recorded.

D. Record Drawings: The construction drawings shall be marked to reflect the following:

1. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.

3. Field changes of dimension and detail.

4. Changes made by Modifications.

5. Details not on original construction drawings.

E. Specifications and Addenda—The Contractor shall 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 Change Order.

F. The Contractor shall have the Licensed Land Surveyor certify the Record Drawings as being correct and complete.

END OF SECTION

SECTION 01810
MAINTENANCE OF FACILITY OPERATIONS
AND SEQUENCE OF CONSTRUCTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The existing leachate storage facility will be maintained in continuous operation by the Owner at all times during the entire construction period. The Contractor shall schedule and conduct his work such that it will not impede the leachate storage process, create potential hazards to operating equipment and/or personnel, or cause odor or other nuisance.

B. The Contractor shall schedule his operations to conform to the requirements specified herein and shall include in his construction schedule all events which will impact operation of the existing leachate storage facility.

C. The Owner will continue to operate the leachate storage facility during the construction period and will be responsible for maintaining effluent quality. The Contractor shall fully cooperate with the Owner, coordinate the construction schedule with the Owner and Engineer, and provide the necessary labor, equipment, and materials to prevent interruption to storage and pumping of landfill leachate. The Owner and Engineer reserve the right to modify or expand the schedule during construction to meet prevailing conditions.

D. The Contractor shall not make any alterations to affect operation of the leachate storage facility without giving two weeks prior written notice to the Owner and Engineer requesting authorization to proceed. Except as noted herein, the Owner will perform all operation of existing valves or equipment.

E. Operation of valves or equipment by the Owner may be limited on specific occasions because of unavailability of personnel. Delays caused by such a limitation shall be expected and shall not be the basis for claim of extra costs by the Contractor.

F. The work specified herein shall be accomplished at such times that will be convenient to the Owner. Overtime work by the Contractor to conform to these requirements shall be considered as normal procedure under this Contract, and the Contractor shall make no claim for extra compensation as a result thereof. Requests for extended work hours shall be in accordance with Section 01100.

G. In order to maintain continuous leachate storage facility operation during construction a phased removal and construction sequence shall be required. Specific

constraints are outlined herein. The Contractor shall submit to the Engineer a detailed sequence of construction to complete the work while maintaining facility operation.

H. The Contractor shall furnish all temporary materials and equipment that may be required to complete the work of this Contract.

1.02 RELATED WORK

A. Demolition work is included in Section 02050.

1.03 SUBMITTALS

A. Submit in accordance with the provisions of Section 01340, a complete description of procedures to maintain facility operation to supplement the construction schedule developed. The description shall include step-by-step procedures, required duration, and specific procedures required to be performed by the Owner's personnel.

B. Submit complete plans of temporary systems required as part of this contract to maintain facility operations. The plans shall clearly delineate the intended location of these items and the Contractor's proposed method for phasing from existing to temporary to completed facilities.

1.04 GENERAL CONSTRAINTS

A. The following constraints shall be applied to all equipment utility systems on the facility site.

1. Vehicular access for the Owner's personnel to the plant site and to all operating treatment units shall be maintained at all times.

2. Facility operating personnel shall have access to all areas that remain in operation.

3. Potable water supply to the facility shall remain operational at all times.

4. Sanitary facilities shall remain operational at all times.

5. Electric power and lighting service shall be uninterrupted.

6. In the event that underground piping or utilities, which are not shown on the Drawings, are encountered, such piping or utilities shall not be disturbed without prior approval of the Engineer.

7. Before making a change in existing piping, electrical or control systems, the Contractor shall inform the Owner and Engineer of such change, and assist in instructing operations and maintenance personnel in any new operating procedures.

8. Portions of some pipelines must remain in service while alterations are being made on other portions. Piping systems that must remain in service shall be isolated by placing blind flanges, plugs or caps on all open ends.

9. Prior to removing equipment from service for any reason, the Contractor shall have on hand all materials required to reconstruct affected systems in its new arrangement.

10. All temporary facilities provided by the Contractor must be demonstrated to be operational to the satisfaction of the Engineer before any existing systems can be removed from use. Availability of these facilities must be maintained at all times. The Contractor must respond to requests from the Engineer for repair and maintenance immediately (7 days per week, 24 hours per day, including holidays). If the Contractor fails to immediately respond to request for repair and maintenance, such repair and maintenance may be performed by the Owner. All costs associated with such repair and maintenance performed by the Owner shall be the responsibility of the Contractor.

11. Demolition, repair, and replacement of tanks, concrete floors, and pads will be performed to the limits shown on the Drawings. All demolition, repair, and replacement work must be completed and reach the design strength required prior to proceeding to the next stage of demolition and repair. The Engineer must approve any deviations from this sequencing.

END OF SECTION

DIVISION 2

SITE CONSTRUCTION

SECTION 02050
DEMOLITION AND MODIFICATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and demolish, modify, remove, and dispose of work as specified herein.

B. Included, but not limited to, are demolition, modifications and removal of existing materials, equipment or work necessary to install the new work as shown on the Drawings and as specified herein and to connect with existing work in approved manner.

C. Demolition, modifications, and removals which may be specified under other Sections shall conform to requirements of this Section.

D. Demolition and modifications include:

1. Temporary modification to existing piping and instrumentation in tanks.
2. Remove existing leachate storage tanks and related equipment.
3. Off-site disposal of excess and unacceptable materials.
4. Modifications to existing foundations as required by the tank manufacturer.

E. Blasting and the use of explosives will not be permitted for any demolition work.

1.02 RELATED WORK

A. Summary of Work is included in Section 01100.

B. Submittals are included in Section 01340.

C. Maintenance of Facility Operation and Sequence of Construction are included in Section 01810.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01340, six copies of proposed methods and operations of demolition and modifications prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility service as required.

B. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations. Sequence shall be compatible with sequence of construction and shutdown coordination requirements.

C. Before commencing demolition work, all modifications necessary to bypass the affected structure shall be completed and all new equipment must be on site. Actual work shall not begin until the Engineer has inspected and approved the modifications and authorized commencement of the demolition work in writing.

D. Submit in accordance with Section 01340, Erection Drawings indicating the means of shoring/ bracing required under Paragraph 3.03. The Submittal shall include complete layouts, location plans and shoring/bracing sequence schedule coordinated with Section 01810.

E. Certification: The professional engineer shall be responsible for the design of the temporary shoring/ bracing of the existing structure and hung utilities. Prior to construction, the professional engineer shall submit a P.E. Certification Form prepared, stamped and signed by the professional engineer registered in the State of Florida verifying that his/her design will adequately provide support during the demolition.

F. Certification: The professional engineer shall be responsible for the design of the modifications to existing tank foundations. Prior to construction, the professional engineer shall submit a P.E. Certification Form prepared, stamped and signed by the professional engineer registered in the State of Florida verifying that his/her design will adequately provide support for the replacement tanks.

1.04 JOB CONDITIONS

A. Protection

1. Execute the demolition and removal work to prevent damage or injury to structures, equipment, piping, instrumentation, conduit, light fixtures, etc., occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.

B. Scheduling

1. Carry out operations so as to avoid interference with operations and work in the existing facilities.

C. Notification

1. At least 48 hours prior to commencement of a demolition or removal, notify the Engineer in writing of proposed schedule therefor. Owner shall inspect the existing equipment to identify and mark those items which are to remain the property of the Owner. No removals shall be started without the permission of the Engineer.

D. Conditions of Structures

1. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

E. Repairs to Damage

1. Promptly repair damage caused to adjacent facilities by demolition operation when directed by Engineer and at no cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.

F. Traffic Access

1. Conduct demolition and modification operations and the removal of equipment and debris to ensure minimum interference with roads onsite and to ensure minimum interference with occupied or used facilities.

2. Special attention is directed towards maintaining safe and convenient access to the existing facilities by landfill personnel and landfill associated vehicles.

1.05 RULES AND REGULATIONS

A. The Building Code of Lake County shall control the demolition, modification, or alteration of the existing buildings or structures.

B. No building or structure, or any part thereof, shall be demolished until an application has been filed with the Building Inspector and a permit issued. The fee for this permit shall be the Contractor's responsibility.

1.06 DISPOSAL OF MATERIAL

A. Salvageable material and equipment shall become the property of the Owner. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.

B. All other material and items of equipment shall become the Contractor's property and must be removed from the site.

C. The storage or sale of removed items on the site will not be allowed.

1.07 QUALITY ASSURANCE

A. The Contractor shall engage the service of a professional engineer registered in the State of Florida for the design of any temporary shoring/bracing of the existing structure and hung utilities during the demolition, repair and replacement.

B. The Contractor shall engage the service of a professional engineer registered in the State of Florida for the design of modifications to existing foundations for the replacement tanks.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. All materials and equipment removed from existing work, shall become the property of the Contractor, except for those which the Owner has identified and marked for his/her use. All materials and equipment marked by the Owner to remain shall be carefully removed, so as not to be damaged, cleaned, and stored on or next to the site in a protected place specified by the Engineer or loaded onto trucks provided by the Owner.

B. Dispose of all demolition materials, equipment, debris and all other items not marked by the Owner to remain, away from the secondary containment area surrounding the leachate tanks and in conformance with all existing applicable laws and regulations. Dispose of these items at the on site landfill or off site.

C. Pollution Controls

1. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the

lowest practical level. Comply with governing regulations pertaining to environmental protection.

a. Do not use water when it may create hazardous or objectionable conditions such as , flooding and pollution.

b. Clean adjacent structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

3.02 STRUCTURAL REMOVALS

A. Remove structures to the lines and grades shown unless otherwise directed by the Engineer.

B. All demolition debris shall be removed and taken from the secondary containment area surrounding the leachate tanks, unless otherwise approved by the Engineer. The Contractor shall dispose of the demolition debris at the site landfill or off site.

C. After removal of parts or all, slabs and like work which tie into new work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

3.03 MECHANICAL REMOVALS

A. Mechanical removals shall consist of dismantling and removing existing piping, equipment, and other appurtenances as specified, shown, or required for the completion of the work. It shall include cutting, capping, and plugging as required, except that the cutting of existing piping for the purpose of making connections thereto will be included under Division 15.

3.04 ELECTRICAL REMOVALS

A. Electrical removals shall consist of the removal of existing control panels, conduits and wires, poles and overhead wiring, panelboards, lighting fixtures, and miscellaneous electrical equipment all as shown on the Drawings, specified herein, or required to perform the work.

B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.

C. Conduits and wires shall be abandoned or removed where shown. All wires in abandoned conduits shall be removed, salvaged and stored. Abandoned conduits concealed in floor slabs or in walls, shall be cut flush with the slab or wall at the point of entrance. The conduits shall be suitably plugged and the area repaired in a flush, smooth, and approved manner. Exposed conduits and their supports shall be disassembled and removed from the site. Repair all areas of work to prevent rust spots on exposed surfaces.

D. Where shown or otherwise required, wiring in underground duct systems shall be removed. All such wiring shall be salvaged and stored as specified. Verify the function of all wiring before disconnection and removing it. Ducts that are not to be reused shall be plugged where they enter buildings and made watertight.

E. All electrical removal work shall be in accordance with all provisions and requirements specified under Division 16.

3.05 DEMOLITION, REPLACEMENT, AND REPAIR

A. Structural elements shall not be overstressed. The Contractor shall be responsible for shoring and/or bracing as required and indicated on the Drawings for adequate structural support as a result of work performed.

B. Prior to demolition the Contractor shall provide temporary shoring and/or bracing of structures and hung utilities as required and/or indicated on the Drawings.

C. The temporary shoring and/or bracing shall be used in specified locations during the phasing of sequence of construction indicated in Section 01810.

D. The shoring and/or bracing shall remain in place until the repair mortar and/or concrete in each stage has attained design strength.

3.06 CLEAN-UP

A. Remove all debris from the secondary containment area surrounding the leachate tanks resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left, clean, neat and orderly.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor and materials required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01340, shop drawings and product data including the following:

1. Sources of cement, pozzolan and aggregates.

2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.

3. Air entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

4. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

5. High-range water reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.

6. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. Provide either a. or b. below for each mix proposed.

a. Standard deviation data for each proposed concrete mix based on statistical records.

b. The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28-day cylinder strength test results for each mix. Provide results of 7- and 14-day tests if available.

7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.

8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.

B. Samples

1. Fine and coarse aggregates if requested by the Engineer.

C. Test Reports

1. Fine aggregates—Sieve analysis, physical properties, and deleterious substance.

2. Coarse aggregates—Sieve analysis, physical properties, and deleterious substances.

3. Cements—Chemical analysis and physical properties for each type.

4. Pozzolans—Chemical analysis and physical properties.

5. Proposed concrete mixes—Compressive strength, slump and air content.

D. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

2. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.

3. Certify curing compound is suitable for use in contact with potable water after 30 days (non toxic and free of taste or odor).

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 Standard Specification for Concrete Aggregates.

3. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C94 Standard Specification for Ready Mixed Concrete.

6. ASTM C143 Standard Test Method for Slump of Hydraulic Cement Concrete

7. ASTM C150 Standard Specification for Portland Cement

8. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete

9. ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

10. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

11. ASTM C260 Standard Specification for Air Entraining Admixtures for Concrete.

12. ASTM C309 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

13. ASTM C494 Standard Specification for Chemical Admixtures for Concrete.

14. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

15. ASTM C1017 Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete.

B. American Concrete Institute (ACI).

1. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete.

2. ACI 305R Hot Weather Concreting.

3. ACI 306.1 Standard Specification for Cold Weather Concreting.

4. ACI 318 Building Code Requirements for Structural Concrete.

5. ACI 350R Environmental Engineering Concrete Structures.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 QUALITY ASSURANCE

A. Reinforced concrete shall comply with ACI 318, the recommendations of ACI 350R and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.

B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.

C. Well in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops, and curing. Propose methods of hot and cold weather concreting as required. Prior to the placement of any concrete containing a high-range water-reducing admixture (plasticizer), the Contractor, accompanied by the plasticizer manufacturer, shall discuss the properties and techniques of batching and placing plasticized concrete.

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary

to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his/her expense, make new acceptance tests of aggregates and establish new design mixes.

F. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.

1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.

4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.

5. Proposed concrete mix designs - compressive strength, slump and air content.

G. A firm providing field testing and inspection services will be approved by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid by the Contractor and reimbursed by the Owner under the Concrete Testing Allowance. Testing of the following items shall be by the Owner to verify conformity with this Specification Section.

1. Concrete placements—compressive strength (cylinders), compressive strength (cores), slump, and air content.

2. Other materials or products that may come under question.

H. All materials incorporated in the work shall conform to accepted samples.

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING

A. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.

B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-feet in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.

C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.

D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.

E. Pozzolan: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.

F. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.

G. Liquid Curing Compounds: Store in closed containers.

1.09 QUALIFICATIONS (NOT USED)

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 WEATHER CONSTRAINTS (NOT USED)

PART 2 PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance, and manufacturer's service.

2.02 MATERIALS

A. Materials shall comply with this Section and any applicable State or local requirements.

B. Cement: Domestic portland cement complying with ASTM C150. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. The following cement type(s) shall be used:

1. Class A,B,C,D Concrete Type II with the addition of fly ash resulting in C3A being below 5 percent of total cementitious content, Type III limited to 5 percent C3A or Type V.

C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.

D. Coarse Aggregate: Well graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 1 herein.

E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures and shall be suitable for use in contact with potable water after 30 days of concrete curing.

1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. High Range Water-Reducer (Plasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non segregating plasticized concrete with little bleeding and with the physical properties of low

water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.

G. Pozzolan (Fly Ash) shall be Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.

H. Sheet Curing Materials. Waterproof paper, polyethylene film, or white burlap polyethylene sheeting all complying with ASTM C171.

I. Liquid Curing Compound. Liquid membrane forming curing compound shall comply with the requirements of ASTM C309, Type 1 D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compound shall be approved for use in contact with potable water after 30 days according to NSF 61 (non toxic and free of taste or odor).

2.03 MIXES

A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.

B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placeability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7- and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test

specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

TABLE 1
CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content (4)
A	2500	C150 Type II	C33	57	440 min.
B	3000	C150 Type II	C33	57	480 min.
C	4000	C150 Type II	C33	57	560 min.
D	5000	C150 Type II	C33	57	600 min.

Class	W/C Ratio (5)	Fly Ash	AE Range (6)	WR (7)	HRWR (8)	Slump Range Inches
A	0.62 max.	--	3.5 to 5	Yes	*	1-4
B	0.54 max.	--	3.5 to 5	Yes	*	1-3
C	0.44 max.	20 - 25%	3.5 to 5	Yes	*	3-5
D	0.40 max.	--	3.5 to 5	Yes	*	3-5

NOTES:
(1) Minimum compressive strength in psi at 28 days
(2) ASTM designation
(3) Size Number in ASTM C33
(4) Cementitious content in lbs/cu yd
(5) W/C is Water-Cementitious ratio by weight
(6) AE is percent air-entrainment
(7) WR is water-reducer admixture
(8) HRWR is high-range water-reducer admixture
* HRWR used at contractor's option

D. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.

E. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.

1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.

F. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10 inches.

G. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

2.04 FORMS

A. Forms shall be free from roughness and imperfections, substantially watertight and adequately braced and tied to prevent motion when concrete is placed. No wooden spreaders will be allowed in the concrete.

B. Wire ties will not be allowed. Metal ties or anchorages which are necessary within the forms shall be so constructed that the metal work can be removed for a depth of at least 1-inch from the surface of the concrete without injury to such surface by spalling or otherwise. Forms shall be thoroughly cleaned before using and shall be treated with oil, or other approved material.

