PROJECT MANUAL

FOR THE

EASTERN REGIONAL WATER SUPPLY FACILITY
SODIUM HYPOCHLORITE SYSTEM CONVERSION TO BULK

Prepared For:

ORANGE COUNTY GOVERNMENT
FLORIDA

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Tt 200-10034-18003 **Bid Set**

ORANGE COUNTY
EASTERN REGIONAL WATER SUPPLY FACILITY
SODIUM HYPOCHLORITE SYSTEM CONVERSION TO BULK

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DIVISION 1

GENERAL REQUIREMENTS

SECTION 01000

PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. 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.

2. Work Included:

a. 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. The Contractor shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.

b. 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.

c. 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.

3. Public Utility Installations and Structures:

a. 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. 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.

g. 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.

h. 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.

B. Contractor Experience:

1. Project Manager shall have a minimum of 10 years of experience with State, Federal, or Municipal Infrastructure and /or Utility related projects. Contractor shall submit resume for the proposed project manager indicating that the experience requirements are met.

2. Project Superintendent shall have a minimum of 10 years experience as the project superintendent with State, Federal or Municipal water treatment or wastewater treatment projects. Contractor shall submit a resume for the proposed project superintendent indicating that the experience requirements are met.

1.02 DRAWINGS AND PROJECT MANUAL

A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.

B. Supplementary Drawings:

1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer, and the Contractor will be furnished one (1) complete set of reproducible Drawings (24 inches by 36 inches) and one (1) reproducible copy of the Project Manual.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation 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 him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction, or improper operation resulting 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 for 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 for the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.

E. Intent:

1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, the interpretation of these Specifications shall be made upon that basis.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

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

2. Any two (2) or more pieces of material or equipment of the same kind, type, or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.

2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one (1) complete set of suitably marked high grade special tools and appliances which may be

needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.

3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract Prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test, and place in operation, the equipment in conformity with the Contract Documents.

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

1.04 INSPECTION AND TESTING

A. General:

1. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. 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.

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. County's Work Schedule:

1. The County reserves the right to have their Resident Project Representative (RPR) present to witness and inspect all Work performed by the Contractor. Working hours for the RPR are an 10-hour period between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday. Any Work beyond the 10-hour period shall be considered overtime and shall be requested in writing 24 hours prior. Contractor, with verbal permission of the RPR, may work 24 hours a day to provide clean-up,

maintenance of vehicles and equipment, and other such items without the RPR present.

2. Any Work required on Saturday or Sunday shall be considered overtime and shall be requested in writing 48 hours in advance. All requests must be approved by County in advance. Under emergency situations a verbal request may be made with a follow-up written request.

3. County observes the following holidays: New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving, Christmas Eve, and Christmas Day.

4. **Contractor shall pay for the RPR's overtime**. Overtime shall be defined as time beyond the 8-hour working period between 7:00 a.m. and 4:00 p.m. on Monday through Friday, and all time on Saturdays, Sundays, and on holidays observed by the County. **Hourly rates for the Resident Project Representatives shall be $50 per hour.**

E. 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.

F. 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.

G. Demonstration Tests:

1. Prior to Contractor's request for a Substantial Completion inspection, all equipment and piping installed under this Contract shall be subjected to demonstration tests as specified or required to prove compliance with the Contract Documents.

2. The Contractor shall furnish labor, fuel, energy, water, and all other materials, equipment, and instruments necessary for all demonstration tests, at no additional cost to the Owner. Contractor shall assist in the demonstration tests as applicable.

1.05 CONSTRUCTION ADMINISTRATION REQUEST (CAR) FORM

The Contractor is responsible to submit a CAR to the Owner's Representative for any interaction requiring the involvement of the Owner's Operational Staff including but not limited to the following examples: existing valve actuation, process interruptions, equipment operation interruption, power interruption, flow diversions, training. The Contractor will not have contact with the Operations Staff without Owner's Representative's knowledge. The Owner's Representative reserves the right to direct the Contractor to provide a CAR at his discretion. Unless otherwise noted by the Owner's Representative, a CAR shall be submitted a minimum of seven (7) calendar days in advance of the intended operation noted within the CAR. Unless otherwise noted within the Contract Documents, for all activities affecting treatment process operation, a CAR shall be submitted a minimum of thirty (30) days in advance of the scheduled activity. Unless otherwise noted within the Contract Documents, the schedule for performing work which will require shutting down a unit process must be coordinated with the Owner by CAR submittal a minimum of sixty (60) days in advance of the scheduled activity. Reference a blank copy of the form within this section

1.06 LINES AND GRADES

A. Grade:

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

2. Adjustments of grades shown on Drawings may be necessary to conform to actual field conditions or to maintain cover under proposed future grades. Such adjustments shall be considered part of the job conditions and no extra compensation will be allowed for such changes, except where specifically otherwise noted in the Drawings or Specifications. Such adjustments must be approved by the Engineer prior to being made.

3. The Engineer will establish bench marks and baseline controlling points. Reference marks for lines and grades as the Work progresses will be located by the Contractor to cause as little inconvenience to the prosecution of the Work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. He shall remove any obstructions placed by him contrary to this provision.

B. Surveys:

1. The Contractor shall furnish and maintain, at his own expense, stakes and other such materials.

2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies.

3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review by the Engineer.

C. Safeguarding Marks:

1. The Contractor shall safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, bear the cost of re-establishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes, and marks.

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

1.07 OPERATION OF EXISTING FACILITIES

A. The existing treatment plant must be kept in continuous operation throughout the construction period in accordance with the requirements of Section 01041. The Contractor shall submit a Contractor's Assistance Request for Access to County Facilities at least 8 hours in advance for entering buildings or other restricted areas or equipment.

1.08 CONNECTION TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from County or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which 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 County or the owning Utility.

1.09 CLEANING UP

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

B. Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. 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. 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 antipollution laws.

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

E. Contractor shall maintain sod and mow areas as needed during construction activities.

1.10 SITE ADMINISTRATION

A. Contractor shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be

specifically reserved to County or others. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except County's employees) to observe the same regulations as Contractor requires of its employees.

B. Access to the Site will be limited to the main gate off Curry Ford Road unless specific alternate arrangements are made with the Owner. Contractor shall supply a list, and periodically update it, that contains the names of all personnel with driver licenses numbers and license plate numbers of all vehicles that will be on-site during construction. Contractor shall also supply the County's designated RPR a daily list of any scheduled visitors. Only scheduled visitors will be permitted to enter upon verification of identity.

C. County reserves the right to direct Contractor to permanently remove any subcontractor or subcontracted employee from the site for breach of security, policy, unsafe working practice, unprofessional behavior, or failure to comply with access restrictions.

1.11 SECURITY

A. Contractor shall be responsible for protection of the Site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons. Contractor shall comply with Orange County's security requirements to protect the Eastern Water Supply Facility site.

B. The County is implementing special security measures to protect the public water system and the Contractor shall provide the same level of security. The Contractor shall provide the following security measures:

1. Contractor will supply list of all personnel that will be on the ERWSF site each morning to County’s R.P.R.

2. All personnel, employees, and/or subcontractors and suppliers that pass through the security perimeter shall wear Contractor issued photo identification badges.

3. Contractor will supply list with names, driver license, and license plate numbers of all personnel.

4. All Contractor's and subcontractor's personnel passing through the security perimeter shall have background checks to identify any historical crimes dealing with terrorism, sabotage, or other government related illegal activities at the cost of the Contractor and before entering Orange County Utilities' ERWSF. Proof of background checks shall be submitted to County.

5. All project deliveries shall be inspected prior to entering the security perimeter of the Facility in order to verify contents. All delivery personnel and delivery vehicles shall be under supervision while within the security perimeter of the Facility in lieu of issuance of photo identification badges. The Contractor shall maintain staff to accept all deliveries to the site, the County will not be responsible for receipt of any deliveries.

6. If access other than the main gate off Curry Ford Road is utilized, a full time guard shall be provided at the construction gate during contractor working hours at the cost of the Contractor. All arrangements for alternative access shall be pre-arranged with the County. All alternative access must be secured and locked when not in use.

No Claim shall be made against County by reason of any act of an employee or trespasser, and Contractor shall make good all damage to County's property resulting from Contractor's failure to provide security measures as specified.

1.12 SMOKE FREE CAMPUS

A. In order to protect the public health, safety, and welfare of citizens and employees, smoking tobacco or any other substance is prohibited in County owned or operated facilities and vehicles. Contractor's personnel will not be permitted to use tobacco or vaping products on County property, including County parking lots, break areas, and worksites. Smoking means the lighting of any cigarette, e-cigarette or other vaping products, cigar or pipe, or the possession of any lighted cigarette, e-cigarette or other vaping products, cigar or pipe, regardless of its composition. This requirement shall be enforced from the beginning of construction and violators will be removed from the property.

1.13 TRAINING

A. Unless otherwise specified longer, a minimum of 2 days of training shall be provided for each piece of equipment supplied, including all electrical installation, instruments, and testing equipment. Contractor shall video and audio record as specified in Section 01390 and Section 01650. The Contractor shall submit a C.A.R. (Construction Assistance Request) form seven days prior to beginning of training. Contractor shall submit training agenda, instructor names and resumes, and training handouts to be used. Training shall be based on O&M manuals supplied by the Contractor and shall be performed by someone qualified in training of equipment to be supplied.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01010

SUMMARY OF PROJECT

PART 1 - GENERAL

1.01 PROJECT LOCATION

Eastern Regional Water Supply Facility
9100 Curry Ford Road
Orlando, FL 32825

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. This Contract is for the the Eastern Regional Water Supply Facility Sodium Hypochlorite System Conversion to Bulk as shown on the Drawings and specified herein. The Work consists of furnishing all labor, equipment, and materials for the construction of the facilities consisting of, but not limited to the expansion of or improvements to the equipment and structures associated with the following:

1. Conversion of the sodium hypochlorite generation system to bulk sodium hypochlorite delivery and storage, including removal of the sodium hypochlorite generators and related equipment, including water softeners, brine storage tanks, blowers, and standpipes and replacement of the existing FRP storage tanks. The storage and feed equipment for the pre disinfection system and aerator cleaning system will remain in the exiting Process Building 75.