C. All exposed edges of the finished concrete shall be chamfered 3/4-inch.

PART 3 EXECUTION

3.01 MEASURING MATERIALS

A. Concrete shall be composed of portland cement, fine aggregate, coarse aggregate, water, and admixtures as specified and shall be produced by a plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant except a high-range water-reducer may also be added in the field.

B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within 1 year of use.

C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as batched on printed batching tickets.

D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.

1. Charge air entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.

2. Inject multiple admixtures separately during the batching sequence.

3.02 MIXING AND TRANSPORTING

A. Concrete shall be ready mixed concrete produced by equipment acceptable to the Engineer. No hand mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.

B. Ready mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.

E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal lined non aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-foot long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement, and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

I. Temperature and Mixing Time Control

1. In cold weather, do not allow the as mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.

2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.

3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well crushed ice for all or part of the mixing water.

4. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 2.

TABLE 2
MAXIMUM TIME TO DISCHARGE OF CONCRETE

Air or Concrete Temperature (whichever is higher)	Maximum Time
80 to 90 Degree F (27 to 32 Degree C)	45 minutes
70 to 79 Degree F (21 to 26 Degree C)	60 minutes
40 to 69 Degree F (5 to 20 Degree C)	90 minutes

J. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

3.03 CONCRETE APPEARANCE

A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:

1. The gradation of aggregate.

2. The proportion of fine and coarse aggregate.

3. The percentage of entrained air, within the allowable limits.

B. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10 feet away, shall be pleasing in appearance, and at 20 feet shall show no visible defects.

3.04 PLACING AND COMPACTING

A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened

sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.

6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

    a. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

    b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

    c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4 feet. Place concrete for walls in 12- to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7-ft and the maximum free fall of concrete shall not exceed 15 feet.

9. Underwater concreting shall be performed in conformity with the recommendations of ACI 304R. The tremie system shall be used to place underwater concrete. Tremie pipes shall be in the range of 8 to 12 inches in diameter and be spaced at not more than 16 feet on centers nor more than 8 feet from an end form. Where concrete is being placed around a pipe, there shall be at least one tremie pipe on each side of each pipe. Where the tremie system is not practical, direct pumped concrete for underwater placement may be used subject to approval of the system including details by the Engineer.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc, shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

2. All concrete shall be placed and compacted with mechanical vibrators. The number, type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7,000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30 inches apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Concrete for slabs less than 8 inch thick shall be consolidated with vibrating screeds; slabs 8 to 12 inches thick shall be compacted with internal vibrators and (optionally) with vibrating screeds.

Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.

5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.

6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:

   a. Frequency returns to normal.

   b. Surface appears liquefied, flattened and glistening.

   c. Trapped air ceases to rise.

   d. Coarse aggregate has blended into surface, but has not disappeared.

3.05 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. Curing Methods

1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:

   a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.

   b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.

c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.

2. Specified applications of curing methods.

a. Slabs for Water Containment Structures: Water curing only.

b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.

c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.

d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.

e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.

f. Concrete Joints: Water cured or sheet material cured.

C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

D. Cold Weather Concreting:

1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

2. Cold weather concreting shall conform to ACI 306.1 and the additional requirements specified herein. Temperatures at the concrete placement shall be recorded at 12-hour intervals (minimum).

3. Discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

4. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree days of curing.

   a. Degree days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (eg: 5 days at an average 70 degrees F = 350 degree days).

   b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

5. Salt, manure or other chemicals shall not be used for protection.

6. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.

E. Hot Weather Concreting

1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lb/sq ft/hr.

2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.

a. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set, or cold joints.

b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job, and to provide vibration immediately after placement.

c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.

3. Discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

3.06 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day degrees of curing (whichever is the longer):

TABLE 3
MINIMUM TIME TO FORM REMOVAL

Forms for:	Degree Days:
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree days in Paragraph 3.05D above).

B. Shores shall not be removed until the concrete has attained at least 70 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.07 INSPECTION AND FIELD TESTING

A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

B. Sets of field control cylinder specimens will be taken by the Engineer (or inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

1. A "set" of test cylinders consists of four cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The fourth may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low.

2. When the average 28 day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7 day strengths (where proper relation between seven and 28 day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations and furnish material and labor required for the purpose of taking concrete cylinder samples. The cost of taking and shipping specimens will be paid for by the Contractor, and reimbursed by the Owner under the Concrete Testing Allowance. Curing boxes shall be acceptable to the Engineer.

D. Slump tests will be made in the field immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. If the slump is greater than the specified range, the concrete shall be rejected.

E. Air Content: Test for air content shall be made on a fresh concrete samples. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight

aggregates or aggregates with high absorptions are used, the latter test method shall be used.

F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Contractor. Work found to be acceptable will be reimbursed under the Concrete Testing Allowance.

3.08 FAILURE TO MEET REQUIREMENTS

A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.

C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

3.09 PATCHING AND REPAIRS

A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching.

B. Defective concrete and honeycombed areas as determined by the Engineer shall be repaired as specified by the Engineer.

C. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.

D. Immediately after removal of forms remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16 inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

E. When patching exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.10 SCHEDULE

A. The following (Table 4) are the general applications for the various concrete classes and design strengths:

TABLE 4
CONCRETE SCHEDULE

Class	Design Strength (psi)	Description
A	2,500	Concrete fill and duct encasement
B	3,000	Concrete overlay slabs and pavements
C	4,000	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams, and all other structural concrete
D	5,000	Prestressed concrete

END OF SECTION

SECTION 03600
GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Cast-in-Place Concrete is included in Section 03300.

B. Modifications and Repair to Concrete is included in Section 03930.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01340, shop drawings and product data showing materials of construction and details of installation for:

1. Commercially manufactured nonshrink cementitous grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.

2. Commercially manufactured nonshrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.

3. Cement grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures and the proposed mix of the grout.

4. Concrete grout. The submittal shall include data as required for concrete as delineated in Section 03300. This includes the mix design, constituent quantities per cubic yard and the water/cement ratio.

B. Laboratory Test Reports

1. Submit laboratory test data as required under Section 03300 for concrete to be used as concrete grout.

C. Certifications

1. Certify that commercially manufactured grout products and concrete grout admixtures are suitable for use in contact with potable water after 30 days curing.

D. Qualifications

1. Grout manufacturers shall submit documentation that they have at least 10 years experience in the production and use of the proposed grouts which they will supply.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

2. ASTM C579 Standard Test Method for Compressive Strength of Chemical Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

3. ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

4. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

B. U.S. Army Corps of Engineers Standard (CRD)

1. CRD C-621 Corps of Engineers Specification for Nonshrink Grout

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 QUALITY ASSURANCE

A. Field Testing

1. All field testing and inspection services required shall be provided by the Owner. The Contractor shall assist in the sampling of materials and shall provide any ladders, platforms, etc, for access to the work. The methods of testing shall comply in detail with the applicable ASTM Standards.

2. The field testing of Concrete Grout shall be as specified for concrete in Section 03300.

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.

C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.

D. Nonshrink cement based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.

E. Nonshrink epoxy grouts shall be delivered as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.

1.09 QUALIFICATIONS

1. Grout manufacturer shall have a minimum of 10 years experience in the production and use of the type of grout proposed for the work.

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 WEATHER CONSTRAINTS (NOT USED)

1.12 DEFINITIONS

A. Nonshrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

A. Nonshrink Cementitious Grout

1. Nonshrink cementitious grouts shall meet or exceed the requirements of ASTM C1107, Grades B or C and CRD C-621. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents, and shall require only the addition of water. Nonshrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

a. General purpose nonshrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co.; NBEC Grout by U. S. Grout Corp. or equal.

b. Flowable (Precision) nonshrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U. S. Grout Corp. or equal.

B. Nonshrink Epoxy Grout

1. Nonshrink epoxy based grout shall be a pre-proportioned, three component, 100 percent solids system consisting of epoxy resin, hardener,

and blended aggregate. It shall have a compressive strength of 14,000 psi in 7 days when tested in conformity with ASTM D695 and have a maximum thermal expansion of 30 x 10^6 when tested in conformity with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders Inc.; Five Star Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co. or equal.

C. Cement Grout

1. Cement grouts shall be a mixture of one part portland cement conforming to ASTM C150, Types I, II, or III and 1 to 2 parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

D. Concrete Grout

1. Concrete grout shall conform to the requirements of Section 03300 except as specified herein. It shall be proportioned with cement, coarse and fine aggregates, water, water reducer and air entraining agent to produce a mix having an average strength of 2,900 psi at 28 days, or 2,500 psi nominal strength. Coarse aggregate size shall be 3/8-inch maximum. Slump should not exceed 5 inches and should be as low as practical yet still retain sufficient workability.

E. Water

1. Potable water, free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

PART 3 EXECUTION

3.01 PREPARATION

A. Grout shall be placed over cured concrete which has attained its full design strength unless otherwise approved by the Engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints and free of all loose material or foreign matter which may effect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete.

Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the air line to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances from metal embedments or bottom of baseplates prior to the installation of the grout.

E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Engineer. Upon completion of the 24 hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Engineer for each specific location of grout installation.

F. Epoxy based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.

G. Construct grout forms or other leakproof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of adequate strength, securely anchored in place and shored to resist the forces imposed by the grout and its placement.

1. Forms for epoxy grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.

H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.

I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise approved by the Engineer.

3.02 INSTALLATION—GENERAL

A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and this Section.

B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours thereafter or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60 and 90 degrees F range.

E. Install grout in a manner which will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.

F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION—CEMENT GROUTS AND NONSHRINK CEMENTITIOUS GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.

B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3 in deep shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of

all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after initial stiffening.

F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45 degree angle from the lower edge of bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float (brush) finish.

G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION—NONSHRINK EPOXY GROUTS

A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener and aggregate.

B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.

C. Place grout into the designated areas in a manner which will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

D. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.

E. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.

F. Epoxy grouts are self curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

3.05 INSTALLATION—CONCRETE GROUT

A. Screed underlying concrete to the grade shown on the Drawings. Provide the surface with a broomed finish, aligned to drain. Protect and keep the surface clean until placement of concrete grout.

B. Remove the debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Wash the tank slab using a strong jet of water. Flushing of debris into tank drain lines will not be permitted.

C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Saturation may be maintained by ponding, by the use or soaker hoses, or by other methods acceptable to the Engineer. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8 inch thick cement paste.

D. Place concrete grout to final grade using the scraper mechanism as a guide for surface elevation and to ensure high and low spots are eliminated. Unless specifically approved by the equipment manufacturer, mechanical scraper mechanisms shall not be used as a finishing machine or screed.

E. Provide grout control joints as indicated on the Drawings.

F. Finish and cure the concrete grout as specified for cast in place concrete.

3.06 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose nonshrink cementitious grout: Use at all locations where nonshrink grout is called for on the plans except for base plates greater in area than 3 feet wide by 3 feet long and except for the setting of anchor rods, anchor bolts, or reinforcing steel in concrete.

2. Flowable nonshrink cementitious grout: Use under all base plates greater in area than 3-foot by 3-foot. Use at all locations indicated to receive flowable nonshrink grout by the Drawings. The Contractor, at his/her

option and convenience, may also substitute flowable nonshrink grout for general purpose nonshrink cementitious grout.

3. Nonshrink epoxy grout: Use for the setting of anchor rods, anchor bolts and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.

4. Cement grout: Cement grout may be used for grouting of incidental base plates for structural and miscellaneous steel such as post base plates for platforms, base plates for beams, etc. It shall not be used when nonshrink grout is specifically called for on the Drawings or for grouting of primary structural steel members such as columns and girders.

5. Concrete grout: Use for overlaying the base concrete under scraper mechanisms of clarifiers to allow more control in placing the surface grade.

END OF SECTION

SECTION 03930
MODIFICATIONS AND REPAIR TO CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein. Work under this Section shall also include bonding new concrete to existing concrete.

1.02 RELATED WORK

A. Demolition and modifications are included in Section 02050.

B. Cast-in-place concrete is included in Section 03300.

C. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01340, a Schedule of Demolition and the detailed methods of demolition to be used at each location.

B. Submit manufacturer's technical literature on all product brands proposed for use, to the Engineer for review. The submittal shall include the manufacturer's installation and/or application instructions.

C. When substitutions for acceptable brands of materials specified herein are proposed, submit brochures and technical data of the proposed substitutions to the Engineer for approval before delivery to the project.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C881 Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.

2. ASTM C882 Standard Test Method for Bond Strength of Epoxy Resin Systems Used with Concrete by Slant Sheer.

3. ASTM C883 Standard Test Method for Effective Shrinkage of Epoxy Resin Systems Used with Concrete.

4. ASTM D570 Standard Test Method for Water Absorption of Plastics.

5. ASTM D638 Standard Test Method for Tensile Properties of Plastics.

6. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics.

7. ASTM D732 Standard Test Method for Shear Strength of Plastics by Punch Tool.

8. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 QUALITY ASSURANCE

A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.

B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and to prevent damage to the structures or contents by falling or flying debris. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.

1.07 WARRANTIES

A. Manufacturer Qualifications: The manufacturer of the specified products shall have a minimum of 10 years experience in the manufacture of such products and shall have an ongoing program of training, certifying, and technically supporting the Contractor's personnel.

B. Contractor Qualifications: Contractors shall complete a program of instruction in the application of the approved manufacturer’s material specified in this Section

and provide certification from the manufacturer attesting to their training and status as an approved applicator.

C. Furnish a notarized certificate stating that the materials meet the requirements of this Section and have the manufacturer's current printed literature on a specified product.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver the specified products in original, unopened containers with the manufacturer's name, labels, product identification and batch numbers.

B. Store and condition the specified product as recommended by the manufacturer.

1.09 QUALIFICATIONS (NOT USED)

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 WEATHER CONSTRAINTS (NOT USED)

PART 2 PRODUCTS

2.01 MATERIALS

A. General

1. Materials shall comply with this Section and any state or local regulations.

B. Epoxy Bonding Agent

1. General

a. The epoxy bonding agent shall be a two component, solvent free, asbestos free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete complying with the requirements of ASTM C881, Type II and the additional requirements specified herein.

2. Material

a. Properties of the cured material:

(1) Compressive Strength (ASTM D695): 8,500 psi minimum at 28 days.

(2) Tensile Strength (ASTM D638): 4,000 psi minimum at 14 days.

(3) Flexural Strength (ASTM D790 Modulus of Rupture): 6,300 psi minimum at 14 days.

(4) Shear Strength (ASTM D732): 5,000 psi minimum at 14 days.

(5) Water Absorption (ASTM D570 2 hour boil): One percent maximum at 14 days.

(6) Bond Strength (ASTM C882) Hardened to Plastic: 1,500 psi minimum at 14 days moist cure.

(7) Effective Shrinkage (ASTM C883): Passes Test.

(8) Color: Gray.

3. Approved manufacturer's include: Sika Corporation, Lyndhurst, NJ Sikadur 32, Hi Mod; Master Builder's, Cleveland, OH Concresive Liquid (LPL) or equal.

C. Epoxy Paste

1. General

a. Epoxy Paste shall be a two component, solvent free, asbestos free, moisture insensitive epoxy resin material used to bond dissimilar materials to concrete such as setting railing posts, dowels, anchor bolts and all threads into hardened concrete and shall comply with the requirements of ASTM C881, Type I, Grade 3 and the additional requirements specified herein. It may also be used to patch existing surfaces where the glue line is 1/8 in or less.

2. Material

a. Properties of the cured material:

(1) Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.

(2) Tensile Strength (ASTM D638): 3,000 psi minimum at 14 days. Elongation at Break 0.3 percent minimum.

(3) Flexural Strength (ASTM D790 Modulus of Rupture): 3,700 psi minimum at 14 days.

(4) Shear Strength (ASTM D732): 2,800 psi minimum at 14 days.

(5) Water Absorption (ASTM D570): 1.0 percent maximum at 7 days.

(6) Bond Strength (ASTM C882): 2,000 psi at 14 days moist cure.

(7) Color: Concrete grey.

3. Approved manufacturer's include:

a. Overhead applications: Sika Corporation, Lyndhurst, NJ Sikadur Hi mod LV 31; Master Builders, Inc., Cleveland, OH Concresive 1438 or equal.

b. Sika Corporation, Lyndhurst, N.J. Sikadur Hi mod LV 32; Master Builders, Inc., Cleveland, OH Concresive 1438 or equal.

D. Nonshrink Precision Cement Grout, Nonshrink Cement Grout, Nonshrink Epoxy Grout and Polymer Modified mortar are included in Section 03600, Grout.

E. Adhesive Capsule type anchor system shall be equal to the HVA adhesive Anchoring System by Hilti Fastening Systems, Tulsa, OK. The capsule shall consist of a sealed glass capsule containing premeasured amounts of a polyester or vinylester resin, quartz sand aggregate, and a hardener contained in a separate vial within the capsule.

F. Acrylic Latex Bonding Agent

G. Crack Repair Epoxy Adhesive

1. General

a. Crack Repair Epoxy Adhesive shall be a two component, solvent free, moisture insensitive epoxy resin material suitable for crack

grouting by injection or gravity feed. It shall be formulated for the specific size of opening or crack being injected.

b. All concrete surfaces containing potable water or water to be treated for potable use that are repaired by the epoxy adhesive injection system shall be coated with an acceptable epoxy coating approved by the FDA for use in contact with potable water.

2. Material

a. Properties of the cured material

(1) Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.

(2) Tensile Strength (ASTM D638): 5,300 psi minimum at 14 days. Elongation at Break: 2 to 5 percent.

(3) Flexural Strength (ASTM D790 Modulus of Rupture): 12,000 psi minimum at 14 days (gravity); 4,600 psi minimum at 14 days (injection)

(4) Shear Strength (ASTM D732): 3,700 psi minimum at 14 days.

(5) Water Absorption (ASTM D570 2 hour boil): 1.5 percent maximum at 7 days.

(6) Bond Strength (ASTM C882): 2,400 psi at 2 days dry; 2,000 psi at 14 days dry plus 12 days moist.

(7) Effective Shrinkage (ASTM 883): Passes Test.

3. Approved manufacturer's include:

a. For standard applications: Sika Corporation, Lyndhurst, NJ Sikadur Hi Mod; Master Builders Inc., Cleveland, OH Concressive 1380 or equal.

b. For very thin applications; Sika Corporation, Lyndhurst, NJ Sikadur Hi Mod LV; Master Builders Inc., Cleveland, OH Concressive 1468 or equal.

H. Polymer-Modified Portland Cement Mortar (Vertical and Overhead Surfaces)

1. The polymer-modified Portland cement mortar shall be a two-component, polymer-modified, Portland cement fast-setting, non-sag mortar with a migrating corrosion inhibitor.

2. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives. It shall have a particle size of less than 0.1 micron.

3. Component A shall contain an organic, migrating corrosion inhibitor which has been independently proven to reduce corrosion in concrete via ASTM G3 (half-cell potential tests). The corrosion inhibitor shall not be calcium nitrate, and shall have a minimum of 7 years of independent field testing to document performance on actual construction projects.

4. Component B shall be a blend of selected Portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and accelerators.

5. The ratio of Component A: Component B shall be 1:5:2 by weight.

6. The polymer-modified Portland cement mortar shall be placeable from 1/8-inch to 1-1/2 inches depth per lift.

7. Aggregate to extend the polymer-modified Portland cement mortar shall be a minus 1/2 or 3/8-inch clean, well graded, saturated surface dry material having low absorption and high density in conformance with the manufacturer's requirements.

8. Approved manufacturers include: Sika Corporation, Lyndhurst, NJ – Sikatop 123 plus.

I. Polymer-Modified Portland Cement Mortar (Horizontal Surfaces)

1. The polymer-modified Portland cement mortar shall be a two-component, polymer-modified, Portland cement fast-setting, non-sag mortar with a migrating corrosion inhibitor.

2. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives. It shall have a particle size of less than 0.1 micron.

3. Component A shall contain an organic, migrating corrosion inhibitor which has been independently proven to reduce corrosion in concrete via ASTM G3 (half-cell potential tests). The corrosion inhibitor shall not be

calcium nitrate, and shall have a minimum of 7 tests). The corrosion inhibitor shall not be calcium nitrate, and shall have a minimum of 7 years of independent field testing to document performance on actual construction projects.

4. Component B shall be a blend of selected Portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and accelerators.

5. The ratio of Component A: Component B shall be 1:7:2 by weight.

6. The polymer-modified Portland cement mortar shall be placeable from 1/8-inch to 1-inch depth per lift.

7. Aggregate to extend the polymer-modified Portland cement mortar shall be a minus ½- or 3/8-inch clean, well graded, saturated surface dry material having low absorption and high density in conformance with the manufacturer's requirements.

8. Approved manufacturers include: Sika Corporation, Lyndhurst, NJ – Sikatop 122 plus.

PART 3 EXECUTION

3.01 GENERAL

A. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.

B. When drilling holes for dowels/bolts at new or existing concrete, drilling shall stop if rebar is encountered. As approved by the Engineer, the hole location shall be relocated to avoid rebar. Rebar shall not be cut without prior approval by the Engineer. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drilled hole locations may be adjusted to avoid rebar interference.

3.02 CONCRETE REMOVAL

A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits followed by chipping or jack hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete or existing reinforcing to be left in place and existing in place equipment is not damaged.

Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, or after obtaining written approval from the Engineer.

B. Where existing reinforcing is exposed due to saw cutting/core drilling and no new material is to be placed on the sawcut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4 inch.

C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1 inch deep saw cut on each exposed surface of the existing concrete.

D. Concrete specified to be left in place which is damaged shall be repaired by approved means to the satisfaction of the Engineer.

E. The Engineer may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate.

3.03 CONNECTION SURFACE PREPARATION

A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified herein, or as directed by the Engineer.

B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. sandblasting, grinding, etc, as approved by the Engineer. Be sure the areas are not less than ½-inch deep. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete, subject to the Engineer's final inspection.

C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of ½-inch. Reinforcing to be saved shall not be damaged during the demolition operation.

D. Reinforcing from existing demolished concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with 1-inch minimum cover all around.

E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified herein or as directed by the Engineer.

1. Method A: After the existing concrete surface at connection has been roughened and cleaned, thoroughly moisten the existing surface with water. Brush on a 1/16 inch layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.

2. Method B: After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. Method C: Drill a hole ¼-inch larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing epoxy. The drilled hole shall first be filled with epoxy paste, then dowels/bolts shall be buttered with paste then inserted by tapping. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of fifteen bar diameters. If not noted on the Drawings, the Engineer will provide details regarding the size and spacing of dowels.

4. Method D: Combination of Method B and C.

5. Method E: Capsule anchor system shall be set in existing concrete by drilling holes to the required depth to develop the full tensile and shear strengths of the anchor material being used. The anchor bolts system shall be installed per the manufacturer's recommendation in holes sized as required. The anchor stud bolt, rebar or other embedment item shall be tipped with a double 45 degree chamfered point, securely fastened into the chuck of all rotary percussion hammer drill and drilled into the capsule filled hole. The anchor may be installed in horizontal, vertical and overhead positions.

3.04 GROUTING

A. Grouting shall be as specified in Section 03600.

3.05 CRACK REPAIR

A. Cracks on horizontal surfaces shall be repaired by gravity feeding crack sealant into cracks per manufacturer's recommendations. If cracks are less than 1/16 inch in thickness they shall be pressure injected.

B. Cracks on vertical surfaces shall be repaired by pressure injecting crack sealant through valves sealed to surface with crack repair epoxy adhesive per manufacturer's recommendations.

3.06 CONCRETE SURFACE REPAIR AND/OR EXPOSED REINFORCING REPAIR

A. All loose, unsound (delaminated), and deteriorated concrete shall be removed by mechanical means.

B. Saw cut perimeter of unsound (delaminated) concrete to form a rectangle with straight edges to a depth of ¾-inch or to the top of the reinforcing, whichever is shallower. Do not cut reinforcing unless otherwise noted.

C. Chip concrete substrate to obtain a surface profile with new fractured-aggregate surface.

D. Depth of repair shall be not less than the performance criteria of the specific product used.

E. Where reinforcing steel with active corrosion is encountered, the procedure shall be as follows:

1. Remove all contaminants and rust from exposed reinforcing steel.

2. When half of the diameter of the rebar is exposed, chip out behind the reinforcing steel, 1-inch minimum.

3. The distance chipped behind the rebar shall be equal to or exceed the minimum placement depth of the material to be used, or as indicated on the Drawings.

4. Bars shown to remain in place which are found to have lost more than 15% class sectional area due to corrosion or which are damaged by the concrete removal process, such that their cross-sectional area has been reduced by more than 15%, shall be replaced with new bars.

F. Cracks encountered in the substrate in the area of the patch area shall be treated as approved by the Engineer.

G. Substrate may be dry or damp, but free of standing water.

H. Remove dust, laitance, and any foreign particles.

I. Spray apply mixed epoxy resin adhesive on the prepared area to receive the Portland cement mortar or concrete in strict compliance with the manufacturer's recommendations.

J. While adhesive coat is still wet (before tack-free to the touch) apply polymer-modified cement. The edges shall be vertical and straight.

K. For applications greater than 1-inch in depth, apply polymer-modified cement in lifts. Score the top lifts of each lift to produce a roughened surface before applying the next lift. Allow the lift to reach final set before proceeding with the next lift. Adhesive coat shall be applied between each lift.

3.07 INSPECTION

A. At the completion of all repairs, the Contractor, Engineer, and Installers of the material used on the repairs shall inspect the work.

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13200
GLASS-FUSED-TO-STEEL LEACHATE STORAGE TANKS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide all materials, labor, tools, equipment, and appurtenances to furnish, erect, and install factory-coated glass-fused-to-steel leachate storage tanks as indicated on the Drawings and specified in this Section complete and ready for operation. Tanks shall be installed in the same locations as the tanks that are being replaced.

B. See Division 1, General Requirements, which contains information and requirements that apply to the work specified.

1.02 RELATED WORK

A. Maintenance of Facility Operations and Sequence of Work is included in Section 01810.

B. Demolition and Modifications is included in Section 02050.

1.03 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01340, Submittals and Acceptance:

A. Provide the following materials as a minimum:

1. Catalogue information and catalogue cuts.

2. Detailed erection drawings and materials specifications signed and sealed by a Registered Professional Engineer licensed in Florida shall be submitted for record purposes.

3. Complete set of structural calculations for the structure signed and sealed by a Registered Professional Engineer licensed by Florida shall be submitted for record purposes. The Contractor shall obtain foundation requirements from the tank manufacturer for use in designing foundation modifications as required in Specification Section 02050.

4. Tank manufacturer and installing contractor’s warranty information and warranty period dates.

B. Submit tank layout drawings showing dimensions, wall thickness, mounting brackets, nozzle locations and orientation, and nozzle construction. The Contractor shall provide the manufacturer's component weights, anchor bolt designs, and weight of the storage tank (both empty and full of liquid).

C. Submit certification that the glass coating, sealer, and bolt head encapsulation materials are suitable for exposure to landfill leachate with high chloride concentrations (average 30,000 mg/L) and an average pH of 6.0.

D. Submit manufacturer's design calculations for structural design of walls and design of tie-down lugs (number and size/signal), signed and sealed by a registered Civil or Structural Professional Engineer licensed in Florida.

E. The Contractor shall submit the tank manufacturer's structural calculations for tank design, including hold-downs and anchor bolt maximum shear and tension values for review. Calculations shall be signed and sealed by a registered Professional Engineer licensed in Florida. The anchor bolt hold down calculations shall provide an anchorage force that is greater than the buoyancy force of the empty tank in the prescribed secondary containment structure flooded to the top of wall.

F. Submit a cathodic protection system design signed and sealed by a Registered Professional Engineer that is a NACE-certified Cathodic Protection Specialist. The design submittal is outlined in Part 2.03 B of the Specifications.

G. Submit a compliance report for the cathodic protection system signed and sealed by a Registered Professional Engineer that is a NACE-certified Cathodic Protection Specialist. The compliance report is outlined in Part 2.03 C of these Specifications.

1.04 WORK SEQUENCE

A. See Section 01810 for Maintenance of Facility Operations and Sequence of Construction.

1.05 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Iron and Steel Institute (AISI)

B. American National Standards Institute (ANSI)

C. American Society for Civil Engineers (ASCE)

1. ASCE 7-05—Minimum Design Loads for Buildings and Other Structures.

D. American Society for Testing and Materials (ASTM)

1. ASTM A36—Standard Specification for Carbon Structural Steel.
2. ASTM A1008—Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
3. ASTM A1011—Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
4. ASTM C282—Standard Test Method for Acid Resistance of Porcelain Enamels (Citric Acid Spot Test).
5. ASTM D5162— Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates.

E. American Water Works Association (ANSI/AWWA)

1. ANSI/AWWA D103—Factory-Coated Bolted Steel Tanks for Water Storage.

F. Florida Building Code (FBC)

G. International Organization for Standardization (ISO)

1. ISO 9001—Quality Management Systems – Requirements.

H. National Association of Corrosion Engineers (NACE)

1. NACE RP0196-2004—Galvanic Anode Cathodic Protection of Internal Submerged Surface of Steel Water Storage Tanks.

I. National Fire Protection Agency (NFPA)

1. NFPA 780—Standard for the Installation of Lightning Protection Systems

J. Occupational Safety and Health Administration (OSHA)

1.06 QUALITY ASSURANCE

A. The manufacturer's quality system shall be ISO 9001 certified.

B. Chemical Resistance of Glass Coating

1. Every batch of component glass frits shall be individually tested in accordance with PEI Test T21 (Citric Acid at Room Temperature).

2. The Contractor shall test coated sheets for glass mil thickness using an electronic dry film thickness gauge (magnetic induction type). The gauge shall have a valid calibration record.

3. Test frequency shall be every 10^{th} sheet to verify specified coating thickness.

C. Coated sheets shall be checked for exterior color uniformity by an electronic colorimeter. The colorimeter shall have a valid calibration record.

D. The Contractor shall perform an electrical leak detection test on the inside surface after fabrication of each sheet using a 67.5-volt wet sponge holiday tester. Any sheet registering a discontinuity shall be rejected. All inside sheet surfaces shall be holiday free. The test shall be carried out in accordance with ASTM D5162-91 Method A (1000V dry test does not conform with ASTM for the specified coating thickness and is not acceptable).

E. One coated sheet per each gauge lot run shall be tested for fishscale by placing the test sheet in an oven at 400° F for 1 hour. The coating shall be examined for evidence of fishscaling. Any sheet exhibiting fishscale shall be rejected and all sheets from the gauge lot then tested or the entire gauge lot shall be rejected.

1.07 WARRANTIES

A. Warranties shall be in accordance with Section 1.12, Warranty, of the Special Terms and Conditions.

B. The Contractor shall provide a warranty for the storage tanks and appurtenances, cathodic protection system, tank materials, tank coatings, and tank erection/installation for 5 years after leachate is first introduced into the tank.

C. During the warranty period, the Contractor shall provide the services of a trained representative to make all adjustments, repairs, and replace all defective equipment at no cost to the Owner.

D. The Contractor shall bear all costs incurred under the terms of the warranty, including travel and housing/dining expenses.

E. Products shall be warranted to be free from defects in workmanship, design, and materials. If any part of the product fails during the warranty period, it shall be replaced or repaired at the Contractor's option and the unit(s) restored to service at no expense to the Owner.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall require the manufacturer to assume responsibility for packaging to prevent normal transit and handling damage to the tank components.

B. All approved glass-fused-to-steel panels shall be protected from damage before packing for shipment.

C. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

D. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to maintain the roll-radius of the tank panels and minimize contact or movement of finished panels during shipment.

E. Shipment from the factory to the job site will be by truck hauling the tank components exclusively. No common carrier, drop, or transfer shipments are allowed.

1.09 QUALIFICATIONS

A. The tank manufacturer shall be a single entity that designs and fabricates all components of the glass-fused-to-steel tanks specified in this Section. The manufacturer shall be a firm with at least 10 years experience in the design and fabrication of glass-fused-to-steel tanks and shall give satisfactory evidence that it has the skill, reliability, and financial stability to guarantee the tank in accordance with the quality required by these Specifications.

B. The installer shall be a single entity that erects all components of the glass-fused-to-steel tanks specified in this Section. The installer shall be a firm with at least 10 years experience in the erection of glass-fused-to-steel tanks and shall give satisfactory evidence that it has the skill, reliability, and financial stability to build the tank in accordance with the quality required by these Specifications.

C. The manufacturer shall retain a full-time registered Professional Engineer, who shall have no fewer than 10 years experience in the design of glass-fused-to-steel tanks and who shall be the responsible engineer in charge of the design work to be

done. All working drawings shall carry the seal, signature, and date of the Professional Engineer licensed in Florida.

1.10 TESTING REQUIREMENTS

A. Chemical Resistance of Glass Coating

1. Every batch of component glass frits shall be individually tested in accordance with ASTM C282.

2. The Contractor shall test coated sheets for glass mil thickness using an electronic dry film thickness gauge (magnetic induction type). The gauge shall have a valid calibration record.

3. Test frequency shall be every 10^{th} sheet to verify the specified coating thickness.

B. Coated sheets shall be checked for exterior color uniformity by an electronic colorimeter. The colorimeter shall have a valid calibration record.

C. The manufacturer shall perform an electrical leak detection test on the inside surface after fabricating each sheet using a 67.5-volt wet sponge holiday tester. Any sheet registering a discontinuity shall be rejected. All inside sheet surfaces shall be holiday free. The test shall be carried out in accordance with ASTM D5162 Method A (1000V dry test does not conform to ASTM for the specified coating thickness and is not acceptable).

D. One coated sheet per each gauge lot run shall be tested for fishscale by placing the test sheet in an oven at 400° F for 1 hour. The coating shall be examined for evidence of fishscaling. Any sheet exhibiting fishscale shall be rejected and all sheets from the gauge lot then tested or the entire gauge lot shall be rejected.

1.11 MAINTENANCE (NOT USED)

1.12 RECORD DRAWINGS

A. Record drawings shall be furnished as specified in Section 01785, Record Drawings.

1.13 SYSTEM DESCRIPTION (NOT USED)

1.14 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Operations and Maintenance Manuals shall be in accordance with General Conditions, Supplemental Conditions, and Specification Section 01780, Operations and Maintenance Manuals.

1.15 PATENTS AND LICENSES (NOT USED)

1.16 DESIGN CRITERIA

A. Each factory-coated glass-fused-to-steel bolted tank shall have a nominal inside diameter of 30.77 feet with a nominal sidewall height of 14.68 feet.

B. The capacity of each tank with zero freeboard shall be 81,000 gallons (U.S.) and a minimum usable capacity of 76,000 gallons (U.S.) with 12-inch freeboard.

C. The materials, design, fabrication, and erection of the bolted tanks shall conform to AWWA standard for "Factory Coated Bolted Steel Tanks for Water Storage" – ANSI/AWWA D103, latest revision.

D. The tank coating system shall conform solely to Section 10.4 of ANSI/AWWA D103.

E. The glass coating on the tank, bolt head encapsulation material, and joint sealant shall have been approved for listing under ANSI/NSF Standard 61 for Indirect Additives.