2. Replacement of the sodium hypochlorite feed pumps and piping.

3. Modifications to the old generator room in Process Building 50 to include sodium hypchlorite storage tanks and metering pumps for the post disinfection system.

4. Temporary sodium hypochlorite storage and feed system to maintain disinfection capabilities during replacement of the existing meter pumps and storage tank modifications.

5. Site work and yard piping.

6. Electrical and instrumentation modifications. Refer to Section 16010 for electrical summary of work.

1.03 CONTRACTOR'S USE OF PREMISES

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

1.04 PROJECT SEQUENCE

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

B. The Eastern Regional WSF shall remain operational throughout construction. Work sequence shall be staged to maintain full plant capacity. The WSF shall not be taken off-line for tie-ins or switchovers. All tie-ins shall be coordinated with and approved by the Owner.

C. The Contract shall submit a detailed Sequence of Construction Plan that describes the intended construction sequence to maintain and transfer sodium hypochlorite feed service from the existing sodium hypochlorite generation system to the proposed bulk delivery, storage and feed system. The Sequence of Construction Plan shall indicate equipment and material deliveries, installation and testing of proposed temporary facilities, demolition, installation and testing of new facilities and demonstrating the Water Supply Facilities, including the sodium hypochlorite feed systems, remain operational and online at all times.

D. Below is a basic outline of the sodium hypochlorite conversion sequence to be used as the basis for the Contractor's detailed Sequence of Construction Plan.

1. Perform modifications to Process Building 50 and install new storage tanks (50-T-1 and 50-T-2), feed pumps (50-MP-1, 50-MP-2, and 50-MP-3), and feed piping for post disinfection feed pumps. Start-up post disinfection feed pumps.

2. Following start-up and acceptance of the new post disinfection metering pumps and storage tanks, remove the existing post disinfection pumps in Process Builidng 75 and associated piping, electrical and controls. The post disinfection metering pumps and storage tanks shall operate uninterrupted for a minimum of 7 days prior to removal of the existing post disinfection metering pumps.

3. Install new sodium hypochlorite feed piping from the feed pump room (Process Building 75) to the injection locations for primary disinfection and forced draft aerators cleaning.

4. Install new primary disinfection feed pumps and FDA cleaning pump along the south wall of the pump room where the old secondary disinfection feed pumps were located.

5. Install temporary storage and feed system for the primary disinfection and forced draft aerators cleaning as described in Section 11400.

6. Following start-up and acceptance of the temporary storage and feed system, remove the existing primary disinfection pumps, recirculation pumps, and FDA cleaning system pumps. Remove the existing storage tanks (75-T-1B, 75-T-2B, and 75-T-3B) and associated tank fill, outlet supply, generation, blower connection, and recycling piping connections. The temporary storage and feed system shall operate uninterrupted for a minimum of 7 days prior to removal of the exsting storage tanks.

7. Remove existing brine storage, softening, and sodium hypochlorite generation equipment and remove all old feed piping from feed pump room to injection locations and all associated electrical and controls. Demolition shall be performed in accordance with Specification Section 02050. If the Owner requests any specific item, salvageable material shall become the property of the Owner. The Contractor shall dismantle all materials to such a size that it can be readily handled, and deliver any of this salvageable material requested by the Owner to a designated storage area. Softeners are to be salvaged, coordinate all other salvageable items with the Owner.

8. Install new sodium hypochlorite storage tanks in Process Building 75 (75-T-1B, 75-T-2B, and 75-T-3B) and suction piping from the storage tanks to the metering pumps.

9. Fill new storage tanks in Process Building 75 (75-T-1B, 75-T-2B, and 75-T-3B) with 12.5 percent sodium hypochlorite solution and start-up and test pre disinfection feed pumps, and the FDA cleaning feed pump. Start-up and testing shall be done one system at a time and the next system shall not be started up until the previous system has been started up and accepted by the Owner.

10. Following start-up and acceptance of the new metering pump and the storage tank modifications, remove the temporary sodium hypochlorite feed system. The new pre disinfection metering pumps, FDA cleaning metering pump, and storage tanks shall operate uninterrupted for a minimum of 7 days before the removal of the temporary storage and feed system.

11. Restore Process Building 75 and install new coating on floors.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

1.01 GENERAL

A. The Contractor shall receive and accept the compensation provided in the Proposal and the Contract as full payment for furnishing all materials, labor, tools and equipment, for performing all operations necessary to complete the work under the Contract, and also in full payment for all loss or damages arising from the nature of the work, or from any discrepancy between the actual quantities of work and quantities herein estimated by the Engineer, or from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner.

B. The prices stated in the proposal include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the unit price shown in the proposal shall be in accordance with the description of that item in this Section.

C. The Contractor's attention is again called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established by the Bid Form or Payment Items, he shall include the cost for that work in some other applicable bid item, so that his proposal for the project does reflect his total price for completing the work in its entirety.

1.02 MEASUREMENT

A. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the Owner, in accordance with the applicable method of measurement therefore contained herein.

1.03 PAYMENT ITEMS

A. Items are as enumerated on the bid form.

1. Item 1 – Construction of the Eastern Regional Water Supply Facility Sodium Hypochlorite System Conversion to Bulk:

   a. Measurement for various items covered under Construction of the Eastern Regional Water Supply Facility Sodium Hypochlorite System Conversion to Bulk will not be made for payment, and all items shall be included in the lump sum price.

   b. Payment for General Requirements shall include all Insurance requirement costs, the cost of bonds, and all Administrative costs. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the pay request invoices to substantiate that appropriate insurance and bonds have been obtained by the Contractor.

   c. Payment for Mobilization/Demobilization will be made at the Contract lump sum price for the item, which price and payment shall be full compensation for the preparatory work and operations in mobilizing for beginning Work on the project including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of field office, building, safety equipment and first aid supplies, sanitary and other facilities, as required by these Specifications, and State and local laws and regulations; and any other preconstruction expense necessary for the start of the Work; the cost of field engineering, permits and fees, construction schedules, shop drawings, temporary facilities, laydown storage area, construction aids, erosion control, work associated with contractor support during Owner/Engineer reviews and inspection, reinspections and any re-work resulting from same, as described in Section 01710: Cleaning; and Section 01720: Project Records Documents. The Contractor shall submit invoices substantiating the cost of mobilization with each pay request. Mobilization/demobilization shall not be more than five percent (5%) of the Total Base Bid price. Ten percent of the cost for mobilization will be withheld until substantial completion and site clean-up.

   d. Payment for Indemnification: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, Owner specifically agrees to give the Contractor the amount listed in the Bid Form and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.

e. Payment for the Eastern Regional Water Supply Facility Sodium Hypochlorite System Conversion Construction: This item shall include all materials, equipment, testing, permits, appurtenances, and work required for the construction of the Eastern Regional Water Supply Facility Sodium Hypochlorite System Conversion to Bulk, excluding bid items listed elsewhere and excluding Additive Alternate bid items.

2. Item 2 – Orange County Permits as defined in Section 01065:

a. Measurement for various items covered under Orange County permits as defined in Section 01065 will not be made for payment, and all items shall be included in the lump sum price.

b. Payment for Orange County Permits as defined in Section 01065 shall be 0.2% fixed percentage of the total bid and pre-established on the bid form. Payment for the lump sum item shall be proportional to the amount to the contract payment for Item No. 1.

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish personnel and equipment that will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress that will ensure the completion of the work within the Contract time. If at any time, such personnel appear to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforementioned, he may order the Contractor to increase the efficiency, change the character or increase the personnel and equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor or his obligations to secure the quality of the work and rate of progress.

B. This Section includes requirements for coordinating with County's operations during the Work, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on County's operations except as allowed in this Section.

C. Contractor shall provide labor, materials, tools, equipment, bypass pumps, standby generators, and incidentals shown, specified and required to coordinate with County's operations during the Work.

1.02 COORDINATION

A. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.

B. All contacts, requests, changes, communications, and coordination with the County shall be initiated through the County's Resident Project Representative (R.P.R). Any other communication or request that is not initiated through the RPR will be null and void. The RPR will decide if a Construction Assistance Request (C.A.R) is needed. All training, spare parts distribution, and other activities described elsewhere shall always require a C.A.R. with seven (7) days notice.

1.03 Except for shutdowns specified, perform the Work such that County's facility remains in continuous, permit compliant operation during the Project. Schedule and conduct the Work such that the Work does not impede County's production or processes, create

potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.

1.04 Contractor has the option of providing additional temporary facilities, including temporary bypass pumping that can eliminate or mitigate a constraint without additional cost to County, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect County's ability to comply with Laws and Regulations, permits, and operating requirements; and that requirements of the Contract Documents are fulfilled.

1.05 Coordinate shutdowns with the County designated RPR and Engineer. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on County's operations and processes.

1.06 Do not shut off or disconnect existing operating systems. Operation of existing equipment will be by County unless otherwise specified or indicated. Where necessary for the Work, Contractor shall seal or bulkhead County-operated gates and valves to prevent leakage that may affect the Work, County's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of the County.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that County's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule.