F. The tank and its anchorage system shall be designed for empty and full tank conditions using a leachate specific gravity of 1.3 at 120º F.

G. At a minimum, the tank and its anchorage system shall be designed in accordance with the Florida Building Code (FBC) requirements supplemented by ASCE 7-05 for wind loading requirements:

1.	Basic Wind Speed, mph	130
2.	Importance Factor	1.15
3.	FBC Exposure	B
4.	ASCE 7-98 Exposure	C

H. The tank manufacturer shall be ISO-9001 certified to ensure product quality.

I. The tank manufacturer shall undergo an annual Factory Mutual inspection and provide proof of this inspection to ensure product quality.

PART 2 PRODUCTS

2.01 MATERIALS

A. Plates and sheets used for construction of the tank shell shall comply with the minimum standards of AWWA D103, Section 2.4.

B. Steel Design Requirements shall be as follows:

1. Mild steel shall be ASTM A570, Grade 30 with tensile stress of 18,000 psi (maximum allowable).

2. High-strength steel shall be ASTM A607, Grade 50 with tensile stress of 30,000 psi (maximum allowable).

3. Rolled structural shapes shall conform to ASTM A36 or AISI 1010.

4. The annealing effect created from the glass-coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be used for calculations detailed in AWWA D103, Sections 3.4 and 3.5.

5. When multiple vertical bolt line sheets and plates of ASTM A1011 Grade 50 are used, they shall be manufactured so that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate; and the effective net section area shall not be taken as greater than 85% of the gross area.

6. Sheet edges of sidewall plates shall be mechanically beveled and ARC flame coated with 1.5 to 5 mils 316 stainless steel before glass coating. Glass coating of the sheet edges shall be similar to the flat panel surfaces. The process shall be equal to EDGECOAT™ by Engineered Storage Products Company or equal.

C. Bolts used in tank lap joints shall be ½-inch- 13UNC – 2A rolled thread and shall meet the following requirements:

1. ANSI/AWWA D103, Section 2.2.

2. SAE J429 Grade 2 (1-inch Bolt Length)

3. Tensile strength: 74,000 psi (minimum).

4. Proof load: 55,000 psi (minimum).

5. Allowable shear stress: 18,163 psi (AWWA D103).

6. Zinc Mechanically Deposited finish.

D. High Strength Bolts (1-1/4-inch Bolt Length) as required shall be as follows:

1. SAE J249 Grade 5/ASTM 325

2. Tensile strength: 120,000 psi (minimum).

3. Proof load: 86,000 psi (minimum).

4. Allowable shear stress: 29,454 psi (AWWA D103).

5. Zinc Mechanically Deposited finish.

E. High-Strength Bolts (> 1-1/4-inch Bolt Length) as required shall be as follows:

1. SAE J249 Grade 8/ASTM 325

2. Tensile strength: 150,000 psi (minimum).

3. Proof load: 120,000 psi (minimum).

4. Allowable shear stress: 36,818 psi (AWWA D103).

5. Zinc Mechanically Deposited finish.

F. Bolt Encapsulation shall be as follows:

1. High-impact polypropylene co-polymer of natural resins with UV (Ultraviolet) light inhibitor only. Color to be black.

2. Entire bolt head up to the splines on the shank.

3. All tank shell bolts shall be installed so that the head portion is inside the tank and the washer and nut are on the exterior.

4. All lap joint bolts shall be properly selected so that threaded portions will not be exposed in the "shear plane" between tank sheets. Also, bolt lengths shall be sized to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

5. All lap joint bolts shall include a minimum of four splines on the underside of the bolt head at the shank to resist rotation during torquing.

6. Polyethylene co-polymer “bolt caps” and sealant shall be used to cover the bolts, nuts, and washers exposed on the outside of the tank sidewall.

G. Sealants used to seal lap joints and bolt connections shall be as follows:

1. One-component, moisture-cured, polyurethane compound. The sealer shall not be used as a coating except for minimal exposed panel edges for the embedded starter ring, notches of sidewall panels, and edges exposed for nozzle connections. The sidewall panel edges shall be protected by the fused glass coating (spray or brush on coatings are not acceptable). The sealant shall cure to a rubber-like consistency, have excellent adhesion to the glass coating, have low shrinkage, and be suitable for interior and exterior exposure.

2. Curing rate at 73° and 50% RH.

3. Tack free: 6 to 8 hours.

4. Final cure: 10 to 12 days.

5. Sealant shall be supplied by Engineered Storage Products Company, DeKalb, Illinois, or equal.

6. Neoprene gaskets and tape-type sealer shall not be used.

H. Glass coating applied to steel shall meet the following minimum requirements:

1. Steel sheets prepared for coating shall be steel grit-blasted on both sides to SSPC-10. Sand blasting and chemical pickling of steel sheets is not acceptable. Before the coating system is applied, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying. Sheets shall be inspected for traces of foreign matter, soil particles, grease, or rust. Any sheets with any such substances shall be recleaned or grit-blasted to an acceptable level of quality.

2. All sheets shall be primed with catalytic nickel oxide glass ground-coat on both sides and then air dried in accordance with Section 10.4.2.1 of ANSI/AWWA D103.

3. Both sides of the sheet shall receive an intermediate coat of cobalt blue glass frit.

4. The sheets shall receive a final white coat of milled titanium dioxide reinforced silica glass coating on the interior surface.

5. The sheets shall then be fired at a minimum temperature of 1,500º F in accordance with the manufacturer's ISO 9001 quality process control procedures, including firing time, furnace humidity, and temperature control.

6. Dry film interior coating thickness shall be 18 mils.

7. Dry film exterior coating thickness shall be 7-15 mils.

8. The finished exterior color shall be standard cobalt blue.

9. All panels shall be adequately protected from damage during shipment and storage.

I. The Contractor shall furnish and install an aluminum roof specified by the tank manufacturer designed and constructed in accordance with AWWA D103. The roof/cover shall be of the aluminum geodesic dome configuration to be self-supporting and shall be constructed of the following materials:

1. Aluminum struts and gussets: 6005A-T6 or 6061-T6.

2. Triangular closure panels: 0.050-inch nominal thickness 3003 – H16 sheet.

3. Tension ring: 6005A-T6 or 6061-T6 Aluminum.

4. Fasteners: 2024-T4 or 7075-T73 anodized aluminum or Series 300 stainless steel.

5. Sealant and gaskets: silicone rubber.

6. Vents and hatches: 6061-T6, 5086-H34, or 3003-H16 aluminum.

7. The roof shall be constructed of non-corrugated triangular aluminum panels which are sealed and firmly clamped in an inter-locking manner to a fully triangulated aluminum space truss system of wide flange extrusions forming a spherical cover.

8. The dome shall be clear-span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring.

9. Aluminum shall be isolated from carbon steel by an austenitic stainless steel spacer or an elastomeric isolator bearing.

10. The dead weight of the dome shall not exceed 3 pounds per square foot of surface area.

11. The dome and tanks shall be designed to act as an integral unit and shall be capable of supporting two 250-lb loads concentrated on two separate 1-ft^2 areas of any aluminum panel in addition to wind and/or other applicable loading.

12. Aluminum flashing shall be used to make the dome perimeter weather-tight and to prevent the entrance of animals and insects where the dome mounts to the tank wall. Fabric or synthetic-rubber-type flashing is not permitted.

13. The tank roof shall manufactured by CST Industries, Inc. in Kansas City, KS; Temcor in Gardena, CA; Engineered Storage Products Co., DeKalb, Illinois; or Engineer-approved equal.

J. Horizontal wind stiffeners shall meet the following minimum requirements:

1. Wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffeners, permitting wind load to be distributed around the tank.

2. Web truss stiffeners shall be of steel with hot-dipped galvanized coating.

3. Rolled steel angle stiffeners are not permitted to be used as intermediate stiffeners.

2.02 ACCESSORIES

A. The Contractor shall ensure that all connections to the tank are designed and furnished by the tank manufacturer to preclude corrosion at each connection.

B. If existing exterior tank ladders cannot be reused, an outside tank ladder shall be furnished and installed to match the existing ladder and meet OSHA requirements as indicated on the Drawings and/or as required by the tank manufacturer as follows:

1. Fabricated of aluminum with grooved skid-resistant rungs.

2. Furnish and install a stainless steel safety climb system and stainless steel step-off grated platforms with handrailing system.

C. Furnish and install one aluminum top-mounted access hatch near the ladder. An aluminum grated access platform system with aluminum handrailing shall be provided all around the access hatch and from the hatch to the ladder.

D. The Contractor shall furnish and install a properly sized vent assembly in accordance with AWWA D103 above the maximum leachate level. The overflow pipe shall not be considered to be a tank vent. The vent shall be constructed of aluminum and designed to prevent rainwater entry and to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23- to 25-mesh polyester monofilament shall be furnished and installed.

E. Furnish and install at a minimum a 24-inch-diameter sidewall access manway as shown on the Drawings in accordance with AWWA D-103. The manway shall include a properly reinforced frame and cover plate. A tank-mounted stainless steel davit to hold and handle the cover plate, when open, is required.

F. The manufacturer's nameplate with serial number, tank diameter, tank height, and maximum capacity.

G. The Contractor shall furnish and install leachate inlet pipe, leachate outlet pipe, tank overflow pipe, and sump as shown on the Drawings.

H. The leachate storage tank shall contain an overflow piping system, 8 inches in diameter, of ductile iron construction. The overflow pipe downcomer shall be installed outside of the leachate storage tank with the tank sidewall flanged steel nozzle penetration within 30 inches of the top of the sidewall of the tank. The overflow inlet inside the tank shall consist of a 13.5-inch-diameter flare end flange fitting positioned vertically so that there are 6 inches of freeboard from the top of the flare to the top of the tank sidewall. Stainless steel standoffs shall be used to support the overflow pipe. A 90° elbow shall be installed at the bottom of the overflow pipe. The overflow piping shall match the existing configuration.

I. A float-operated liquid level indicator shall be provided on the exterior of the tank. The level indicator shall be a full-travel, direct-read-type gauge with an accuracy of plus or minus 1 inch. All interior components (i.e. float and float cables) shall be stainless steel. The exterior gauge board shall be galvanized steel with a graduated vinyl face. The scale on the vinyl face of the gauge board shall be graduated in large 1-ft increments. Bolt-on brackets shall be provided to attach the gauge board to the tank wall. A large "red" pointer shall be provided to indicate the tank liquid level. The liquid level indicator shall be as manufactured by Engineered Storage Products Co. of DeKalb, IL or Tank Products, Inc. of Ontario, CA, or approved equal.

J. Furnish and install an alarm limit switch to connect to and operate with the level sight gauge. The limit switch shall provide a minimum of two single-pole double-throw (SPDT) switches that actuate on a user-defined tank level. The alarm limit switch shall be Varec 2557 or approved equal. The audible alarm and flashing light will activate when the liquid level exceeds the level of the overflow pipe.

2.03 CATHODIC PROTECTION SYSTEM

A. Each leachate storage tank shall be furnished and installed with a passive, sacrificial anode cathodic protection system. The cathodic protection design/install constructor shall provide all engineering services, materials, equipment, labor, and supervision for the installation of the cathodic protection system for protecting uncoated steel surfaces exposed to the contained liquid. The cathodic protection system shall control corrosion and protect the portions of the tank structures immersed in liquid.

B. The cathodic protection design shall be prepared by a Registered Professional Engineer that is a NACE-certified Cathodic Protection Specialist. The Specialist shall have at least 20 years of documented experience designing cathodic protection systems for water process vessels. The design submittal shall include calculations, material list, product data sheets, detailed installation plans, a design analysis narrative, and the résumés of the Specialist and Technician. Sacrificial anodes shall be equally spaced (to the nearest vertical bolt line) around the tanks, attached to the floor, and bolted through tank shell sheet bolt holes. Buss bars shall be used to ensure continuity between the tank shell sheets. All electrical connections inside of the tank shall be protected against corrosion by application of a sealer. Sacrificial anodes shall be manufactured from magnesium or zinc alloys that are formulated specifically for this use. Installation shall require use of sacrificial anodes with lead wires that connect to a collector cable terminating in a test box with a tank connection cable, a tank test lead, a shunt, and a reference electrode lead. The shunt shall be located in an easily accessible location to facilitate measuring the current output of the system by landfill personnel. Sacrificial anode current capacities used in system life calculations for any sacrificial anode shall not exceed the consumption rate values given in NACE RP0196-2004 Table 1. After the cathodic protection system is installed, the sacrificial anode corrosion protection system shall be able to provide sufficient current to protect the tank for the full design life of the system, including anticipated coating deterioration.

C. Once the tank is placed in service, the cathodic protection system shall be tested to ensure effective corrosion control is achieved. Tests shall be conducted by a NACE-certified Technician Level I. The system will be inspected to determine if adjustments are required to maintain control of internal corrosion of the tank. Before inspection the tank must have been in use with typical liquid totally covering the anodes for at least 4, but not more than 30, consecutive days. The

tests shall be conducted using an LC-4 voltmeter and a copper/copper-sulfate reference cell. Anode current output measurements shall be determined by measuring the voltage between the two outstanding legs of the lead wire assemblies used to electronically connect the anodes to the tank. The anode open circuit potential shall be measured by placing the reference electrode with submersible adapter and lead wire into the stored liquid and measuring the potential between the reference electrode and the core rod of the disconnected anode. The tank potential shall be measured by placing the reference electrode with submersible adapter and lead wire into the stored liquid and measuring the potential between the reference electrode and the tank using a multimeter. The criteria for acceptance shall include the following: Anode current output shall not exceed +0.28 mVolt for magnesium anodes (+1.62 mVolt for zinc anodes) and shall not be lower than 0.1 mVolt for any anodes; tank "OFF" potential readings shall not be less negative than -850 mVolts. If any values fail to meet criteria, the Contractor shall investigate and correct the lack of protection at no cost to the Owner. The corrections may involve coating repairs and/or anode additions. Once all points tested meet NACE criteria, the Specialist shall issue a compliance report with all field data, analysis of the data, record drawings, and a statement that NACE criteria have been achieved. The Specialist shall sign and seal the report and drawings. A proposal shall also accompany the report, with firm fixed costs to conduct annual compliance tests for 5 years.

2.04 SALVAGED MATERIALS AND ACCESSORIES

A. Salvaged materials and accessories from the existing leachate storage tanks may be reused in place of new products when these materials and accessories meet the requirements of this Specification, are compatible with new equipment and tanks, are designated reusable by the Owner, and conform to the requirements of Section 02050.

2.05 MANUFACTURER

A. The tanks shall be Model 3115 Aquastore as manufactured by Engineered Storage Products Company, DeKalb, Illinois, or equal.

B. Acceptable firms to provide the Cathodic protection services and systems are:

Corrosion Control Incorporated	(706) 557-9624
Allied Corrosion	(770) 425-1355
Farwest Corrosion	(918) 627-9333
Corrpro Company	(330) 725-6681

2.06 PIPING CONNECTIONS

A. Pipe connections shall be located and sized to match the existing locations indicated on the Drawings and as necessary to meet the tank manufacturer's requirements.

B. Pipe connection end joints shall be either interior or exterior flange assemblies with appropriate gaskets.

C. Openings in the tank wall for pipe connections shall be field located, saw cut, and use an interior and exterior flange assembly bolted to the tank wall. A single component urethane sealer shall be applied on the cut panel edges and field drilled holes.

PART 3 EXECUTION

3.01 SHIPMENT INSPECTION

A. After the tank components are delivered to the site, the Contractor and Owner's Representative shall check the components for dents and other damage. Particular care shall be taken in handling to avoid abrasion of or other damage to the coating system.

3.02 FOUNDATION

A. The tank foundation shall safely support and anchor the structure and its loads. The tank foundation slab shall be modified in accordance with the tank manufacturer's requirements and Specification Section 02050.

B. The Owner shall make available copies of the geotechnical reports relative to bearing capacities of the soils for review by the Contractor upon request. All other investigations needed shall be performed by the Contractor and their cost included in the project bid price.

C. The Contractor shall be responsible for placing anchor bolts. The adhesive-type anchor bolts are to be drilled and epoxy set in the existing concrete tank floor slab. The Contractor shall employ an installation specialist to ensure proper placement of anchor bolts according to the tank manufacturer's certified construction/erection drawings.

D. The discharge pipe in the existing sump will not be disturbed or modified. The sump grating shall be raised as necessary to the new concrete tank floor elevation.

E. As necessary, the leveling of a new starter ring shall be in accordance with the tank manufacturer's requirements and the maximum differential elevation within

the ring shall not exceed 1/8-inch nor exceed 1/16-inch within any 10 feet of length.

3.03 TANK INSTALLATION

A. The Contractor shall install tanks level as shown on the Drawings.

3.04 SIDEWALL STRUCTURE

A. Field erection of the glass-coated, bolted steel tank shall be in accordance with the procedures in the tank manufacturer's erection manual.

B. Erection shall be performed by the tank manufacturer's authorized erector who has installed a minimum of 20 glass-fused-to-steel tanks within the last 10 years.

C. Particular care shall be taken in handling and during construction to avoid abrasion of or other damage to the coating system.

3.05 ELECTRICAL GROUNDING

A. An electrical grounding system shall be designed by a Florida Registered Professional Engineer to withstand direct lightning strikes without damage and furnished and installed in accordance with Section 7.4.1.4 (C) of NFPA 780 using three ground terminals at approximately 30-foot intervals around the perimeter of the tank.

3.06 FIELD TESTING

A. Electrical testing shall be used during and after erection to locate damage to the coating system. Repair/touch-up work shall be in accordance with the manufacturer's recommendations.

B. Before the hydrostatic testing, the Engineer and the Owner shall examine the erected tank and repairs/touch-up as required shall be completed.