B. Informational Submittals: Submit the following:

1. Shutdown Planning Submittal:

a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for County to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown. Also include a back-up plan that can be implemented within 8 hours if the work is not completed in the stated time.

b. Furnish submittal to County and Engineer at least thirty days prior to proposed shutdown start date. Do not start shutdown until obtaining County's acceptance of shutdown planning submittal.

c. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to County and Engineer of date and time each shutdown is to start (Outage Request form). Provide notification at least 7 days in advance of each shutdown. If scheduled shutdown does not occur, Contractor shall revise and resubmit the shutdown form for new shutdown date(s).

1.08 GENERAL CONSTRAINTS

A. Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for County's equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by County after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.

B. The following constraints apply to coordination with County's operations:

1. Operational Access: County's personnel shall have access to equipment and areas.

2. Temporary Partitions and Enclosures: Contractor shall provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas that are adjacent to the Work and that must be kept operational.

3. Schedule and perform equipment and system start-ups and shut-downs for Monday through Thursday. Equipment and systems shall not be placed into operation or shutdown on Friday, Saturday, and Sunday without prior approval of County.

4. Dead End Valves or Pipe: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of pipes and conduits, unless otherwise noted. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by Engineer. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with

drain/flushing connection consisting of a 1-inch tap with corp for every 12 inches in pipe diameter.

5. Maintain clean and dry work area by pumping and properly disposing of fluid that accumulates in work areas.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PIPE LOCATIONS

A. All pipes shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

3.02 OPEN EXCAVATIONS

A. Contractor shall adequately safeguard all open excavations by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by workmen. All open excavations shall comply with applicable OSHA Standards.

3.03 TEST PITS

A. Test pits for the purpose of locating underground pipelines or structures in advance of the construction shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the Engineer. The costs for such test pits shall be borne by the Contractor.

3.04 CARE AND PROTECTION OF PROPERTY

A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at

his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer. Contractor shall repair existing irrigation lines and control wires disturbed during construction.

3.05 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from damage in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at no additional expense to the Owner.

B. Protect all structures in a suitable manner to prevent damage. Should any part of a structure become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If, in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the Contract.

C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

3.06 MAINTENANCE OF TRAFFIC

A. Unless permission to close a street is received in writing from the proper authority (County, City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.

B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the Contractor shall expedite construction operations and periods when traffic is being detoured will be strictly controlled by the Owner. All maintenance of traffic plans required for construction shall be approved by the local governmental entity having jurisdiction.

C. The Contractor shall take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

3.07 PRIVATE LAND

A. The Contractor shall not enter or occupy private land outside the site, except by written permission of the appropriate Owners. Contractor shall provide Owner a copy of such written permission prior to entering private land.

3.08 SITE ACCESS

A. The project site is a secured site. A background check shall be performed on all workers. All workers shall be issued Contractor issued badges and shall report to the site through the security guard area to be allowed on-site. The Contractor shall provide a list of authorized construction personnel. Personnel that are not on the authorized list will not be allowed on-site.

3.09 COOPERATION WITHIN THIS CONTRACT

A. The Contractor shall, at least 7 days prior to interrupting a utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the Owner and make arrangements for the interruption, which will be satisfactory to the Owner.

B. The Contractor shall plan his work to minimize interference with the operation of the existing water treatment facilities. The Contractor shall coordinate with and provide at least 7 days notice to the Owner prior to any required shutdown or interruption of the operation of any portion of the existing water treatment plant and shall plan his work to minimize interruptions of service.

3.10 COOPERATION WITH OTHER CONTRACTS

A. This Contract will require a portion of the work to be connected to work done under other contract(s). It will be necessary for the Contractor to plan his work and cooperate with other contractors insofar as possible to prevent any interference and delay.

B. Contractor shall coordinate and cooperate with other contractors performing work on or contiguous to the project.

3.11 TIE-INS

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from County or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

3.12 SHUT DOWNS

A. General:

1. Terminology: A "shutdown" is when a portion of the normal operation of County's facility, whether equipment, systems, piping, electrical, or conduit, has to be temporarily suspended or taken out of service to perform the Work.

2. Work that may interrupt normal operations shall be coordinated and performed at times acceptable to the County. Contractor to sumit shutdown plans as required and shall receive approval by the County prior to the Work being performed.

3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to Engineer's satisfaction that Contractor has complied with these requirements before commencing the shutdown.

4. If Contractor's operations cause an unscheduled interruption of County's operations, immediately re-establish satisfactory operation for County.

5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of County's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by Contractor if, in Engineer's opinion, Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.

6. Shutdowns shall be in accordance with this Section and the example schedule. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

7. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may not be included in the example schedule. Coordinate requirements for such shutdowns with Engineer and County.

B. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. Contractor shall lock out and tag circuit breakers and switches operated by County and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify Engineer that facilities are available for use.

END OF SECTION

OUTAGE REQUEST

==========

CONTRACTOR: _____ Outage Request #_____

EQUIPMENT TO BE AFFECTED BY THE OUTAGE: _____

REQUESTED STARTING DATE: _____ STARTING TIME: _____

COMPLETION DATE: _____ COMPLETION TIME: _____

WORK TO BE ACCOMPLISHED: _____

_____

EQUIPMENT REQUIRED TO BE ON HAND PRIOR TO OUTAGE:

_____ _____

_____ _____

COMMENTS: _____

REQUESTED BY: _____ APPROVED BY: _____
Contractor Date

APPROVED BY CONTRACTOR/CONSTRUCTION MANAGER: _____

==========

OCU COMMENTS:

_____

_____

OCU APPROVAL: _____ DATE: _____

START OF DOWNTIME, TIME/DATE: _____

COMMENTS: _____

WORK VERIFIED BY:

_____ _____
(Contractor) (Date)

_____ _____
(OCU) (Date)

FINISH OF DOWNTIME, TIME / DATE: _____

E.R.W.S.F. SODIUM HYPOCHLORITE SYSTEM CONVERSION TO BULK

CONTRACTOR'S ASSISTANCE REQUEST
FOR ACCESS TO COUNTY FACILITIES

DATE: _____ **NUMBER:** _____

LOCATION/STRUCTURE: _____

PURPOSE: _____

ADDITIONAL ASSISTANCE REQUESTED: _____

DATE ACCESS NEEDED: _____

DURATION OF WORK: _____

_____ _____
Contractor **O.C.U. Construction**

COMMENTS/RESTRICTIONS: _____

_____
PLANT SUPERVISOR

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide and pay for field engineering service for Project.

1. Survey work required in execution of Work.

2. Civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.

3. The method of field staking for the construction of the Work shall be at the option of the Contractor.

4. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.

5. The Contractor shall be held responsible for the preservation of all stakes and marks. If any stakes or marks are carelessly or willfully disturbed by the Contractor, the Contractor shall not proceed with any work until he has established such points, marks, lines, and elevations as may be necessary for the prosecution of the Work.

6. The Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to identify existing control points and maintain a survey during construction.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.

2. Project Record Documents: Section 01720.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified engineer or registered land surveyor, acceptable to the Owner and the Engineer.

B. Registered professional engineer of the discipline required for the specific service on the Project, currently licensed in the State of Florida.

1.03 SURVEY REFERENCE POINTS

A. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.

1. Make no changes or relocations without prior written notice to the Engineer.

2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

3. Require surveyor to replace Project control points which may be lost or destroyed at no additional cost to the Owner. Establish replacement based on original survey control.

1.04 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two (2) permanent bench marks on site, referenced to data established by survey control points.

1. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:

1. Site improvements:

a. Stakes for grading, fill, and topsoil replacement.

b. Utility slopes and invert elevations.

2. Batter boards for structure.

3. Building foundation, column locations, and floor levels.

4. Controlling lines and levels required for mechanical and electrical trades.

C. From time to time, verify layouts by same methods.

1.05 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. At the end of the project, submit a certified site survey at 1 inch equals 20 feet scale on reproducible tracing sheets 24 inches by 36 inches, indicating the building corners and location of all new structures and elevations of stormwater facilities, pavement areas, sidewalks, finished floors, vaults, and above grade piping.

C. At the end of the project, submit a certified survey at the same scale as the Engineer's line drawings indicating elevations and stationing at 100-foot pipe increments and at all valve and fitting locations.

1.06 SUBMITTALS

A. Submit name and address of surveyor and professional engineer to the Engineer.

B. On request of the Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by a registered engineer or surveyor certifying that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certify as to variances from the Contract Documents.

D. Submit drawings showing locations of all structures constructed. This drawing shall be included with the Project Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. General

1. Upon Notice of Award, obtain and pay for all appropriate and applicable permits and licenses as provided for in the General Conditions, except as otherwise provided herein.

2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.

3. Strictly adhere to the specific requirements of the governmental unit(s) or agency (cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.

4. A copy of the permits obtained by the County are furnished in Appendix C "Permits Obtained by County" of these specifications.

5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

B. Building Permit (Permit No. B19904288)

1. The County will pay the general building permit fee and any related impact fees or assessments to be paid to Orange County for the issuance of that permit only.

2. The Contractor will pay all fees associated with obtaining Orange County trade permits and any and all inspection fees for the Orange County Building Department providing inspections for this project in accordance with the General Conditions. The Contractor shall apply for and obtain the building permits from Orange County and schedule and obtain final approval from the building inspectors.

3. The Contractor shall obtain the Building Permits within 14 days of the Notice to Proceed. Any delays in picking up and obtaining the permit shall be the Contractor's responsibility and all costs including re-permitting or extending the permit for any portion of the project shall be paid by the Contractor of no cost to the Owner.

4. Information on Orange County Building Department fees is included in the Instructions to Bidders in Division 0.

5. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from Orange County, as required by the building and sub-discipline construction permits.

C. Construction Dewatering Permit

The Contractor shall apply and pay for all fees associated with obtaining Florida Department of Environmental Protection District Office construction dewatering permits, if required. The Contractor shall provide all materials and equipment to comply with the permit requirements at no additional cost to the County.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 STANDARDS AND ABBREVIATIONS

A. Referenced Standards: Any reference to published specifications or standards of any organization or association shall comply with the requirements of the specification or standard which is current on the date of Advertisement for Bids. In case of a conflict between the referenced specifications or standards, the one having the more stringent requirements shall govern.