C. Following completion of erection, cleaning, and the Engineer and Owner's examination, each tank shall be hydrostatically tested.

1. The tank shall be filled with water to the overflow inlet elevation for 48 hours.

2. Any leaks disclosed by this test shall be corrected by the erector in accordance with the tank manufacturer's recommendations.

3. Water used for the hydrostatic test shall be supplied by the Contractor.

4. Water used for the hydrostatic test shall be disposed of on-site as directed by the Engineer.

D. Labor and equipment necessary for tank testing is to be included in the Contractor's bid.

3.07 CERTIFICATION

A. The Contractor shall provide a written certification that the storage tanks have been properly installed according to the Drawings, Specifications, and manufacturer's specifications/instructions. Make all corrections and adjustments as necessary to achieve such certification at no additional cost to the Owner.

3.08 INSPECTION

A. On or within 3 months after the 1-year anniversary date of initial tank use, the tank erector shall conduct a visual inspection of the interior and exterior of each tank. The Owner is responsible for draining and cleaning out the tank before the arrival of the tank erector's inspector. The Owner is also responsible for all requirements necessary for entry into the tank under OSHA confined-space rules. A written report of the inspection of each tank's condition shall be delivered to the Owner within 30 days of the inspection.

END OF SECTION

DIVISION 15

MECHANICAL

SECTION 15020
MECHANICAL

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes requirements for the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.02 DEFINITIONS

A. *Finished Spaces*: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. *Exposed, Interior Installations*: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. *Exposed, Exterior Installations*: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. *Concealed, Interior Installations*: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. *Concealed, Exterior Installations*: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01340, Submittals and Acceptance.

1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stored items shall be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the

Contractor's expense. During the installation, piping, ductwork, and similar openings shall be capped to keep out dirt and other foreign matter.

B. The Contractor shall store plastic pipes protected from direct sunlight and supported to prevent sagging and bending.

1.06 COORDINATION

The Contractor shall do the following:

A. Arrange for pipe spaces, chases, slots, and openings in building structure during construction to allow for mechanical installations.

B. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

D. Provide coordination drawings at ¼ inch = 1 foot, 0 inch scale illustrating the coordination of piping, ductwork, lighting, and structure for an interference-free installation. Provide 24-inch x 36-inch bond paper and submit for review.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 PIPE, TUBE, AND FITTINGS

A. Match existing pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: Refer to ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

Shall be as follows:

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents:

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated:

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated, and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by the pipe manufacturer.

2.04 TRANSITION FITTINGS

Transition fittings shall be as follows:

A. AWWA Transition Couplings: The same size as and with pressure rating at least equal to and with ends compatible with the piping to be joined.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Underground Piping NPS 1-1/2 (DN 40) and Smaller: Manufactured fitting or coupling.

3. Underground Piping NPS 2 (DN 50) and Larger: AWWA C219, metal sleeve-type coupling.

4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions, one end with threaded brass insert and one solvent-cement-joint end.

1. Available Manufacturers:

a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions, one end with threaded brass insert and one solvent-cement-joint end.

1. Available Manufacturers:

a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC, and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Available Manufacturers:

a. NIBCO INC.
b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends the same size as the piping to be joined and a corrosion-resistant metal band on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities, Inc.

2.05 DIELECTRIC FITTINGS

Dielectric fittings shall be as follows:

A. Description: A combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1,725-kPa) minimum working pressure at 180ºF.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1,035- or 2,070-kPa) minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Epco Sales, Inc.
    d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1,035- or 2,070-kPa) minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, threaded ends, and 300-psig (2,070-kPa) minimum working pressure at 225ºF.

1. Available Manufacturers:

    a. Calpico, Inc.
    b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2,070-kPa) minimum working pressure at 225°F.

1. Available Manufacturers:

    a. Perfection Corp.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Victaulic Co. of America.

2.06 MECHANICAL SLEEVE SEALS

Mechanical sleeve seals shall be as follows:

A. Description: Modular sealing element unit designed for field assembly to fill the annular space between the pipe and the sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit the surface of the pipe. Include the type and number required for pipe material and the size of the pipe.

3. Pressure Plates: Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of the length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.07 SLEEVES

Sleeves shall be as follows:

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.08 GROUT

Grout shall be as follows:

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout:

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. The Contractor shall install piping according to the following requirements.

B. The drawing plans, schematics, and diagrams indicate the general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install the piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow the application of insulation, if required.

J. Select system components with a pressure rating equal to or greater than the system operating pressure.

K. Sleeves are not required for core-drilled holes.

L. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces:

a. Exception: Extend sleeves installed in the floors of mechanical equipment areas or other wet areas 2 inches above the finished floor level. Extend cast-iron sleeve fittings below the floor slab as required to secure a clamping ring if a ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).

b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install a section of cast-iron soil pipe to extend the sleeve to 2 inches above the finished floor level.

(1) Seal the space outside of the sleeve fittings with grout.

4. Except for underground wall penetrations, seal the annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for the size, depth, and location of joint.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for a 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals:

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select the type and number of sealing elements required for the pipe material and size. Position the pipe in the center of the sleeve. Assemble mechanical sleeve seals and install in the annular space between the pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for a 1-inch annular clear space between the pipe and sleeve for installing mechanical sleeve seals:

1. Mechanical Sleeve Seal Installation: Select the type and number of sealing elements required for the pipe material and size. Position the pipe in the center of the sleeve. Assemble mechanical sleeve seals and install in the annular space between the pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following.

B. Ream the ends of pipes and tubes and remove burrs. Bevel the plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from the inside and outside of the pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to the tube end. Construct joints according to ASTM B 828 or CDA's *Copper Tube Handbook* using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's *Brazing Handbook,* "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select the appropriate gasket material, size, type, and thickness for service application. Install the gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657:

1. Plain-End Pipe and Fittings: Use butt fusion.

2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to the pipe manufacturer's written instructions.

3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions in piping NPS 2 (DN 50) and smaller adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges in piping NPS 2-1/2 (DN 65) and larger next to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.04 EQUIPMENT INSTALLATION—COMMON REQUIREMENTS

A. Install equipment to allow the maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow the right of way for piping installed at the required slope.

3.05 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match the original factory finish.

3.06 CONCRETE BASES

A. Concrete Bases: Anchor the equipment to the concrete base according to the equipment manufacturer's written instructions.

1. Construct concrete bases of the dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect the concrete base to the concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through the concrete base and anchor into the structural concrete floor.

4. Place and secure anchorage devices. Use the supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with the items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to the supported equipment.

6. Install anchor bolts according to the anchor-bolt manufacturer's written instructions.

7. Use 3,000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 03300, Cast-in-Place Concrete.

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.08 GROUTING

The Contractor shall do the following:

A. Mix and install grout for the mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for the placement of grout.

D. Avoid air entrapment during the placement of grout.

E. Place grout so as to completely fill the equipment bases.

F. Place grout on the concrete bases and provide smooth bearing surface for the equipment.

G. Place the grout around the anchors.

H. Cure placed grout.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16020
ELECTRICAL

PART 1 GENERAL

1.01 SCOPE OF WORK

The work includes furnishing all labor, materials, equipment, and incidentals necessary for a complete corrosion-resistant and operable electrical installation, including all fees, charges and permits necessary. Work of this Section includes electrical installation requirements for equipment of other Sections. This Section is general and may contain specifications for equipment and devices not contained within the scope of this project.

A. The Contractor shall provide temporary and permanent electrical services of proper voltage and phase as required for the project. All single-phase temporary receptacle outlets shall be provided with ground fault protection in accordance with NEC Article 305-6.

B. The Contractor shall coordinate the work of this Section with others involved in the construction of the project.

C. The Contractor shall coordinate with the local power company to schedule and arrange for connection of the proposed electrical systems to the electrical distribution system.

1.02 RELATED WORK

A. The provisions of all other technical sections of the Specifications are fully applicable to this Section as if incorporated in this Section.

1.03 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01340, Submittals and Acceptance:

A. The Contractor shall submit a complete list of materials and equipment to be incorporated in the work to the Engineer within 15 days after the Award of Contract.

B. The list shall include catalog numbers, cut sheets, diagrams, and other descriptive data required to demonstrate conformance to the Specifications. Partial lists will not be acceptable.

C. The basis of acceptance shall be the manufacturer's published ratings for the equipment. The manufacturer shall be regularly engaged in manufacture of products specified.

D. Shop Drawings

1. Shop drawings shall be submitted for the following items of equipment:

   a. Wiring Devices
   b. Control Panels
   c. Safety Switches
   d. Circuit Breakers
   e. Relays
   f. Control Devices
   g. Transformers
   h. Transient Voltage Surge Suppressors

2. Contents of the shop drawings shall include the following:

   a. Details of construction, outline, and assembly drawings
   b. Dimensions
   c. Materials
   d. Finish
   e. Ratings
   f. Accessories
   g. Trim
   h. Engineering data
   i. Ladder-type schematic control diagrams and wiring diagrams
   j. Calculations for harmonic current and voltage distortion

E. Manufacturer's Literature

1. The manufacturer's literature shall be submitted for the equipment listed in Paragraph 1.03.D, including the following:

   a. Written description of equipment function, normal operating characteristics, and limiting conditions.

   b. Recommended assembly, installation, alignment, adjustment, and calibration instructions.

   c. Operating instructions.

   d. Guide to troubleshooting.

e. Maintenance instructions and timetables.

f. Assembly drawing.

g. Parts List with components clearly identified on the assembly drawing.

F. Certification/Documentation

1. Transient voltage surge suppressor submittals shall include the following:

a. UL 1449 peak let-through voltage documentation.

b. Category C3 peak let-through voltage test results.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American National Standards Institute (ANSI)

C2	National Electrical Safety Code (NESC)
C12.16	Solid-State Electricity Meters
C39.1	Requirements, Electrical Analog Indicating Instruments
C50.10	Rotating Electrical Machinery
C62.41	Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
C62.45	Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits
C80.1	Specification for Rigid Steel Conduit, Zinc-Coated
C82.9	HID Lamp Ballasts

B. American Society for Testing and Materials (ASTM)

A153	Zinc Coating (Hot Dip) on Iron and Steel Hardware
B8	Concentric Lay Stranded Copper Conductors; Hard, Medium-Hard, or Soft

C. Federal Specifications and Standards (FSS)

A-A-50552	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
A-A-50553	Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-Wall (EMT) Type)
A-A-50563A	Conduit Outlet Boxes, Bodies and Entrance Caps, Electrical
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive, Plastic
A-A-55810	Conduit, Metal, Flexible
A-A-59213	Splice Connectors
A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
W-C-375C	Circuit Breakers, Molded Case; Branch Circuit and Service
W-C-596G(2)	Connector, Electrical Power, (Plug, Receptacle and Cable Outlet)
W-P-115C	Panel, Power Distribution
W-S-896F(1)	Switches, Toggle (Toggle and Lock), Flush-Mounted (General Specification)

D. National Electrical Manufacturers Association (NEMA)

ICS 1	Industrial Controls and Systems
ICS 6	Enclosures for Industrial Controls and Systems
MG 1	Motors and Generators
PB 1	Panel Boards
ST 20	Dry-Type Transformer for General Applications
TC 2	Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
WD 1	General Purpose Wiring Devices

E. National Fire Protection Association (NFPA)

70	National Electrical Code (NEC)
101	Life Safety Code

F. Underwriters Laboratories, Inc. (UL)

6	Electrical Rigid Metal Conduit - Steel
50	Enclosures for Electrical Equipment
67	Panelboards
83	Thermoplastic-Insulated Wires and Cables
360	Liquid-Tight Flexible Steel Conduit
467	Grounding and Bonding Equipment
489	Molded-Case Circuit Breakers and Circuit Breaker Enclosures
498	Attachment Plugs and Receptacles
508	Industrial Control Equipment
510	PVC, Polyethylene and Rubber Insulating Tape

514A	Metallic Outlet Boxes
514B	Conduit, Tubing, and Cable Fittings
514C	Non-metallic Outlet Boxes, Flush-Devices Boxes and Covers
651	Schedule 40 and 80 Rigid PVC Conduit
797	Electrical Metallic Tubing - Steel
1029	High Intensity Discharge Lamp Ballasts
1449	Transient Voltage Surge Suppressors
1660	Liquid-Tight Flexible Nonmetallic Conduit

G. Institute of Electrical and Electronics Engineers (IEEE)

117	Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery
519	Recommended Practices and Requirements for Harmonic Control in Electric Power Systems

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplemental Conditions, and Specification Section 01740, Warranties and Bonds.

B. All equipment and materials supplied shall be warranted against defective design, materials, and workmanship for a minimum of one year, or as specified in this Section, against normal use. The warranty period shall begin once the total project is accepted by the Owner and shall cover replacement of equipment and/or repair, including labor, travel time, and miscellaneous expenses at no cost to the Owner for the full warranty period.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials with the manufacturer's tags and labels and UL labels intact. Deliver packaged material in the manufacturer's original, unopened containers bearing the manufacturer's name, brand, and UL label. Store materials and equipment in a dry, clean location. Handle and store so as to avoid damage. Remove items delivered in broken, damaged, rusted, or unlabeled condition from the project site immediately.

B. The Contractor shall provide suitable protection of materials and equipment from dust and moisture. The Contractor shall be responsible for the condition of materials and equipment until acceptance by the Owner.

1.09 QUALIFICATIONS (NOT USED)

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 MAINTENANCE (NOT USED)

1.12 OPERATIONS AND MAINTENANCE MANUAL

A. Operations and Maintenance Manuals shall be in accordance with General Conditions, Supplemental Conditions, and Specification Section 01780, Operations and Maintenance Manuals.

B. Before final acceptance of this project, an operation and maintenance manual shall be submitted to the Engineer. The manual shall include the manufacturer's literature as outlined in Paragraph 1.03.E, Drawings corrected according to shop drawing review comments and record modifications, and lists of suppliers and/or service shops that can provide parts and accessories and equipment repair for the items of equipment listed in Paragraph 1.03.E. The lists shall include a contact name, telephone number, and address.

1.13 CODES, INSPECTIONS, AND FEES

A. The Contractor shall obtain all necessary permits and inspections required for the work of this Section and pay all related incidental charges. The Contractor shall deliver to the Engineer all certificates of inspection issued by authorities having jurisdiction.

1.14 PROJECT REQUIREMENTS (NOT USED)

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All material and equipment shall be new, approved, and labeled, where required, by UL or other Occupational Safety and Health Administration (OSHA)-recognized Nationally Recognized Testing Laboratories (NRTL) for use in the United States. Only products by manufacturers regularly engaged in the production of specified units will be acceptable.

B. Where two or more units are required which perform the same function or are of the same class of equipment or materials, provide all units from a single manufacturer.

C. Provide materials and equipment of suitable composition to perform satisfactorily when exposed to corrosive conditions of project site.

1. Provide breather and drain fittings in all raceways and enclosures where necessary to prevent condensation or trapping of moisture.

2. Provide heaters in all control panels to prevent condensation.

2.02 CONDUIT

A. Rigid Metal Conduit: Rigid metal conduit shall be zinc-coated steel and shall conform to UL 6. Fittings shall be cast or malleable iron, zinc-coated, and shall conform to FSS A-A-50563A and UL 514B.

1. PVC-coated rigid steel conduit, elbows, and fittings shall be coated with a bonded polyvinylchloride permanently fused on at the factory.

a. The above-ground conduit system PVC coating shall have a minimum thickness of 40 mils. Couplings and condulets shall have overlapping pressure-sealing sleeves.

b. The below-ground conduit system for instrument signals PVC coating shall have a minimum thickness of 20 mils.

B. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be polyvinyl chloride compound and shall conform to NEMA TC-2 and UL 651. Conduit shall be sunlight resistant, rated for use with 90 °C conductors. Fittings shall be of the same polyvinyl chloride compound of the same manufacture as the conduit and shall conform to NEMA TC-3 and UL 514B. Conduit and fittings shall be joined by a solvent cement. The type of cement and procedure for application shall be as recommended by the manufacturer. Conduit shall be Carlon Plus 80, or equal.

C. Liquidtight Flexible Metal Conduit: Liquidtight flexible metal conduit shall be made with galvanized steel flexible conduit covered with an extruded PVC jacket.

1. Fittings shall be compression type specifically designed for use with flexible conduit and shall form watertight connections. Box connectors shall have "O" ring between the fitting body and the enclosure.

D. Liquidtight Flexible Nonmetallic Conduit: Liquidtight flexible nonmetallic conduit shall be an assembly of a hard PVC spiral completely surrounded by flexible PVC. Conduit shall conform to UL 1660 for use as indicated in Article 351 of the NEC and shall be sunlight resistant.

1. Fittings shall be compression type designed for use with the flexible conduit. Box connectors shall have "O" ring between the fitting body and the enclosure.

2. Conduit shall be "Carflex" manufactured by Carlon, or equal.

2.03 BOXES

A. General: Boxes shall be sized as required and suitably rated for installation location by the NEC or as shown on the Drawings.

1. Boxes shall be nonmetallic code-gauge galvanized steel, stainless steel, or cast metal, as specified or shown on the Drawings.

2. Cast metal boxes shall be cast iron and shall be gasketed of the type indicated on the Drawings.

B. Outlet Boxes: Outlet boxes shall be sheet steel, cast metal, or nonmetallic.

1. Sheet steel boxes shall be cadmium-coated or zinc-coated.

2. Cast metal boxes shall conform to FSS A-A-50563A.

3. Non-metallic boxes shall conform to UL 514C.

4. Fixture outlet boxes and junction boxes shall be 4-inch, octagonal.

5. Switch and receptacle outlet boxes shall be 2 inches wide by 4 inches high by 2 inches deep.

6. Junction box extensions and covers shall conform to UL 514A.

7. Boxes installed in wet locations or on exterior surfaces shall be gasketed.

2.04 WIRING DEVICES

A. Toggle Switches: Toggle switches shall be specification grade and shall conform to FSS W-S-896F(1) and shall be totally enclosed with bodies of molded compound and a mounting strap.