In case of conflict between the referenced specifications or standards and the Contract Documents, the Contract Documents shall govern.

B. Abbreviations:

AA	Aluminum Association
AAA	American Arbitration Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHO	The American Association of State Highway Officials
ABA	American Bar Association
ABMA	American Boiler Manufacturers Association
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIA	American Insurance Association
AIEE	American Institute of Electrical Engineers (Now IEEE)
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction

AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ARI	American Refrigeration Institute
ASA	American Standards Association (Now ANSI)
ASAHC	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction
ASSHTO	American Association of State Highway Transportation Officials
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America (formerly SCPI)
CDA	Copper Development Association
CFS	Cubic Feet Per Second
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
DOT Spec	Standard Specification for Road and Bridge Construction Florida Department of Transportation
E/A	Engineer and/or Architect
EDA	Economic Development Association
EEI	Edison Electric Institute
EPA	Environmental Protection Agency
FCI	Fluid Control Institute
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
Fed Spec	Federal Specification
FPS	Feet Per Second
FS	Federal Standards

GPM	Gallons Per Minute
HMI	Hoist Manufacturers Institute
HP	Horsepower
HSBII	Hartford Steam Boiler Inspection and Insurance Co.
ID	Inside Diameter
IEEE	Institute of Electrical and Electronic Engineers
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IPS	Iron Pipe Size
MGD	Million Gallons Per Day
MHI	Materials Handling Institute
MMA	Monorail Manufacturers Association
NBFU	National Board of Fire Underwriters
NBHA	National Builders' Hardware Association
NBS	National Bureau of Standards
NCSA	National Crushed Stone Association
NCSPA	National Corrugated Steel Pipe Association
NEC	National Electrical Code
NECA	National Electrical Contractors' Association
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NLA	National Lime Association
NPC	National Plumbing Code
NPT	National Pipe Threads
NSC	National Safety Council
NSF	National Sanitation Foundation
OD	Outside Diameter
OSHA	U.S. Department of Labor, Occupational Safety and Health Act
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
PSI	Pounds per Square Inch
PSIA	Pounds per Square Inch Absolute
PSIG	Pounds per Square Inch Gauge
RPM	Revolutions Per Minute
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSI	Scaffolding and Shoring Institute
SSPC	Steel Structures Painting Council
SSPC	Structural Steel Painting Council
STA	Station (100 feet)

TDH	Total Dynamic Head
TH	Total Head
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
USASI or	United States of America Standards Institute

C. Additional abbreviations and symbols are shown on the Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01091

REFERENCE SPECIFICATIONS

PART 1 - GENERAL

1.01 GENERAL

A. Applicable Publications. Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of or omission from said standards or requirements.

B. Assignment of Specialists. In certain instances, specification test requires (or implies) that specific work is to be assigned to specialist or expert entities who must be engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of such referenced documents which are not in conflict with the requirements of these Specifications or applicable codes.

B. References herein to "Building Code" shall mean the Florida Building Code. The latest edition of the code shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, Drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts

shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

D. Applicable Standard Specifications. The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 PUBLIC NUISANCE

A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, pollution of adjacent lands, flooding of adjacent lands, or excessive noise.

B. Sound levels measured by the contractor furnished testing service shall not exceed 50 dBA from 7 P.M. to 7 A.M. or 60 dBA 7 A.M. to 7 P.M. This sound level shall be measured at the exterior of the nearest exterior wall of the nearest residence. Levels at the equipment shall not exceed 85 dBA at any time. Sound levels in excess of these values are sufficient cause to have the Work halted until equipment sound levels are in compliance with this section. Work stoppage by the local governmental agency, Engineer, or Owner for excessive noise shall not relieve the Contractor for any delays of other portions of the contract including but not limited to the completion date. This work stoppage shall not be grounds for any claims by the Contractor.

C. Pollution control (i.e. dust, dirt, debris, etc.) shall be based on requirements outlined in Section 02050 - Demolition to comply with governing regulations.

D. No claim shall be made by the Contractor for time lost due to work stoppage resulting from the creation of a public nuisance by the Contractor.

1.02 HAULING AND CONSTRUCTION OPERATIONS ON PLANT PROPERTY

A. The Contractor shall conduct access, hauling, filling, and storage operations as specified herein and as shown on the Contract Drawings.

1. On-site borrow areas are designated as follows: Suitable material, as approved by Engineer, from excavations for project structures. Any additional borrow material required shall be provided by the Contractor from off-site.

2. On-site spoil areas will become property of the Contractor and are to be disposed off-site.

B. Construct all fill areas so runoff shall not flood improved areas.

1.03 EXCAVATION AROUND AND CONNECTION TO EXISTING UTILITIES

A. It is essential that the Contractor understand that the existing water plant must be kept in operation with minimal impact and shut-downs. The Contractor shall coordinate and consult with the Owner's plant operating personnel and the County Construction Inspector before excavating around or cutting into existing utilities on the plant site. Existing utilities of major concern are water, chemical and process pipelines, electrical power conduits and cables, instrumentation conduits and cables and drain lines.

B. The Contractor shall take necessary steps to verify the location of all underground utilities shown prior to commencing any excavation work. Where work is to be conducted through congested utility corridors where the likelihood exists that all underground utilities may not be shown, the Contractor shall use methods such as the use of ground penetrating radar, or equal, in order to establish the locations of potential conflicts within the proposed alignment. Where potential conflicts are identified, the Contractor shall submit (within seven (7) days of discovery) to the Engineer for review, a plan for avoiding such conflict.

C. Some areas within the water plant construction site will require hand excavation due to the congestion of underground piping systems and/or due to the criticality of piping systems that may be damaged unavoidably during machine excavation.

D. Cover for underground piping shall not be less than that indicated on the Drawings, or a minimum of 36 inches of cover where obtainable. In areas where other piping conflicts preclude the maximum cover desired, the piping shall be laid to provide the maximum cover obtainable.

E. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation, cooperation, and coordination with the Owner's plant management personnel. Some such connections may have to be made during off-peak hours (late night or early morning hours). The Contractor shall give a minimum of 7 days notice to the Owner when tie-ins with the existing plant utilities are required.

F. For major utility pipeline tie-ins and relocations, the Contractor shall submit a detailed Plan of Action for review and approval by the Owner and the Engineer. No major utility relocation or tie-ins shall proceed until the Plan of Action for that Work is approved.

1.04 JURISDICTIONAL DISPUTES

A. It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the Work shown on the Drawings or specified herein in order to avoid any work stoppages due to jurisdictional disputes.

1.05 INCLEMENT WEATHER

A. In the event of inclement weather, the Contractor shall, and shall cause subcontractors to protect carefully the Work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any portion of work or materials have been damaged or injured by reason of failure on the part of the Contractor or any subcontractors to so protect the Work, such Work and materials shall be removed and replaced at the expense of the Contractor.

1.06 COORDINATION OF WORK

A. The Contractor shall cooperate fully so as to eliminate or minimize the creation of conflicts. Adjustments from time to time may be required in the Contractor's work location and/or schedule provided a reasonable notice is given by the Owner or Engineer.

1.07 USE OF PUBLIC STREETS

A. The use of public streets and roads shall be such as to provide a minimum of an inconvenience to the public and to other traffic. Any earth or other excavated materials spilled from trucks shall be removed by the Contractor and the streets and roads cleaned to the satisfaction of the Owner.

1.08 CHEMICALS

A. All chemicals used during project construction, or furnished for project operations, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of the State Department of Health, Florida Department of Environmental Protection and if required, also the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with the manufacturer's instructions or recommended use procedures.

1.09 SAFETY AND HEALTH REGULATIONS

A. The Contractor shall comply with the Department of Labor Safety & Health Regulations for construction promulgated under the Occupational Safety & Health

Act of 1970, (PL 91-596) and under Section 107 of the Contract Work Hours & Safety Standards Act (PL 91-54).

B. All equipment furnished and installed under this Contract shall comply to Part 1910, Occupational Safety & Health Standards & Amendments thereto.

C. The Contractor shall comply with the Florida Trench Safety Act (90-96, Florida Law).

D. All materials, equipment, and components that come in contact with drinking water or drinking water chemicals shall be in conformance with ANSI/NSF Standard 61.

E. All raw water and potable piping and equipment that will contact raw water or potable water shall be disinfected in accordance with County and FDEP requirements and Section 15041 prior to being put into service.

1.10 STATE AND FEDERAL PERMITS

A. Construction in Florida Department of Transportation rights-of-way, wetlands and navigable water bodies will be governed by applicable State and Federal permits. All conditions set forth on the permits shall be a part of the Contract and they shall be attached by addendum.

1.11 INSPECTION

A. The authorized representatives and agents of the Environmental Protection Agency and Controlling State and Local Pollution Control Agencies shall be permitted to inspect all work, material, payrolls, personnel records, invoices of materials and any other relevant data and records. The Owner and Engineer shall be permitted access to any work area for the inspection of work and materials. The Owner may, at the Contractor's expense, order the uncovering or removal of any finished work if circumstances indicate faulty work or materials were used in the original installation. The Owner and Engineer shall also be permitted to inspect material invoices, payrolls or any other relevant data or records as may be necessary or required to satisfy the requirements of the Contract.

1.12 ENVIRONMENTAL PROTECTION

A. General:

1. Contractor shall comply with all Federal, State and Local laws and regulations controlling pollution of the environment. Contractor shall take

necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter. In the event of conflict between such laws and regulations and the requirements of the Specifications, the more restrictive requirements shall apply. Environmental protection requirements specified in other Sections shall be considered as supplementing the requirements of this Section.