1. Handles shall be brown.

2. Wiring terminals shall be screw type, back- or side-wired.

3. Switches shall be rated, quiet type, 20 amperes, 277 volts.

4. Switches shall be suitable for control of tungsten filament lamp loads with "T" marking of UL.

5. No more than one switch is allowed in a single gang position of a switch box.

B. Receptacles: Receptacles shall be specification grade and shall conform to FSS W-C-596G(2), NEMA WD-1 and UL 498.

1. Single and duplex receptacles for general purpose use shall be heavy-duty specification grade, 20 amperes, 125 volts, three-wire grounding, NEMA configuration 5-20R.

2. Special-purpose single receptacles shall be heavy-duty specification grade, 20 amperes, 250 volts, three-wire grounding, NEMA configuration 6-20R, unless indicated otherwise on the Drawings.

3. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, three-wire grounding, NEMA configuration 5-20R.

a. Receptacles shall have a nominal sensitivity to ground leakage current of 4 to 6 milliamps and shall function to interrupt the current supply for any value of ground leakage current exceeding the trip level of 4 to 6 milliamps on the load side of the receptacle with a maximum tripping time of 1/30th of a second.

b. Receptacles shall provide protection for any device connected to the circuit beyond the receptacle.

c. Receptacles shall have test and reset buttons accessible on the face of the receptacle.

4. Receptacles shall be suitable for mounting in a standard outlet box and shall have a high-impact nylon face.

5. Wiring terminals shall be screw type, back- or side-wired.

6. Receptacles shall be Leviton, Hubbell, or approved equal.

2.05 DEVICE PLATES

Cover Plates: Cover plates shall conform to UL 514A.

A. Furnish one-piece type to suit devices installed, with round or beveled edges.

B. Weatherproof cover plates shall be spring-loaded gasketed type with individual cover for each outlet or switch.

C. Waterproof cover plates shall have screw cap for each outlet. Plugs shall have matching screw attachment to maintain rating when the plug is attached. The screw cap shall be permanently attached to the cover plate by a chain. A matching plug shall be provided for each cover plate.

D. Zinc-coated steel or cast-metal plates shall be used on unfinished walls.

E. Satin finish stainless steel plates shall be used on finished walls.

F. Provide metal screws with countersunk heads and finish to match finish of plate.

2.06 WIRE AND CABLE

A. Conductors: All conductors shall be annealed soft drawn copper, conforming to ASTM B8, FSS A-A-59544, UL 83, and the latest requirements of the NEC. All conductors shall have THHN-, THW-, or THWN-type insulation, rated at 600 volts, unless specifically noted otherwise.

1. Other types of insulation may be used as permitted by the NEC. The Contractor shall be responsible for change in conduit size and conductor size to maintain ampacity of circuit.

2. Wire #8 AWG and larger shall be stranded concentric lay. Wire sizes #14, #12, and #10 AWG shall be stranded for control and motor power and solid for light and receptacle circuits.

3. Conductors shall be as manufactured by Senator Wire & Cable Company, Laribee Wire Manufacturing Company, Inc., Southwire Company, or equal.

B. Conductor splices shall conform to FSS A-A-59213. Acceptable: Scotchcast Splicing Kit, Minnesota Mining and Manufacturing Company. Plastic tape shall conform to FSS A-A-55809.

2.07 SAFETY SWITCHES

A. Safety switches shall be NEMA heavy-duty type and UL listed. Switches shall be suitably rated for the installation location as may be indicated on the Drawings.

1. All switches shall have switch blades which are fully visible in the OFF position when the door is open. Switches shall have permanently attached arc suppressors, hinged or otherwise attached to permit easy access to line-side lugs without removing the arc suppressor. Lugs shall be UL listed for copper and aluminum cables and front removable. All current-carrying parts shall be plated by electrolytic processes.

2. Switches shall have a quick-make and quick-break operating handle and mechanism which shall be an integral part of the box, not the cover. Padlocking provisions shall be provided for padlocking in the OFF position only, with at least three padlocks. Switches shall have a dual-cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open.

B. Enclosures: Switches installed indoors shall be furnished in NEMA 1 general-purpose enclosure with knockouts, unless otherwise specified. Switches located outdoors shall be furnished in NEMA 4X stainless steel enclosures.

1. Covers on NEMA 1 enclosures shall be attached with butt-type pin hinges.

2. NEMA 4X switches shall be furnished in stainless steel enclosures without knockouts. The means of sealing the cover shall be positive, with 30- through 200-ampere switches having quick-release latches with pin-type hinges and gaskets. Enclosures shall be of Code-gauge stainless steel.

C. The switch jaws shall be multi-spring type for positive grip of the switch blades. The fuse clips shall be spring-reinforced, positive-pressure type or electrolytic copper.

D. Switches shall be as manufactured by Square D, General Electric, Cutler-Hammer/Westinghouse, ITE, or approved equal. All switches shall be by the same manufacturer.

2.08 CIRCUIT BREAKERS

A. The Contractor shall provide molded-case thermal magnetic circuit breakers of the type, size, and electrical characteristics as specified or indicated on the Drawings. Circuit breakers used as service entrance disconnects shall be suitable and rated as service entrance equipment.

B. Circuit breakers shall be of single-unit construction, and multi-pole circuit breakers shall have trip elements in each pole with common trip bar. Frame size 225 amperes of larger shall have adjustable magnetic instantaneous trip and shall have interchangeable thermal magnetic trip units.

C. Shunt trip shall be installed in circuit breakers where required by the Drawings or Specifications.

D. Circuit breaker interrupting ratings shall be equal to the available short circuit current at the point of installation with minimum ratings below:

Frame Size	240 V	480 V
100 A	18,000	14,000
225 A	25,000	22,000
400 A	42,000	30,000
800 A	42,000	30,000
1200 A	42,000	30,000

E. Provide NEMA Type 1 enclosures for general duty indoor use. Enclosures shall be NEMA 4X stainless steel for exterior locations unless indicated otherwise.

F. Circuit breakers shall be as manufactured by General Electric, ITE, Square D, or Cutler-Hammer/Westinghouse, or approved equal.

2.09 TRANSIENT-VOLTAGE SURGE SUPPRESSORS

A. The primary transient voltage surge suppressor shall be installed at the main service on the load side of the main breaker or automatic transfer switch as indicated on the drawings.

1. Primary service transient voltage surge suppressors shall be listed in accordance with UL 1449 and shall be tested to Category C3 (20 kV, 10 kA, 8/20 μsec. Waveform) in accordance with ANSI/IEEE C62.41 and C62.45. Suppressors shall meet or exceed the following criteria:

a. Single-impulse current rating of 160,000 amperes per phase (8/20 μsec. waveform).

b. Pulse life rating of 1,000 occurrences with no clamping drift for Category C (8/20 μsec. waveform).

c. UL 1449 peak let-through voltage shall not exceed the following:

Voltage	L-N	N-G
120/208 or 120/240	500	500
277/480	800	800

d. The Category C3 peak let-through voltage ANSI/IEEE C.62.41 (20 kV-1.2/50 μs) shall be tested by an independent testing laboratory. Documentation of the test shall be submitted with the shop drawings.

e. Peak let-through voltage measured in UL and ANSI/IEEE testing shall include the effect of 6-inch leads connected to the complete unit.

f. Turn-on and turn-off times shall be less than 1.0 nanosecond.

B. Secondary transient voltage surge suppressors shall be installed on the secondary side of step-down transformers or at the associated panelboards, at control panels, and at motor disconnects or junction boxes as indicated on the Drawings. Suppressors located at panelboards shall be connected to a 30-amp multi-pole breaker. All other suppressors shall be fused.

1. Secondary transient voltage surge suppressors shall be listed in accordance with UL 1449. Suppressors shall meet or exceed the following criteria:

a. Single-impulse current rating of 80,000 amperes per phase (8/20 μsec. waveform).

b. Pulse life rating of 1,000 occurrences with no clamping drift for Category C (8/20 μsec. waveform).

c. UL 1449 peak let-through voltage shall not exceed the following:

Voltage	L-N	N-G
120/208 or 120/240	500	500
277/480	800	800

d. The Category C3 peak let-through voltage ANSI/IEEE C.62.41-1991 (20 kV-1.2/50 μs) shall be tested by an independent testing laboratory. Documentation of the test shall be submitted with the shop drawings.

e. Peak let-through voltage measured in UL and ANSI/IEEE testing shall include the effect of 6-inch leads connected to the complete unit.

f. Turn-on and turn-off times shall be less than 1.0 nanosecond.

C. Minimum requirements for surge suppressors:

1. The Contractor shall provide suppression elements between each phase or leg and the system neutral and between the neutral conductor and ground.

2. Each module of modular type suppressors shall be externally fused. The status of each module shall be monitored on the front of the enclosure and on each module.

3. Suppressor failure mode shall be of a "fail-short" design.

4. Visible indication of proper connection and operation shall be provided.

5. Modular-type suppressors shall have an internal disconnect and current limiting fuses. Encapsulated suppressors shall have an external fuse or circuit breaker protection.

6. Terminals shall be provided for all necessary power and ground connections and shall accommodate #10 to #1 AWG wire sizes.

7. Suppressors shall be of solid-state components and shall operate bidirectionally (current flows in both directions).

8. Suppressors shall have a warranty guarantee period of at least five years.

D. All transient-voltage surge suppressors shall be by the same manufacturer and shall be installed in accordance with the manufacturer's installation instructions. The mounting position shall be selected to provide the shortest lead possible between the suppressor and the point of connection.

E. Transient-voltage surge suppressors shall be as manufactured by Advanced Protection Technologies, Inc. or approved equal.

2.10 GROUNDING

A. Ground rods shall be copper-clad steel, 3/4 inch x 10 foot sectional type, with couplings and driving studs for installation.

B. The conductor shall be bare, stranded copper, complying with ASTM B8 for main power ground and instrument ground, unless otherwise indicated. Grounding conductors run in conduit shall have green insulation.

C. Connection to the ground rod shall be made with exothermic welding kits by Cadweld or approved equal. "Acorn" type clamps are not acceptable. Ground connections to equipment frames, building steel, etc., shall be made with equipment grounding lugs or clamps intended for grounding purposes.

2.11 PLASTIC CAUTION TAPE

A. The Contractor shall provide a continuous non-metallic caution tape 12 inches below finished grade, above each duct or conduit run. The tape shall be 6 inches wide, imprinted to indicate underground electric utilities, as manufactured by Giffolyn, Terra-Tape, or equal.

PART 3 EXECUTION

3.01 LAYOUT OF CONDUIT AND WIRING SYSTEMS

A. The Contractor shall lay out the work and shall be responsible for all necessary lines, levels, elevations, and measurements. The Drawings indicate the extent and general arrangement of the components. The Contractor shall become familiar with the work of other trades engaged in the construction. Exact routing of raceways and locations of equipment may be governed by structural conditions and obstructions. The Contractor shall coordinate with the details of equipment shop drawings for connections to equipment furnished by others. This is not to be construed as permission to redesign systems.

B. The Contractor shall submit all requests for changes in the proposed layout due to structural features, equipment locations, and similar conditions to the Engineer, with the following provisions:

1. Detail the reasons for the changes.

2. Submit request within 30 days after award of contract.

3. Make no changes without the written approval of the Engineer.

C. Examine areas scheduled to receive electrical equipment and material for conditions which will adversely affect the execution, permanence, or quality of the work. Determine field conditions by actual measurement. Do not proceed with installation until defects have been corrected.

3.02 INSTALLATION

A. General: The Contractor shall comply with NEC, NESC, local codes and rules, and regulations of local agencies having jurisdiction. Sizes of conductors, circuit breakers, motor controllers, and protective devices indicated or specified shall meet all requirements of the NEC.

1. Determine the rating and type of all electrical equipment furnished. Provide electrical equipment and conductors of correct size to serve equipment. Voltage drop shall be limited to 3%, including main service, feeder, and branch circuit. Coordinate electrical installation of systems and packaged equipment items specified in other sections of these Specifications.

2. Provide coordination of protective, control, and signaling devices.

B. Grounding: The Contractor shall establish a ground network which will electrically connect the metal structural materials, equipment enclosures, conduits, outlet boxes, cabinets, motor frames, transformer cases, switchgear enclosures, etc., service transformer neutral, and the earth to create a low impedance path to clear faults. The ground system shall be bonded and sized in accordance with NEC. Solidly ground all non-current-conducting metal parts to the electrical installation grounding bus. A green insulated grounding conductor shall be carried with each circuit.

1. Provide common grounds throughout system.

2. Provide a ground grid consisting of driven copper-clad steel ground rods connected by bare copper conductor at service entrance and/or as shown on the Drawings. Resistance to remote earth shall be 10 ohms or less before connection to system.

C. Identification: Equipment such as but not limited to disconnect switches, control panels, etc., shall be clearly marked.

1. Identify all devices operating at more than 250 VAC phase-to-phase or 125 VAC phase-to-ground with red enamel letters or numerals of appropriate height applied with a stencil.

2. Except as otherwise noted, all equipment shall be marked with engraved nameplates of laminated two-color phenolic plastic having white letters. Attach each nameplate with stainless steel screws. Align nameplates on equipment being marked in center near the top.

3. Panelboards and control panels shall have designation in 1/2-inch-high letters and voltage in 1/4-inch-high letters centered above door on exterior trim.

4. Mark equipment mounted remotely from source of power (such as pumps and fans) with equipment number, source of power, and starter location. Where starters are remotely mounted, the marking shall include equipment name, number, and location.

5. Conductors shall be identified at each termination, pull box, junction box, handhole, point of entry to or exit from wireways, panelboards, control panels, and other points of access. Tags or labels shall be securely affixed to the conductor in visible locations. Tags shall be durable plastic with the designation stamped on one side with suitable dies. Labels shall be permanent with legible black characters on white heat-shrink tubing or equivalent identification acceptable to the Engineer.

    a. Power conductors shall be color-coded to identify phases, neutral and switching legs, using plastic, self-sealing tape. Tags or labels shall identify the switchboard, MCC, panel, etc., each power conductor is served from and the circuit number.

    b. The control conductor (including monitor and instrumentation conductors) shall be identified by color coding and tag or label as to wire number (corresponding to manufacturer's wiring diagram) and equipment name.

    c. Power wiring and control wiring shall be identified in all handholes with a waterproof permanent tag attached to the cable with plastic cable ties.

D. Equipment Connections: The Contractor shall provide complete system with all power and control connections required for proper operation.

E. Conduit:

1. Rigid galvanized steel (RGS) conduit may be used as follows:

    a. Exposed outdoors where indicated on the Drawings.

    b. Below grade with a coating of tar or pitch, pressure-sensitive plastic tape, or two coats of asphalt tar enamel and allowing 24 hours drying between coats and before covering.

    c. Below grade with PVC coating where indicated on the Drawings.

2. Rigid non-metallic (PVC) conduit may be used as follows:

   a. Below-grade direct burial, Schedule 80.

3. Conduit burial depth shall be measured from the top of the conduit to the top surface of finished grade, pavement, concrete, or similar cover as follows:

   a. 24 inches (minimum) below unpaved areas,

4. For concretes slabs on grade and foundations, conduit burial depth shall be measured from the bottom of the concrete slab or foundation as follows:

   a. 12 inches (minimum) below concrete slabs on grade or foundations.

5. It shall be the responsibility of the Electrical Contractor to coordinate the location and depths of all electrical conduits to be installed under this contract with other trades. Particular attention shall be provided at all locations where conduits enter a structure or building from underground. Proper clearances from the top of the conduits to the bottom of slabs and foundations shall be maintained.

6. Where conduits rise through slabs on grade, curved portion of bends shall not be visible above finished slab.

7. Conduit stub-up to above grade and conduit stub-up out of or from below floor slab shall be rigid galvanized steel from and including the last 90º bend.

8. Galvanized conduits which penetrate concrete in wet locations shall be protected by a 20-mil sheath of PVC at the penetration extending from 2 inches within the concrete to the first coupling or fitting outside the concrete.

9. Stub-ups through concrete slabs for connection of future equipment or conduits runs shall be provided with couplings threaded inside for plugs and shall be set flush with finished floor or slab. Install screwdriver-operated threaded flush plugs in couplings. Provide pull wire in all empty conduit runs.

10. Avoid bends and offsets, where possible. Make bends and offsets with an approved hickey or conduit-bending machine. Install plastic (PVC)-coated conduit and fittings in accordance with the manufacturer's installation manual using tools designed for installing plastic (PVC)-coated conduit and fittings. Touch up any and all damaged areas with the manufacturer's recommended coating compound. Do not install crushed or deformed

conduit. Use expansion fittings or other approved devices where conduit or tubing crosses expansion joints. Prevent dirt or trash from lodging in conduits, boxes, and fittings. Free clogged conduit of all obstructions or replace conduit.

11. Supports:

    a. Pipe straps, wall brackets, hangers, or ceiling trapeze.

    b. Use wood screws or screw-type nails for fastening to wood. Use toggle bolts for fastening to hollow masonry units. Use concrete inserts or expansion anchors for fastening to concrete. Use machine screws, welded threaded studs, or spring-tension clamps for fastening to steel work.

    c. Power-driven threaded studs may be used in lieu of expansion bolts or machine or wood screws where acceptable to the Engineer.

    d. Use threaded C-clamps on rigid steel conduit only.

    e. Do not weld conduit or pipe straps to steel structures.

    f. Non-metallic conduit through 1-inch size shall use one hole snap strap clamps and 1-¼-inch through 2-inch shall use two hole snap straps clamps, with maximum spacing between supports as outlined in the NEC based on 50°C conductor temperature. Clamps shall be manufactured from a nylon compound.