2. Failure of the Contractor to fulfill any of the requirements of this Section may result in the Owner ordering the stopping of construction operations.

3. Failure on the part of the Contractor to perform the necessary measures to control erosion, siltation, and pollution will result in the Owner notifying the Contractor to take such measures. In the event that the Contractor fails to perform such measures within 24 hours after receipt of such notice, the Owner may stop the Work as provided above, or may proceed to have such measures performed by others. The cost of such work performed by others plus related fees by the Engineer will be deducted from monies due the Contractor on his Contract.

4. All erosion and pollution control features installed by the Contractor shall be acceptably maintained by the Contractor during the time that construction work is being done.

5. Repair or replace damaged or inoperative erosion and pollution control devices as directed by the Engineer or the Owner's Representative.

6. Where there is a high potential for erosion and possible water pollution, the Contractor shall not expose, by his construction methods or procedures, an area of erosive land at any one time larger than the minimum amount required for the proper and efficient construction operation. If the exposure of any incomplete work corresponding to the exposure period required for erosion is anticipated, temporary protective measures shall be taken to prevent the erosion or collapse of land in that immediate construction area.

B. Erosion and Pollution Control Schedule: At or prior to the preconstruction conference, the Contractor shall submit to the Owner for his information, three (3) copies of his erosion and pollution control work schedule. This schedule shall show the time relationship between phases of the Work which must be coordinated to reduce erosion and pollution, and shall describe construction practices and temporary control measures which will be used to minimize erosion and pollution. The schedule shall also show the Contractor's proposed method of erosion control on haul roads and borrow and material pits, and his plan for disposal of waste materials or other sources of pollution.

Maps or other documents may also be required to show the proposed final surface gradient of proposed borrow pits, soil type base course pits, and waste areas. No work shall be started until the erosion and pollution control schedules and methods of operations have been submitted to the Owner for his information.

C. Air Pollution Controls:

1. Contractor shall control dust caused by his operations in the construction of the Project, including but not specifically limited to the following:

   a. Clearing, grubbing, and stripping.

   b. Excavation and placement of embankment.

   c. Cement and aggregate handling.

   d. Limerock stabilization.

   e. Use of haul roads.

   f. Sandblasting or grinding.

2. Contractor shall control air pollution from the following causes in constructing the project:

   a. Volatiles escaping from asphalt and cutback materials.

   b. Use of herbicides or fertilizers.

3. Control of dust and other air pollutants by the Contractor shall include:

   a. Exposing the minimum area of land.

   b. Applying temporary mulch with or without seeding.

   c. Use of water sprinkler trucks.

   d. Use of covered haul trucks.

   e. Use of stabilizing agents in solution.

   f. Use dust palliatives and penetration asphalt on temporary roads.

   g. Use of wood chips in traffic and work areas.

h. Use of vacuum-equipped sandblasting systems.

i. Use of plastic sheet coverings.

j. Restricting the application rate of herbicides to recommended dosage. Materials shall be covered and protected from the elements. Application equipment and empty containers shall not be rinsed and discharged so as to pollute a stream, river, lake, pond, water impoundment, or the ground water.

k. Relay of operations until climate or wind conditions dissipate or inhibit the potential pollutants.

D. Open Burning of Combustible Wastes: No open burning of combustible waste materials or vegetation shall be permitted. All waste materials shall be removed from the site or within public rights-of-way and disposed in a legal manner.

E. Permanent and Temporary Water Pollution Control (Soil Erosion):

1. Sufficient precautions shall be taken during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride, or other polluting materials harmful to humans, fish, or other life, into the supplies and surface waters of the State. Control measures must be adequate to assure that turbidity in the receiving water will not be increased more than allowed by the State or controlling agency. Such measures may consist of construction of berms, dikes, dams, drains and sediment basins, or use of fiber mats, woven plastic filter cloths, gravel, mulches, quick growing grasses, sod, bituminous spray and other erosion control devices or methods approved by the State or controlling agency.

2. The Contractor shall not be permitted frequent fording of live streams with construction equipment; therefore, temporary bridges or other structures shall be used wherever such crossings adversely affect sediment levels and an appreciable number of stream crossings are necessary.

3. The Contractor shall promptly clear all waterways and drainage patterns of false work, piling, debris, or other obstructions placed during construction work and not a part of the finished work.

4. The Contractor shall remove and dispose of silt accumulations as directed by the Engineer or the Owner's Representative.

5. If new and additional erosion control structures are to be installed, under

this project, to prevent possible future erosion as a result of work under this contract, they shall be constructed concurrently with the other work, as early as possible, and as conditions permit.

F. Noise Control: The Contractor shall provide adequate protection against objectionable noise levels caused by the operation of construction equipment in order to comply with all current City ordinances and these Specifications. Sound levels shall be measured at the exterior of the nearest exterior wall of the nearest residence or building. Levels at construction equipment shall not exceed 85 dBA at any time. Sound levels in excess of allowable values are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the Engineer or Owner for excessive noise shall not relieve the Contractor of the other portions of this Specification including, but not limited to completion dates and bid amounts.

1.13 TREE AND SHRUB PROTECTION AND TRIMMING

A. Contractor shall exercise care to protect all trees and shrubs designated to remain. Trees and shrubs outside construction limits shall remain and shall be protected and where damaged, restored to original condition. Contractor shall obtain approval from the Owner prior to removing any trees. Trees damaged within construction limits due to negligence shall be restored to original condition.

B. Tree limbs which interfere with construction operations and are approved for pruning shall be neatly cut with sharp pruning instruments; do not break or chop. All cut faces shall be coated with an approved tree pruning compound which is waterproof, antiseptic, elastic and free of kerosene, coal tar, creosote and other substances harmful to plants. Pruning operations shall be extended to restore the natural shape of the entire tree or shrub. Do not allow fires under or adjacent to trees or other plants which are to remain.

C. Contractor shall protect tree and shrub root systems. Do not store construction materials, debris or excavated materials beyond construction limits. Do not permit vehicles or construction equipment beyond the limits of utility line construction. Restrict foot traffic to prevent excessive compaction of soil over root system. Excavated material shall be stockpiled away from tree drip lines as approved by the Engineer. Protect tree and shrub root systems from damage due to noxious materials in solution caused by run-off or spillage during construction operations, or drainage from stored materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations. Excavate within the drip line of trees only when approved by the Engineer. Where trees are designated to remain within the limits of construction and trenching for utilities is required within tree drip lines, cut roots with sharp pruning instruments; do not break or chop. Paint roots over 2" caliper with approved tree pruning compound.

D. Trees damaged by construction operations shall be repaired promptly after damage occurs to prevent progressive deterioration of damaged trees. Removed trees, branches, roots and other excess materials shall be removed from the construction site to an approved landfill at the expense of the Contractor.

1.14 SITE CLEANUP AND RESTORATION

A. The Contractor shall keep the working area free at all times of tools, materials and equipment not essential to the progress of the Work. Debris, waste materials, and rubbish shall be properly disposed of and not allowed to accumulate. If the Contractor should fail to do this, the Owner will make the necessary arrangements to affect the cleanup by others and will back charge the cost to the Contractor. If such action becomes necessary on the part of and in the opinion of the Owner, the Owner will not be responsible for the inadvertent removal of material which the Contractor would not have disposed of had he affected the required cleanup.

B. Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as result of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the Work, and the ditches, channels, drains etc., kept in a clean and neat condition.

C. On or before the completion of the Work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations, in a neat and satisfactory condition.

D. The Contractor shall restore the entire project site to its original or better condition, with the exception of any area(s) designated for alteration by the Contract Documents. The Contractor shall restore or replace; when and as directed, any public or private property damaged by his work, equipment, or employees to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration.

E. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors and on completion of the Work shall deliver it undamaged and in fresh and new appearing condition.

1.15 LAWS AND REGULATIONS

A. It shall be the responsibility of the Contractor to give all notices and comply with all the laws, rules, regulations, ordinances, etc., that may be applicable at the time the Work is started on the project. Should the Contractor discover the Drawings or Specifications are contradictory to, or in variance with the above, he shall notify the Engineer immediately, in writing, in order that any required changes or modifications can be made. It is not the Contractor's responsibility to make certain that the Drawings or Specifications are in non-compliance with any of the above; however, should he be aware of any existing discrepancy, or have reason to believe such may exist and performs work without proper notice to the Engineer, the Contractor shall be responsible for any cost involved in making the necessary alterations or corrections.

1.16 CONTRACTOR'S USE OF PREMISES

A. All project construction work will be accomplished on the Owner's property, public rights-of-way or within temporary construction easements and the Contractor shall confine his activity to those designated areas. The Contractor shall not enter upon private property for any reason without securing prior permission from the property owner. Such permission, including any stipulations, shall be in writing and a copy shall be delivered to the Engineer prior to the Contractor's entry or occupation of the subject property. This requirement will be rigidly enforced, particularly with regard to the utilization of vacant areas adjacent to the work site for the storage of materials or parking equipment.

B. The Contractor shall perform his work in such manner that he will not damage adjacent public or private property. Any damage to existing physical structures or utility services shall be repaired or restored promptly at no expense to the Owner.

C. The Contractor shall avoid damage to and preserve all existing vegetation (grass, shrubs, trees, etc.) on or near the work area which do not, within reason, interfere with construction. The Contractor will be responsible for and required to replace or restore all such vegetation damaged or destroyed at no cost to the Owner. The Contractor will also be responsible for any unauthorized cutting or damage to trees, shrubs, etc., and also damage caused by careless operation of equipment, storage of materials and rutting or tracking of grass by equipment.

D. The Contractor shall conduct access, hauling, filling, and storage operations as specified herein and as shown on the Contract Drawings.

1. On-site borrow areas are designated as follows: Suitable material, as approved by Engineer, from excavations for project structures. Any

additional borrow material required shall be provided by the Contractor from off-site.

2. On-site spoil areas will become property of the Contractor and are to be disposed off-site.

E. Construct all fill areas so runoff will not flood improved areas.

F. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation, cooperation, and coordination with the Owner. Some such connections may have to be made during off-peak hours (late night or early morning hours). The Contractor shall give a minimum of 7 days notice to the Owner when tie-ins with the existing plant utilities are required.

G. For major utility pipeline tie-ins and relocations, the Contractor shall submit a detailed Plan of Action for review and approval by the Owner and the Engineer. No major utility relocation or tie-ins shall proceed until the Plan of Action for that Work is approved.

1.17 HAZARDOUS LOCATIONS

A. The Contractor shall be responsible for identification of hazardous locations, appropriate construction methods, and all other safety issues.

1.18 ADDITIONAL PROVISIONS, PROJECT SEQUENCE

A. The Contractor shall provide at his own cost all necessary temporary facilities for access to, and for protection of, all existing structures. The Contractor is responsible for all damage to existing structures, equipment, and facilities caused by his construction operations, and must repair all such damage when and as ordered by the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01152

APPLICATIONS FOR PAYMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Submit applications for payment in accordance with schedule established by the General Conditions and the Agreement between Owner and Contractor.

B. Related Requirements Described Elsewhere:

1. Agreement between Owner and Contractor.

2. Progress Payments, Retainages and Final Payment: General Conditions of the Contract.

3. Measurement and Payment: Section 01025.

4. Contract Closeout: Section 01700.

1.02 FORMAT AND DATA REQUIRED

A. Submit applications typed on forms provided by the Owner, with itemized data typed on 8-1/2 inch x 11 inch or 8-1/2 inch x 14 inch white paper continuation sheets.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Forms:

1. On Orange County's form (8-½" x 11") fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.

3. Execute certification with signature of a responsible officer of Contract firm.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item of work.

C. Certification and Consent of Surety:

1. The Contractor shall certify, for each current pay request, that all previous progress payments received from the Owner, under this Contract, have been applied by the Contractor to discharge in full all obligations of the Contractor in connection with Work covered by prior applications for payment, and all materials and equipment incorporated into the Work are free an clear of all liens, claims, security interest and encumbrances. Contractor shall attach to each application for payment like affidavits by all Subcontractors and Suppliers.

2. Contractor shall provide a "Consent of Surety" to each application for payment.

D. Monthly As-Builts

1. Contractor shall submit current, up-to-date as-builts including coordinate asset table with each monthly payment application.

2. Monthly payment application will not be processed without monthly as-built submittal approved by County Resident Project Representative.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. To receive approval for payment on component material stored on site, submit copies of the original invoices with the application for payment. Provide a log sheet for all stored materials, which identifies the type, quantity and value of all stored materials

B. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:

   a. Item number and identification as shown on application.
   b. Description of specific material.
   c. Proof that stored products paid for on previous estimates have been paid for by Contractor.

5. Contractor shall provide monthly photos, aerial photos, draw schedules, and progress schedules.

C. Submit one copy of data and cover letter for each copy of application.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in application form as specified for progress payments.

1. Project Record Documents: To requirements of Section 01720.

2. Warranties and Bonds: To requirements of Section 01740.

3. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.

4. Certificate of Insurance for Products and Completed Operations.

5. Contract Closeout: To requirements of Section 01700.

B. Submit a “Consent of Surety” and “Final Releases of Lien” with the final application for payment. Contractor shall attach “Final Releases of Lien” for each subcontractor and supplier.

1.06 SUBMITTAL PROCEDURE

A. Submit applications for payment to the Owner at the time stipulated in the Agreement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Contractor shall participate in the preconstruction meeting, progress meetings, and specifically called meetings throughout the progress of the Work. Contractor shall:

a. Inform participants and individuals whose presence is required of date and time of each meeting.

b. Make physical arrangements for meetings.

c. Provide and distribute in paper and electronic forms; documents logs, schedules and record drawings required for each meeting.

2. Representatives of Contractor, and Contractor's subcontractors and suppliers attending meetings, shall be qualified and authorized to act on behalf of the entity each represents.

B. Related Requirements Described Elsewhere:

1. Construction Progress Schedules: Section 01310.

2. Shop Drawings, Working Drawings, and Samples: Section 01340.

3. Project Record Documents: Section 01720.

1.02 PRECONSTRUCTION MEETING

A. Engineer will schedule a preconstruction meeting no later than twenty (20) days after date of Notice to Proceed. The meeting shall be scheduled at the convenience of all parties.

B. Location: A local site, convenient for all parties, designated by the Engineer.

C. Attendance:

1. Owner's representative.

2. Engineer and his professional consultants.

3. Resident project representative.

4. Contractor and his superintendent.

5. Major subcontractors.

6. Representatives of major suppliers and manufacturers as appropriate.

7. Governmental and Utilities representatives as appropriate.

8. Others as requested by the Contractor, Owner, and Engineer.

D. The Engineer shall preside at the preconstruction meeting. The purpose of the preconstruction meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.

E. The Engineer will prepare the meeting agenda. The agenda for the preconstruction meeting will include but not be limited to the following:

1. Distribution and discussion of:

a. List of major subcontractors and suppliers.

b. Construction schedules.

c. Contact information.

d. Schedule of Values.

2. Critical work sequencing: Relationships and coordination with other contracts and/or work and continuing water treatment plant operation.

3. Major equipment deliveries and priorities.

4. Project coordination: Designation and responsible personnel.

5. Procedures and processing of:

    a. Field decisions.

    b. Proposal requests.

    c. Request for Information.

    d. Submittals.

    d. Change Orders.

    f. Applications for Payment.

    g. Submittal of Shop Drawings, project data and samples.

7. Adequacy of distribution of Contract Documents.

8. Procedures for maintaining Record Documents

9. Use of premises:

    a. Office, work, and storage areas.

    b. Owner's requirements.

    c. Access and traffic control.

10. Construction facilities, controls, and construction aids.

11. Temporary utilities.

12. Safety and first aid procedures.

13. Check of required Bond and Insurance certifications.

14. Completion time for contract and liquidated damages.

15. Request for extension of Contract Time.

16. Procedures for periodic monthly (or whatever interval is deemed appropriate or necessary, however, a minimum of monthly meetings will be required) progress meetings, for all involved.

17. Security procedures.

18. Procedures for making partial payments.

19. Guarantees on completed work.

20. Equipment to be used.

21. Project layout and staking of work.

22. Project inspection.

23. Labor requirements.

24. Laboratory testing of material requirements.

25. Provisions for material stored on site and monthly inventory of materials stored.

26. Requirements of other organizations such as utilities, railroads, highway departments, building departments.

27. Rights-of-way and easements.

28. Housekeeping procedures.

29. Posting of signs and installation of Project Sign.

30. Pay request submittal dates.

31. Equal opportunity requirements.

1.03 PROGRESS MEETINGS

A. The Engineer shall schedule regular periodic meetings. The progress meetings will be held a minimum of once every thirty (30) days and at other times as required by the progress of the Work. The first meeting shall be held within thirty (30) days after the preconstruction meeting or thirty (30) days or less after the date of Notice to Proceed.

B. Hold called meetings as required by progress of the Work.

C. Location of the meetings: As designated by the Owner.

D. Attendance:

1. Engineer and his professional Subconsultants as needed.

2. Resident Project Representative.

3. Contractor and his Superintendent.

4. Owner's representatives.

5. Subcontractors (active on the site, as appropriate to the agenda).

6. Others as appropriate to the agenda (suppliers, manufacturers, other subcontractors, etc.).

E. The Engineer shall preside at the meetings. The purpose of the meetings will be to review the progress of the Work.

F. The Engineer will prepare the meeting agenda. A typical agenda for the progress meetings will include but not be limited to the following:

1. Review approval of minutes of previous meeting.

2. Review of labor and construction equipment.

3. Review of work progress since previous meeting.

4. Review of work scheduled (4-week look ahead schedule).

5. Schedule update.

6. Field observations, problems, conflicts.

7. Review of pay applications.

8. Review of off-site fabrication, delivery schedules.

9. Corrective measures and procedures to regain projected schedule.

10. Request for information.

11. Maintenance of quality standards.

12. Change proposals.

13. Review of submittals/shop drawings.

14. Review proposed changes for:

    a. Effect on Construction Schedule and on completion date.

    b. Effect on other contracts of the Project.

15. Critical/long lead items.

16. Punch list.

17. Other business/general discussion.

18. Adjournment.

G. The Contractor is to attend progress meetings and is to study previous meeting minutes and current agenda items, and be prepared to discuss pertinent topics and provide specific information including but not limited to:

1. Status of all submittals and what specifically is being done to expedite them.

2. Status of all activities behind schedule and what specifically will be done to regain the schedule.

3. Status of all material deliveries, latest contact with equipment manufacturers, and specific actions taken to expedite materials.

4. Status of open deficiencies and what is being done to correct the same.

H. The Contractor is to provide a current submittal log at each progress meeting in accordance with Section 01340: Shop Drawings, Working Drawings, and Samples.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 REQUIREMENT

A. The Contractor will submit cost-loaded Critical Path Method (CPM) Progress Schedules to the Project Manager depicting the approach to prosecution and completion of the Work. This requirement includes, but is not limited to the Contractor's approach to Activity cost-loading, recovering schedule and managing the effect of changes, substitutions and Delays on Work sequencing.

B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work (or Work remaining) conform to the Contract requirements and the sequences of Work indicated in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may affect cost, progress, schedule, furnishing and performance of the Work; and show how the Contractor's Means and Methods translate into Activities and logic.