12. Expansion couplings shall be used in all straight lengths of non-metallic conduit in exposed applications. Maximum spacing between expansion couplings shall be 100 feet.

13. Connections: All conduits, where they enter sheet metal enclosures such as panelboards, pull boxes, or outlet boxes, shall be secured in place by galvanized locknuts and bushings, one locknut inside of box with bushing on conduit end and one locknut outside of box for rigid conduit. The locknuts shall be tightened against the box without deforming the box.

    a. All bushings and conduit box connectors shall have the insulating material permanently fastened to the fittings.

    b. Grounding bushings shall be used in switchgear and motor control centers.

c. Conduit connections exposed in wet locations shall have a watertight threaded hub. Metallic conduit box connections may use a two-piece hub with built-in recessed neoprene gasket such as Appleton Uni-Seal. Non-metallic conduit box connectors may use a neoprene flat washer or "O" ring placed over threads of the fitting between the shoulder of the fitting and the box.

d. Conduit connections shall use fittings to maintain the NEMA rating of enclosures.

F. Boxes:

1. Provide outlet, pull, junction, or terminal boxes in wiring or conduit systems wherever required for pulling wires, making connections, and mounting devices or fixtures.

a. Indicated locations are approximate only. Coordinate actual location with all work to be performed in space or area and for equipment to be served.

b. Locate outlets so that fixtures and other items will be symmetrically located according to space or area layout.

c. Outdoor switch and receptacle outlets shall use non-metallic boxes and covers.

2. Outlet boxes in exposed work or wet locations shall be cast metal. Sheet metal boxes shall be concealed in walls or ceiling. Non-metallic boxes shall be used with non-metallic conduit.

3. Supports:

a. In open overhead spaces, cast boxes threaded to rigid metallic conduit need not be separately supported unless used for fixture support.

b. Use wood screws or screw-type nails for fastening to wood. Use toggle bolts for fastening to hollow masonry units. Use concrete inserts or expansion anchors for fastening to concrete. Use machine screws or welded, threaded studs for fastening to steel work.

c. Power-driven threaded studs may be used in lieu of expansion bolts or machine or wood screws where acceptable to the Engineer.

G. Wiring Devices: Receptacles installed outdoors shall be the ground-fault circuit-interrupter type.

H. Wiring:

1. Provide complete system of conductors as indicated.

2. Size shall be as required by the NEC and shall be #12 AWG minimum for power and lighting circuits and #14 AWG minimum for control and alarm circuits.

3. Crimp-on insulated wire terminals shall be used on stranded wire for terminations.

4. Splices shall be in accessible locations only and shall be insulated pressure type for #10 AWG and smaller wires. For #8 AWG and larger, use solderless connectors covered with an insulation material equivalent to the conductor insulation.

I. Appearance: All items shall be cleaned or touched up as necessary to ensure first class condition.

3.03 FIELD TESTS AND OBSERVATION

A. General: Do not enclose or cover any work until it has been observed, tested, and accepted.

1. Provide all personnel, equipment, and instruments required for observation and testing.

2. Show by demonstration that all circuits and devices are in operating condition. Tests shall include the following:

a. Megger all motor windings before operation for insulation resistance and, if found low, dry out windings to secure acceptable insulation resistance.

b. Check control center components, buses, starters, breakers, relays, alarms, interlocks, etc., and place in service in accordance with the manufacturer's instructions. Provide inspection and adjustment of electrical equipment before energization.

c. Megger all power cables and wiring for insulation resistance and record.

d. Check all motors for correct lubrication and lubricate, if required, in accordance with the manufacturer's instructions.

e. Check direction of rotation of all motors and reverse, if necessary.

3. Assemble in binders and turn over to the Owner all instruction bulletins, lubrication schedules, operating instructions, pamphlets, parts lists, prints, etc., accompanying or attached to apparatus and equipment.

4. Notify Engineer one week before test date.

B. Ground Rod Test: Before any wire is connected to ground rods, test each rod for resistance to ground.

1. Testing instrument shall be a direct reading, single test, portable ground-testing megger.

2. Test procedure shall be as recommended by the manufacturer of test instrument used.

3. The make and model of the test instrument used and a copy of test procedure shall be submitted to the Engineer before the test is conducted.

4. Do not conduct tests within 48 hours after rainfall or during foggy weather.

5. If ground resistance exceeds 10 ohms, additional grounds shall be driven.

6. The grounding test shall be witnessed by the Engineer or other representative of the Owner. A copy of test results and method shall be included in the maintenance manual. Deliver one copy of test results to the Engineer within 1 week after test.

3.04 ADJUST AND CLEAN

A. Remove excess and waste materials from project site.

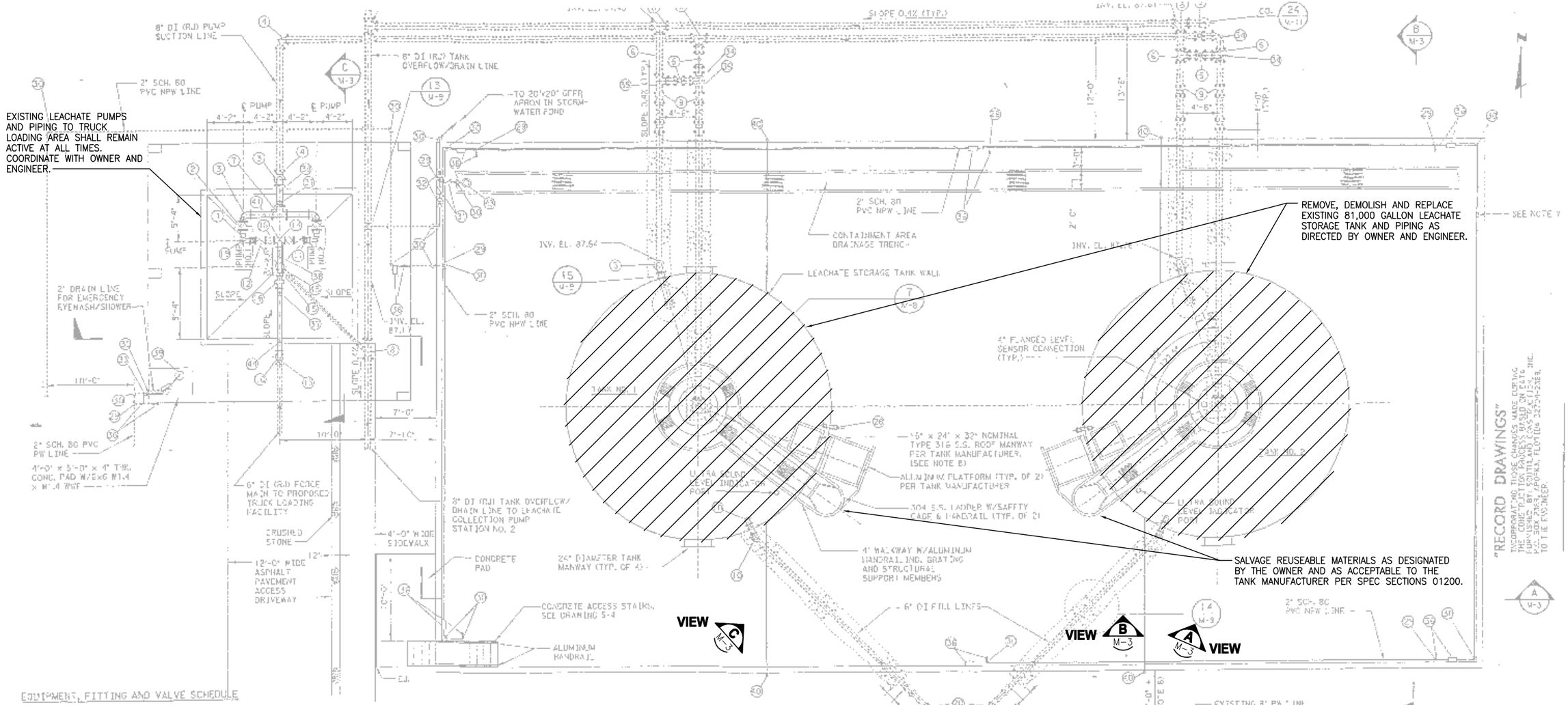
B. Remove defective work and replace with material that meets Specification requirements or repair to the satisfaction of the Owner.

C. Touch up scratches, abrasions, voids, and other defects in factory- or shop-finished surfaces.

END OF SECTION

ATTACHMENT 1

DRAWINGS



EQUIPMENT, FITTING AND VALVE SCHEDULE

1. 8" x 6" FLEXIBLE EXPANSION ECCENTRIC REDUCER (FLG.) (TOP LEVEL)
2. 8" PLUG VALVE W/GEAR OPERATOR & HANDWHEEL (FLG.)
3. 8" 90° BEND DI (FLG.)
4. 8" 90° BEND DI (RJ)
5. 8" PLUG VALVE (RJ) W/ VALVE BOX AND CONCRETE PAD, SEE DETAIL 1, DWG. M-9
6. 8" TEE DI (RJ)
7. 8" TEE DI (FLG.)
8. 8" x 4" WYE DI (RJ)
9. 8" DOUBLE BALL EXPANSION JOINT DI (RJ) WITH 12" EXPANSION CAPABILITY (FLEX-TEND BY EBAA OR APPROVED EQUAL)
10. 6" 90° BEND DI (FLG.)
11. 6" FLEXIBLE EXPANSION JOINT (FLG.) WITH 316 S.S. RESTRAINING RODS.
12. 6" SWING CHECK VALVE (FLG.)
13. 6" 90° BEND DI (RJ)
14. 6" TEE DI (FLG.)
15. 6" LINE-FLANGE
16. 8" FLOW METER
17. 6" TEE WYE DI (MJ)
18. 6" PLUG VALVE W/GEAR OPERATOR AND HANDWHEEL (FLG.)
19. 6" x 4" 90° BEND DI (FLG.)
20. 8" DOUBLE BALL EXPANSION JOINT DI (RJ) WITH 12" EXPANSION CAPABILITY (FLEX-TEND BY EBAA OR APPROVED EQUAL)
21. 4" PLUG VALVE (RJ) W/VALVE BOX AND CONCRETE PAD
22. NOT USED
23. 4" 90° BEND DI (RJ)
24. 4" DI WALL PIPE (PEW PEJ)
25. 6" x 4" TEE DI (RJ)
26. 4" 45° BEND DI (RJ)
27. 4" PLUG DI (RJ)
28. 4" MECHANICAL LEVEL SENSOR PORT
29. 2" TEE SCHEDULE 80 PVC (SOCKET)
30. 2" 90° BEND SCHEDULE 80 PVC (SOCKET)
31. 2" PVC CHECK VALVE
32. 2" PVC BALL VALVE
33. 2" x 1 1/4" REDUCER COUPLING SCHEDULE 80 PVC (SOCKET)
34. 8" MJ x PE, 90° BEND, (RJ)
35. 8" MJ x MJ x PE TEE (RJ)
36. 3/4" PEAT HOSE BIBB W/VACUUM BREAKER (ACORN B-26 OR APPROVED EQUAL) MANGSE RACK, SEE DETAIL E, DRAWING M-8 FOR COLUMN MOUNTED AND DETAIL 27, DRAWING M-11 FOR WALL MOUNTED
37. PIPE FLANGE SUPPORT, SEE DETAIL 8, DRAWING M-5.
38. PRESSURE GAUGE SEE DETAIL 19 DRAWING M-10.
39. EMERGENCY EYEWASH & SHOWER, SEE DETAIL 5, DRAWING M-6.
40. GROUNDING LUG
41. AUTOMATIC AIR RELEASE VALVE, SEWAGE TYPE, APCO SARV MODEL 400 OR APPROVED EQUAL AND 3/4 SCHEDULE 80 PVC DRAIN LINE TO FLOOR DRAIN
42. 8" MJ x FLG. WALL PIPE (RJ)
43. SUMP PUMP - ENPO MODEL 1500MA W/74E 1/3 HP, 1750 RPM 230 V/SINGLE PHASE/60 HZ CONTROLS SHALL BE BY DIV. 16, ELECTRICAL
44. PIPE STANCHION SUPPORT, SEE DETAIL 9, DRAWING M-9.
45. FLOOR DRAIN, W/BALL FLOAT ADAPTOR TYPE BACK WATER VALVE, ALL 304 S.S. CONSTRUCTION (BLUCHER-JOSAM TYPE NO. 4208 OR APPROVED EQUAL)
46. 8" MJ x PE WALL PIPE (RJ)
47. 6" FLG. x MJ WALL PIPE (RJ)
48. 6" 45° BEND DI (RJ)

NOTES:

1. FOR GRADING, DRAINAGE, AND CRUSHED STONE PLACEMENT, SEE CIVIL DRAWINGS.
2. FOR HANDRAIL, STAIRS, PLATFORM, GRATING AND CONCRETE DETAILS, SEE STRUCTURAL DRAWINGS.
3. FOR CONTINUATION OF ALL PIPING, SEE DRAWING M-1.
4. ALL DIMENSIONS, ELEVATIONS, AND FITTINGS FOR PUMP NO. 1 AND TANK NO. 1 ARE TYPICAL FOR PUMP NO. 2 AND TANK NO. 2.
5. FOR ALL STRUCTURAL DIMENSIONS, SEE STRUCTURAL DRAWINGS.
6. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL EXISTING PIPING, VALVES, STRUCTURES AND APPURTENANCES BEFORE BEGINNING ASSOCIATED CONSTRUCTION.
7. NEW PIPING SHALL BE SUPPORTED ON S.S. UNISTRUTS FIVE FOOT ON CENTER, UNISTRUT SHALL BE MOUNTED TO CONCRETE WALL USING TWO 1/4" S.S. ANCHOR BOLTS.
8. DO NOT TIGHTEN THE ROOF MANWAY NUTS AND BOLTS. LEAVE AT LEAST 1" SLACK SUCH THAT IT CAN RELIEVE PRESSURE.
9. FOR FENCE LOCATION, SEE DRAWING C-1a.

"RECORD DRAWINGS"
INCORPORATING THOSE CHANGES MADE DURING THE CONSTRUCTION PROCESS AS NOTED ON PLANS FURNISHED BY SOUTH AND CONSTRUCTION, INC. P.O. BOX 2353, APOPKA, FLORIDA 32704-2353, TO THE ENGINEER.

FOR INFORMATION ONLY

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED
DRAWN
CHECKED

JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

LAKE COUNTY SOLID WASTE MANAGEMENT FACILITY
STORAGE TANK REPLACEMENT
LAKE COUNTY, FLORIDA

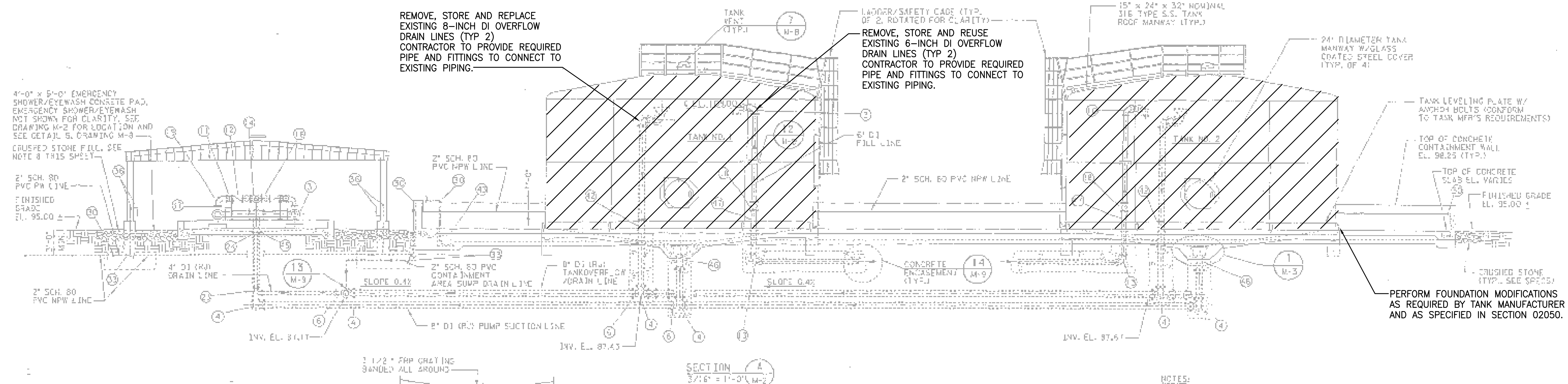
LEACHATE STORAGE TANK
MECHANICAL DEMOLITION PLAN

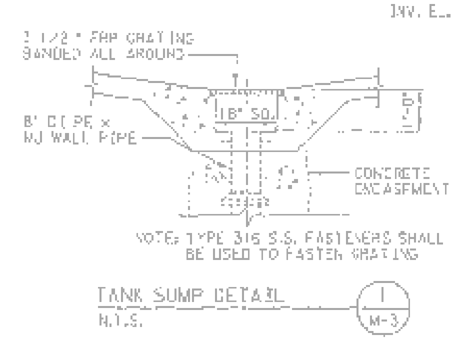
APPROVED BY

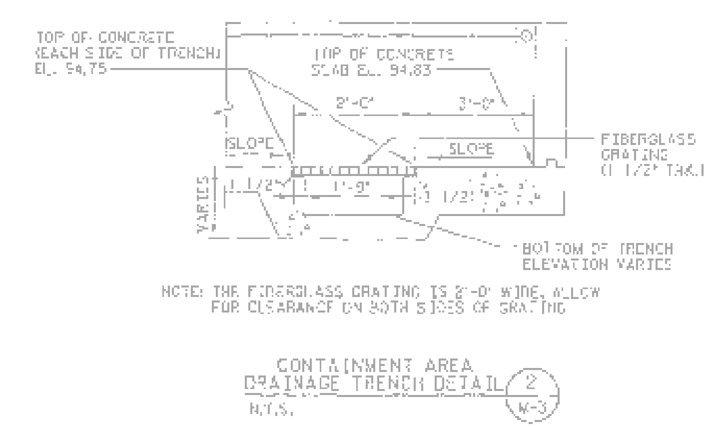
DATE: SEP 2008
PROJECT NO.: 12090-022-01
SCALE: NONE
DWG. NO.: M-1