C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision Submittals. Upon acceptance by the Project Manager, the Initial submittal will become the As-Planned Schedule for the Work. Revision submittals upon acceptance will become the As-Planned Schedule for the Work remaining to be completed as of the submittal date for that Revision.

D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.

E. No work shall begin prior to Owner and Engineer acceptance of the schedule.

1.02 GLOSSARY OF TERMS

A. The following terms, whether or not already defined elsewhere in the Contract Documents, have the following intent and meanings within this Section:

1. Activity Value (Value) – That portion of the Contract Price representing an appropriate level of payment for the part of the Work designated by the Activity.

2. As-Planned Schedule – The first, complete Initial Progress Schedule submitted by the Contractor with the intent to depict the entire Work as

awarded and accepted by the Project Manager or returned as no resubmittal required.

3. Contract Float – Days between the Contractors anticipated date for completion of the Work, or of a specified portion of the Work, if any, and the corresponding Contract Time.

4. CPM Schedule – The Progress Schedule based on the Critical Path Method (CPM) of scheduling. The term Critical Path means any continuous sequence of Activities in the Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent, specified Contract Time.

5. Early/Late Dates – Early/late times of performance, based on CPM calculations, for an Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part of the Work on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work on the corresponding Contract Time, even if the Contractor plans early completion.

6. Milestones – Key, pre-determined points of progress in the completion of a facility, denoting interim targets in support of the Contract Times. Milestones may pinpoint targets for key excavation and substructure events, significant deliveries, critical path transition from superstructure to piping and electrical rough–in and building enclosure. Also, hook–up of mechanical and electrical equipment, availability of power for testing, equipment shakedown, training of County personnel, start–up, Substantial Completion and other events of like import.

7. Official Schedule – The Initial or most recent Revision Submittal accepted by the Project Manager or returned as no resubmittal required and the basis for Payment Submittals until another Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-Planned Schedule.

8. Payment Submittal – A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.

9. Total Float – Days by which an activity may slip from its Early Dates without necessarily extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float may also be calculated and reported in working Days. When an activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will impact a Contract Time.

1.03 QUALITY ASSURANCE

A. The Contractor may self-perform the Work covered by this Section or employ a Subcontractor, subject to the Project Manager's consent. Employment of a scheduling Subcontractor shall not in any way alter or reduce the Contractor's obligations under the Contract Documents.

B. The Contractor will obtain a written interpretation from the Project Manager, if the Contractor believes that the selection of activities, logic ties and/or restraints requires a written interpretation of the Contract Documents. With each submission, the Contractor will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.

C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints.

D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the obligation to comply with the Contract Times and any sequence of Work indicated in or required by the Contract Documents and to complete, within the Contract Times, any Work omitted from that Progress Schedule.

E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any interpretation of or variation from the Contract Documents, unless expressly approved by the Project Manager through a written interpretation or by a separate, written notation on the returned Progress Schedule Submittal.

1.04 ALLOWANCES

A. Work covered by contractual allowances will be completed within the Contract Times. The Progress Schedule will incorporate the Contractor's best estimate of the activities, logic and restraints required, using the information in the Contract Documents or as indicated by the Project Manager in writing.

1.05 “OR EQUALS” AND SUBSTITUTIONS

A. Activities in the Initial Submittal will be based strictly on the products named or specified in the Contract Documents and will not reflect any “or equal” or substitute materials or equipment, even if the Contractor intends to pursue “or equal” and substitution proposals. This limitation also applies to Means and Methods indicated in or required by the Contract Documents.

1.06 MILESTONES AND SCHEDULE RECOVERY

A. The Project Manager will select Milestones and Milestone Dates on the basis of the As-Planned Schedule. As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone Dates will serve as target dates.

B. Whenever any Activity slips by fourteen (14) or more Days from the Late Date for an activity in the Official Schedule, Milestone Dates selected by the Project Manger, or a pertinent Contract Time, the Contractor will deliver a Revision Submittal documenting the Contractor's schedule recovery plan and/or a properly supported request for an extension in the Contract Time. The narrative will identify the Delay and actions taken by the Contractor to recover schedule, whether by adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).

C. Upon evaluation of that Revision Submittal, if the Project Manager determines there is sufficient cause, the County may withhold liquidated damages or provide a notice of intent to do so, if schedule is indeed not recovered, and/or may give a notice of default.

1.07 PROGRESS SCHEDULE SOFTWARE

A. The scheduling software employed by the Contractor to process the Progress Schedule will be the current version of Oracle's Primavera P6 Professional Project Management, or Oracle's Primavera Contractor CPM scheduling software.

B. If the Contractor intends to use companion schedule reporting, analysis or graphics software tools, the Contractor will furnish to the Project Manager descriptive materials and samples describing such software tools.

C. Software shall be compatible with Primavera's Contractor Manager web based software. See Section 01400: Document Control System Software – Web Based System.

1.08 NON-PERFORMANCE

A. The Project Manager may refuse to recommend all or any part of any payment, if the Contractor fails, refuses or neglects to provide the required Progress Schedule information on a timely basis. Partial payments without a properly updated Progress Schedule shall be returned to the Contractor as non-conforming.

B. If justified under the circumstances, the County also may prepare alternate progress schedules, as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or take other action commensurate with the breach.

1.09 REPORTS, SCHEDULES AND PLOTS

A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float.

1. For Precedence Diagram Method, separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying vertical logic ties are appended or not.

B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times, Critical Paths and sub-Critical Paths on 24"x 36" or smaller sheets. Activities will be shown on the Early Dates with Total Floats noted by Late Date flags. For Payment and Revision Submittals plot a target comparison based on the current Official Schedule.

C. The Activity Value report will tabulate Activity code and description and Activity Value, percent complete and earned value as calculated by the scheduling software. Cash flow plots shall be provided showing the monthly and cumulative actual and planned earned values with curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule submittals, the cash flow curves shall also plot the most current Official Schedule planned earnings curves.

D. Each submittal shall include listings of all added and deleted activities, logic, constraints, Activity Value changes and update information vs. the previous Progress Schedule submittal. This list may be manually prepared or generated by accessory software that will generate such listings.

1.10 NARRATIVE REQUIREMENTS

A. The Initial Submittal narrative will describe the Contractor’s approach to prosecution of the Work and the basis for determination of activity durations, sequence and logic, including the Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor’s phasing of the Work; use of crewing and construction equipment; identification of non-work Project Managers, shifts, weekend Work and multiple calendars applied to activities and an explanation of the basis for restraint dates

B. Revision and Payment Submittal narratives will explain any changes to the approach or planning referred to in Paragraph A above on account of any change, delay, schedule recovery, substitution and/or Contractor-initiated revision occurring since the previous submittal.

C. Each narrative will list the Critical Path Activities and compare Early and Late Dates against Contract Times and Milestone Dates. Narratives shall also recap progress and Days gained or lost vs. the current Official Schedule, and identify delays, their extent and causes.

D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all pending and anticipated "or equal" and substitution proposals. Payment and Revision Submittals narratives will describe any new delays and shall certify that the Contractor has not been delayed, as of the cut-off date, by any acts or omissions of the County or Project Manager, except as otherwise specifically stated.

1.11 ACTIVITY REQUIREMENTS

A. Separate activities will identify permits, design when included in the Work, construction, Submittal preparation and review (and resubmission and re-review), deliveries (site or storage), testing, start-up, commissioning and Punch List. Separate Activities will be used for County-furnished equipment, interfaces with other work and other responsibilities of the County, Project Manager and Professional.

B. Activities will be detailed to the extent required to show the transition of trade Work. Activities will delineate the progression of the Work through mass excavation, substructure, superstructure, equipment installation, start of piping and conduit rough-in, building enclosure, mechanical and electrical equipment hook–up phase, building mechanical, electrical and plumbing (MEP), interior finishes, training of County personnel, equipment checkout & testing and start–up.

C. Submittal Activities will segregate long-lead items, any item requiring structural access and other procurements that, in the Contractor's judgment, may bear on the rate of progress. If the Contract Documents require MEP coordination drawings, separate MEP coordination drawing Activities will be used for each floor. Allow time for reviews per Section 01300 and the General Conditions, and revisions and re-submittals. Also include activities for or provide a separate tabular schedule of submittal dates for all shop drawings, product data, and samples including County furnished products and the dates reviewed submittals will be required from the Project Manager. Indicate decision dates for selection of finishes.

D. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work, Work in separate structures and Work in distinct areas, locations or floors within an area or structure; or rough-in and finish Work.

E. Activity durations will equal the work Days required to sufficiently complete the Work designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity is not quite 100% complete). Installation Activities will last from

ten (10) to forty (40) workdays. Submittal review activity durations shall conform to specified timeframes.

F. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by building or structure, floor or area, Change Order and other meaningful schemes.

G. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the Contract Amount to the time periods that they will be earned and eligible for payment based on the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify cost-loading of the Progress Schedule. When used, pay activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots.

1.12 FLOAT TOLERANCES AND FLOAT OWNERSHIP

A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative twenty (20) Days of Float will be returned as "Revise and Resubmit," unless a time extension is requested or the County assesses liquidated damages or gives notice of intent to do so, in the event schedule is not recovered.

B. Float calculated from the definitions given in this Section, supersede any conflicting Float values in any early completion Progress Schedule.

C. Neither the County nor the Contractor own the Float time, the Project owns the Float time. Neither the County nor the Contractor use of positive Total Float will impact a Contract Completion Date or justify an extension of Contract Time.

1.13 SUBMITTALS

A. Each Progress Schedule Submittal will consist of an electronic disk with the Contractor's files, a narrative and five (5) copies of the required reports and plots.

B. The Project Manager will review Progress Schedule Submittals and return a review copy within 14 Days after receipt and the Contractor shall, if required, resubmit within 7 Days after return of the review copy.