N:\12090 Lake County\022 Storage Tank Evaluation & Replacement\Contract Drawings\Mechanical\12090002-M02.dwg

Plotted: 3/03/09 1:57pm jallen

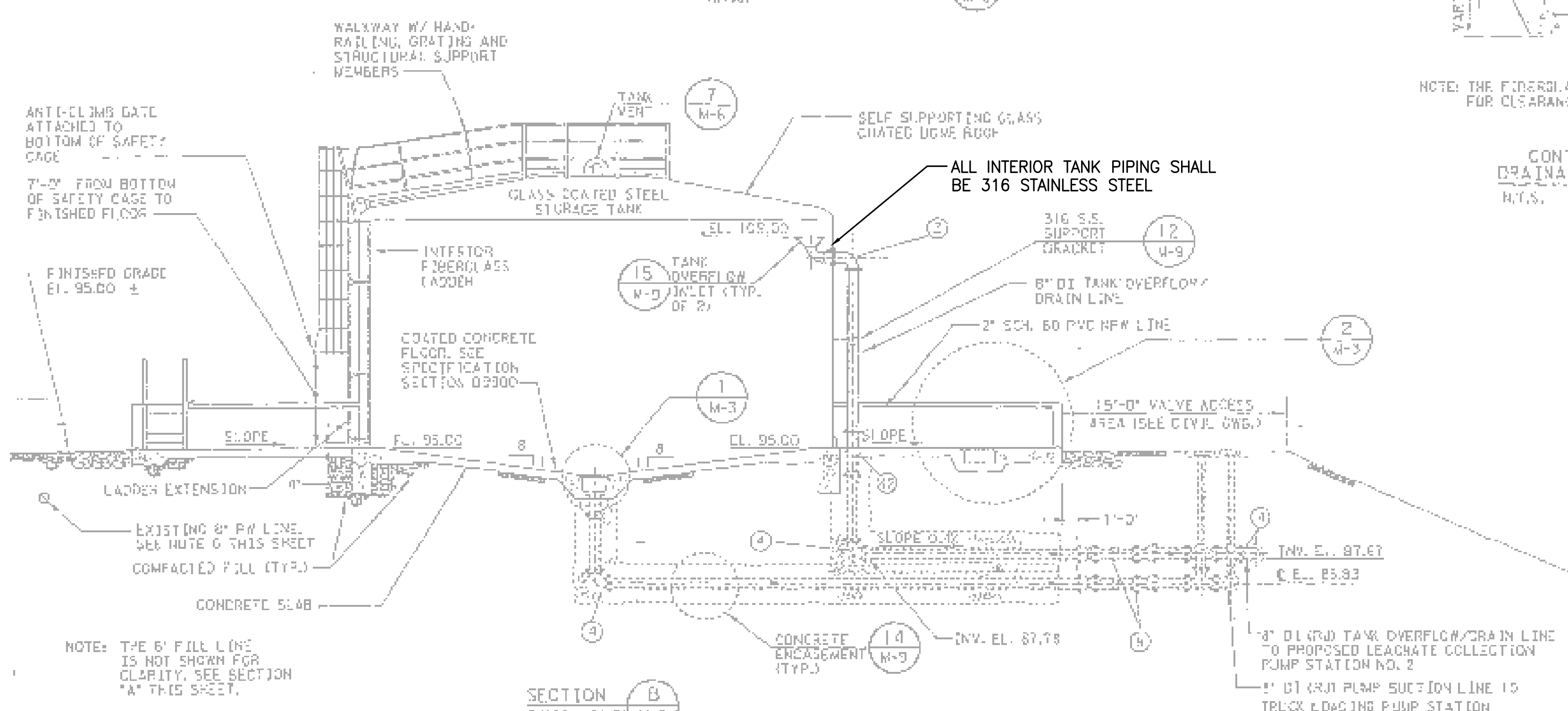


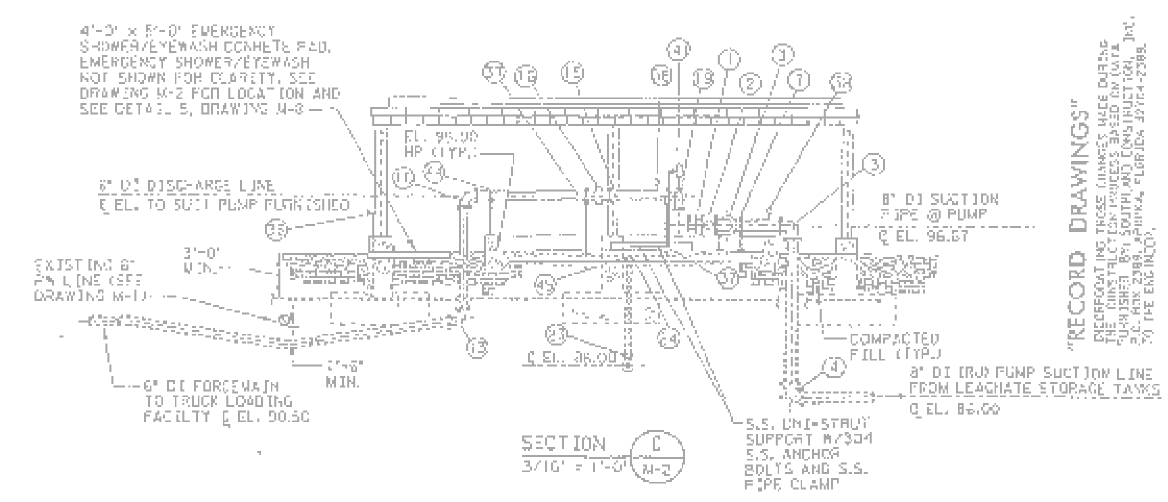




NOTES:

1. FOR GRADING, DRAINAGE AND CRUSHED STONE PLACEMENT. SEE CIVIL DRAWINGS.
2. FOR HANDRAIL, STAIRS, PLATFORM, GRATING AND CONCRETE DETAILS, SEE STRUCTURAL DRAWINGS.
3. FOR CONTINUATION OF ALL PIPING, SEE DRAWING M-1.
4. ALL DIMENSIONS, ELEVATIONS, AND FITTINGS FOR PUMP NO. 1 AND TANK NO. 1 ARE TYPICAL FOR PUMP NO.2 AND TANK NO. 2.
5. FOR ALL STRUCTURAL DIMENSIONS, SEE STRUCTURAL DRAWINGS.
6. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL EXISTING PIPING, VALVES, STRUCTURES AND APPURTENANCES BEFORE BEGINNING ASSOCIATED CONSTRUCTION.
7. FOR EQUIPMENT, FITTING AND VALVE SCHEDULE SEE DRAWING M-2.
8. THE LIMITS OF CRUSHED STONE PLACEMENT SHALL EXTEND A MINIMUM OF 4'-0" BEYOND THE ROOF DRIP LINE OF THE PROPOSED TRUCK LOADING PUMP STATION BUILDING. SEE CIVIL DRAWINGS.
9. FOR FENCE LOCATION, SEE DRAWING C-16.





"RECORD DRAWINGS"

FOR INFORMATION ONLY

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED ____
DRAWN ____
CHECKED ____

JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

LAKE COUNTY SOLID WASTE MANAGEMENT FACILITY
STORAGE TANK REPLACEMENT
LAKE COUNTY, FLORIDA

LEACHATE STORAGE TANK
MECHANICAL DEMOLITION SECTION

APPROVED BY

DATE	PROJECT NO.
SEP 2008	12090-022-01
SCALE	DWG. NO.
NONE	M-2

LAST SAVED: 9/29/2008 8:14 AM RROSARIO

EAST TANK MANWAY VIEW A M-1

EAST TANK LADDER AND PLATFORM ASSEMBLY VIEW B M-1

PARTIAL WEST TANK AND EAST TANK VIEW C M-1

WEST TANK & SECONDARY CONTAINMENT WALL VIEW

WEST TANK LADDER AND LEVEL INDICATOR VIEW

WEST TANK MANWAY AND FILL LINE VIEW

EAST TANK & SECONDARY CONTAINMENT WALL VIEW

NOTES:

1. FACILITY PERSONNEL WILL DRAIN AND FLUSH INSIDE LEACHATE STORAGE TANKS BEFORE TANK REMOVAL AND DEMOLITION. COORDINATE WITH ENGINEER.
2. DIMENSIONS AND LOCATIONS OF EXISTING EQUIPMENT, APPURTENANCES AND STRUCTURES HAVE BEEN OBTAINED FROM EXISTING RECORD DRAWINGS AND FIELD SURVEYS.
3. CERTAIN EXISTING EQUIPMENT AND STRUCTURES NOT DIRECTLY RELATED TO THE WORK PERFORMED UNDER THIS CONTRACT HAVE BEEN OMITTED FOR THE SAKE OF CLARITY. IT IS NOT WARRANTED THAT THE LOCATIONS AND DIMENSIONS OF THE EXISTING EQUIPMENT, APPURTENANCES AND STRUCTURES ARE EXACT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS OF EXISTING PIPING, EQUIPMENT, ELECTRICAL CONDUITS, ETC. AS REQUIRED TO BE REMOVED FOR THE NEW CONSTRUCTION.
4. THE DEMOLITION, MODIFICATIONS OR ALTERATION OF EXISTING BUILDINGS, EQUIPMENT, PIPING AND STRUCTURES SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LOCAL REGULATIONS AND CODES. THE CONTRACTOR SHALL REFER TO SPECIFICATIONS FOR FURTHER DETAILS.
5. DEMOLITION AND SALVAGE OF EXISTING EQUIPMENT AND PIPING IS SHOWN ON SHEET M-1 AND DETAILED IN SPECIFICATIONS SECTION 02050.
6. FOR MAINTENANCE OF EXISTING PLANT OPERATION AND FOR CONSTRUCTION SEQUENCE REFER TO SPECIFICATIONS SECTION 01810.
7. ALL EXISTING ITEMS APPEAR SCREENED IN THESE DRAWINGS. ALL PROPOSED ITEMS APPEAR BOLD.
8. SHEET M-1 CORRESPONDS TO EXISTING SHEET M-2. SHEET M-2 CORRESPONDS TO EXISTING SHEET M-3 AND SHEET E-1 CORRESPONDS TO EXISTING SHEET E-3.

FOR INFORMATION ONLY

LTR.	DATE	REVISIONS	BY	APPRD.

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JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

LAKE COUNTY SOLID WASTE MANAGEMENT FACILITY
STORAGE TANK REPLACEMENT
LAKE COUNTY, FLORIDA

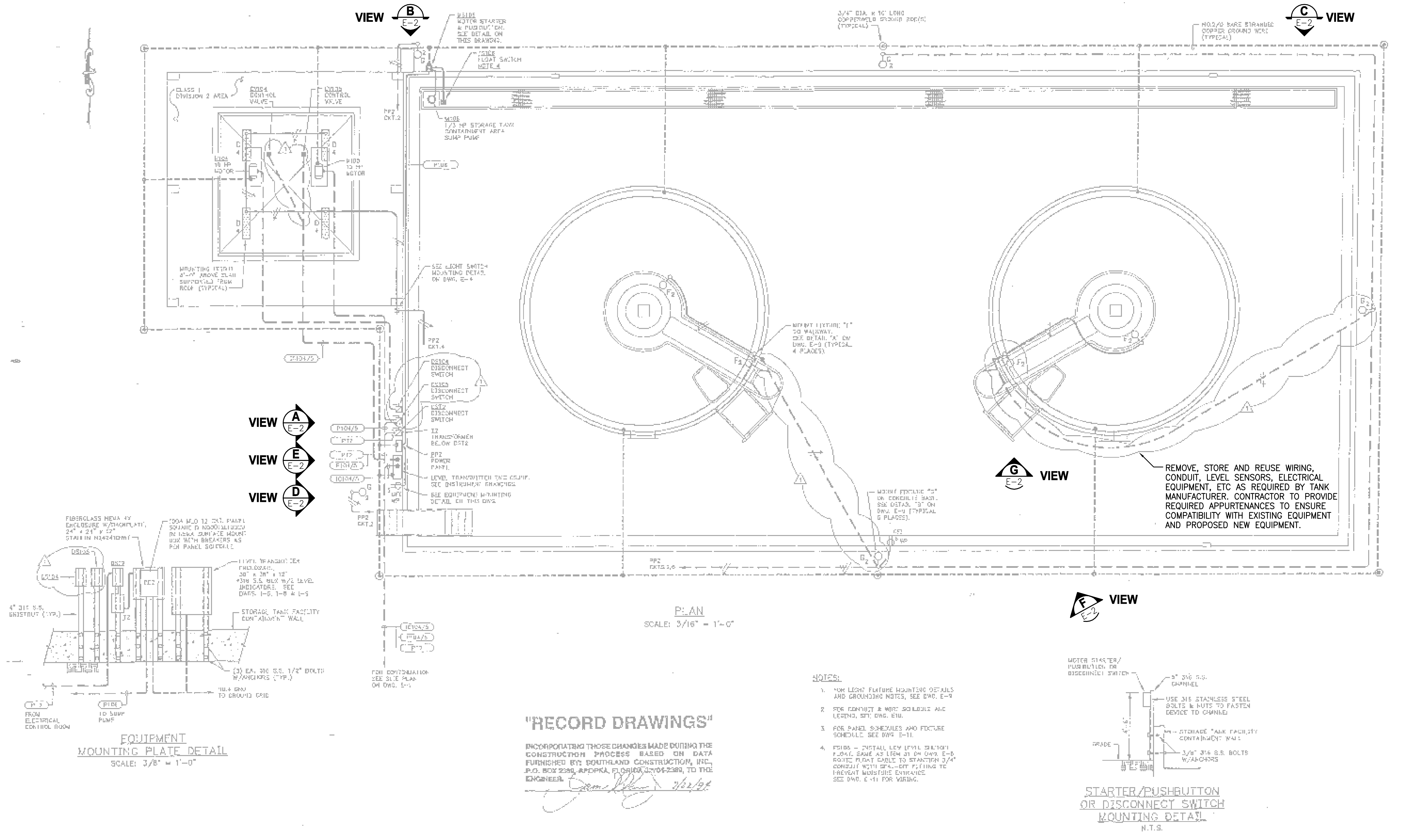
LEACHATE STORAGE TANK MECHANICAL DEMOLITION VIEWS

APPROVED BY

DATE	PROJECT NO.
SEP 2008	12090-022-01
SCALE	DWG. NO.
NONE	M-3

Plotted: 3/03/09 1:57pm jallen

LAST SAVED: 9/29/2008 8:17 AM RROSARIO



NOTES:

1. FOR LIGHT FIXTURE MOUNTING DETAILS AND GROUNDING NOTES, SEE DWG. E-9
2. FOR CONDUIT & WIRE SCHEDULE AND LEGEND, SEE DWG. E10.
3. FOR PANEL SCHEDULES AND FIXTURE SCHEDULE SEE DWG E-11.
4. FS106 – INSTALL LOW LEVEL SWITCH FLOAT SAME AS ITEM 31 ON DWG. E-5 ROUTE FLOAT CABLE TO STANCHION 3/4" CONDUIT WITH SEAL-OFF FITTING TO PREVENT MOISTURE ENTRANCE. SEE DWG. E-11 FOR WIRING.

"RECORD DRAWINGS"

INCORPORATING THOSE CHANGES MADE DURING THE CONSTRUCTION PROCESS BASED ON DATA FURNISHED BY: SOUTHLAND CONSTRUCTION, INC., P.O. BOX 2380, APOPKA, FLORIDA 32704-2380, TO THE ENGINEER. 3/22/09

FOR INFORMATION ONLY

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JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

LAKE COUNTY SOLID WASTE MANAGEMENT FACILITY
STORAGE TANK REPLACEMENT
LAKE COUNTY, FLORIDA

LEACHATE STORAGE TANK
ELECTRICAL DEMOLITION PLAN

APPROVED BY

DATE	PROJECT NO.
SEP 2008	12090-022-01
SCALE	DWG. NO.
NONE	E-1

DISCONNECT SWITCHES VIEW A E-1

BETWEEN WEST TANK AND PUMP PAVILION SOUTHWARD VIEW B E-1

SIDE OF EAST TANK ALONG EAST CONTAINMENT WALL SOUTHWARD VIEW C E-1

LEVEL TRANSMITTER ENCLOSURE VIEW D E-1

CONTROL PANEL ENCLOSURE VIEW E E-1

EAST TANK AND SOUTH CONTAINMENT VIEW F E-1

SACRIFICIAL ANODE ASSEMBLY VIEW G E-1

FOR INFORMATION ONLY

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED

DRAWN

CHECKED

JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

LAKE COUNTY SOLID WASTE MANAGEMENT FACILITY
STORAGE TANK REPLACEMENT
LAKE COUNTY, FLORIDA

LEACHATE STORAGE TANK ELECTRICAL DEMOLITION VIEWS

APPROVED BY

DATE: SEP 2008

PROJECT NO.: 12090-022-01

SCALE: NONE

DWG. NO.: E-2