C. Requirements for a Preliminary Submittal:

1. Within twenty (20) Days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the Project Manager a Preliminary Submittal of the Progress Schedule for the Work. The Preliminary Submittal will show the Work as awarded, without delays, Change Orders or substitutions. The Preliminary Submittal shall be in CPM format and show general work planning and sequencing for the entire Contract Time and detailed planning for the first 90 days after Notice to Proceed.

2. No cost or resource loading of activities is required for the Preliminary Submittal. The Project Manager may issue comments on the Preliminary Submittal. A narrative should be included if needed to clarify planning and sequencing represented in the Preliminary Submittal. Any comments issued should be considered and incorporated as appropriate in the development of the full Progress Schedule Initial Submittal.

D. Requirements for the Initial Submittal:

1. Within twenty (20) Days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the Project Manager the Initial Submittal of the Progress Schedule for the Work. The Initial Submittal will show the Work as awarded, without delays, Change Orders or substitutions.

    a. Activity Values will prorate Schedule of Values costs and/or pay items through to Activities. Provide a cross-reference listing with two parts; a part that will list each activity with the respective amounts allocated from each Schedule of Values and Unit Price Item making up the total value of each activity and a second part that will list the Schedule of Values and Unit Price Items with the respective amounts allocated from each activity that make up the total value of each item.

2. After the As-Planned Schedule is established, the Project Manager will select Milestones and record the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.

3. If the Project Manager refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the Contractor will continue to submit Payment and Revision Submittals reflecting progress and the Contractor's approach to remaining Work. The Project Manager will rely on the available Payment and Revision Submittals, subject to whatever adjustments it determines appropriate.

E. Requirements for Payment Submittals:

1. Payment Submittals with progress up to the closing date and updated Early Dates and Late Dates for progress and remaining Activities will be due with each Progress Payment. As-built data will consist of actual dates, percent complete, earned payment, changes, Delays and other significant events occurring before the closing date.

2. Activity percent complete and earned value should indicate a level of completion that corresponds to the Application for Progress Payment for the same period. The earned value should be calculated by the scheduling software as Activity Value times percent complete. Explanation should be provided whenever the cumulative earned value of activities in a Payment Submittal is not within 10% of the value of work completed as represented in the corresponding Application for Progress for Payment.

3. At the Contractor's option, a Payment Submittal may overlay minor adjustments on activities and sequencing for Work remaining. This excludes Activity re-scoping to reflect Delays, changes, schedule recovery or substitutions.

F. Requirements for revision Submittals:

1. Revision Submittals will be submitted when necessary because of major changes or delays affecting activities, sequencing or restraints for Work remaining and/or to put forth a schedule recovery plan. Revision Submittals may also be required because of Contractor-initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence that will require additional testing or inspection personnel, or when requested by the Project Manger when Work is performed out-of-sequence from the current Official Schedule such that the number of Days gained or lost can not be determined or the scheduled dates of completion of the Work in a Payment Submittal are not viewed as reliable.

2. If requesting a time extension, the Revision Submittal should show the impact of the delay after incorporating reasonable mitigation to minimize the impact and illustrate how the number of Days requested time extension was determined. The delay should be determined as the change in the forecast Contract Completion Date(s) resulting solely from delays that entitle the Contractor to a time extension as provided in the General Conditions. Any and all Contractor slippage and delay occurring prior to and concurrent with the delay potentially entitling the Contractor to a time extension shall be incorporated in the Revision and explained such that the concurrent and non-concurrent periods of delay are indicated.

If the Contractor does not follow the procedures contained in this Section or, if the Contractor's analysis is not verifiable by an independent, objective evaluation by the Project Manager using the electronic files and data furnished by the Contractor, any such extension in Contract Time will not be granted.

G. Retrospective Delay Analysis.

1. If the Project Manager refuses to endorse any Revision Submittal as "Resubmittal Not Required," the Contractor and County will use the latest Official Schedule when evaluating the effect of Delays on Contract Time and/or Contract Price. The procedure to be used will consist of progressively updating the latest Official Schedule at key closing dates corresponding to starting and finishing dates of the delays and/or dates the delays became critical or dates the Critical Path may have changed for other reasons. For each Progress Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will be correlated to Delays occurring solely in that iteration.

2. For each iteration, revisions in Activities, logic ties and restraints affecting Work after the closing date will be included in that Progress Schedule only if they meet any of the following conditions. First, they are Progress Schedule revisions that the Project Manager consented to contemporaneously (i.e., before the closing date) in writing. Second, they reflect comments or objections raised by or on behalf of the Project Manager and that were actually confirmed by the as-built progress. Lastly, they represent Contractor's schedule recovery plans or other Progress Schedule revisions that were actually confirmed by the as-built progress.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and approval, such Shop Drawings, Test Reports, and Product Data on materials and equipment (hereinafter in this Section called Data), and material samples (hereinafter in this Section called Samples) as are required for the proper control of work, including but not limited to those Shop Drawings, Data, and Samples for materials and equipment specified elsewhere in the Specifications and in the Drawings.

2. Within fourteen (14) calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete list of preliminary data on items for which Shop Drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way expressed or implied relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Contract Documents. This procedure is required in order to expedite final review of Shop Drawings.

3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:

a. Submittal description and number assigned.

b. Date to Engineer.

c. Date returned to Contractor (from Engineer).

d. Status of submittal (Approved, Approved as Noted, Amend and Resubmit, and Rejected).

e. Date of resubmittal and return (as applicable).

f. Date material release (for fabrication).

g. Projected date of fabrication.

h. Projected date of delivery to site.

i. Status of O&M manuals submittal.

j. Specification Section.

k. Drawings sheet number.

B. Related Requirements Described Elsewhere:

1. Construction Progress Schedules: Section 01310.

2. Material and Equipment: Section 01600.

3. Project Record Documents: Section 01720.

4. Operating and Maintenance Data: Section 01730.

1.02 CONTRACTOR'S RESPONSIBILITY

A. It is the responsibility of the Contractor to check all drawings, data and samples prepared before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer.

B. Determine and verify:

1. Field measurements.

2. Field construction criteria

3. Catalog numbers and similar data.

4. Conformance with Specifications.

C. The Contractor shall furnish the Engineer a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning and ending of manufacture, testing, and installation of materials, supplies, and equipment. This schedule shall indicate those that are critical to the progress schedule.

D. The Contractor shall not begin any of the work covered by a Shop Drawing, Data, or a Sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.

E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.

F. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:

1. Date.

2. Project Title and Number.

3. Contractor's name and address.

4. The number of each Shop Drawings, Project Data, and Sample submitted.

5. Notification of Deviations from Contract Documents.

   a. The Contractor shall indicate in **bold type** at the top of the cover sheet of submittal of shop drawing if there is a deviation from the Drawings, Specifications, or referenced specifications or codes.

   b. The Contractor shall also list any deviations from the Drawings, Specifications, or referenced specifications or codes and identify in green ink prominently on the applicable Shop Drawings.

6. Submittal Log Number conforming to Specification Section Number.

G. The Contractor shall submit three (3) copies of descriptive or product data information and Shop Drawings to the Engineer plus the number of copies which the Contractor requires returned in addition to electronic copies.

H. No work shall be performed until the completion of the review and approval by the Engineer of the associated Shop Drawings.

I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposes to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of the Drawings and Specifications.

J. The Contractor shall not use Shop Drawings as a means of proposing alternate items to demonstrate compliance with the Drawings and Specifications.

K. Each submittal will bear a stamp indicating that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. The Contractor stamp shall be similar to the sample given below.

(OWNER'S NAME)
(PROJECT NAME)
(PROJECT NUMBER)

SHOP DRAWING NO.:_____

SPECIFICATION SECTION:_____ **DRAWING NO.** _____

WITH RESPECT TO THIS SHOP DRAWING OR SAMPLE, I HAVE DETERMINED AND VERIFIED ALL QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE CRITERIA, INSTALLATION REQUIREMENTS, MATERIALS, CATALOG NUMBER, AND SIMILAR DATA WITH RESPECT THERETO AND REVIEWED OR COORDINATED THIS SHOP DRAWING OR SAMPLE WITH OTHER SHOP DRAWINGS AND SAMPLES AND WITH THE REQUIREMENTS OF THE WORK AND THE CONTRACT DOCUMENTS.

_____ **NO VARIATION FROM CONTRACT DOCUMENTS**

_____ **VARIATION FROM CONTRACT DOCUMENTS AS SHOWN**

(CONTRACTOR'S NAME)
(CONTRACTOR'S ADDRESS)

BY:_____**DATE:**_____
AUTHORIZED SIGNATURE

NOTE: NOT TO SCALE

L. Drawings and schedules shall be checked and coordinated with the work of all trades and sub-contractors involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

A. The Engineer's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conforms to the information in the Contract Documents and is compatible with the design concept. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules will be general, and shall not be construed:

1. As permitting any departure from the Contract Documents.

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials.

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or contract time, the Engineer may return the reviewed drawings without noting an exception.

D. "Approved As Noted" - Contractor shall incorporate Engineer's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the Engineer acknowledging the comments and their incorporation into the Shop Drawing.

E. "Amend And Resubmit" - Contractor shall resubmit the Shop Drawing to the Engineer. The resubmittal shall incorporate the Engineer's comments highlighted on the Shop Drawing.

F. "Rejected" - Contractor shall correct, revise and resubmit Shop Drawing for review by Engineer.

G. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

H. If the Contractor considers any correction indicated on the drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

I. When the Shop Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:

1. Systems.

2. Processes.

3. As indicated in specific Specifications Sections.

All drawings, schematics, manufacturer's product data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface checking.

K. Only the Engineer shall utilize the color "red" in marking Shop Drawing submittals.

L. Shop drawing and submittal data shall be reviewed by the Engineer for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor and the Contractor shall reimburse the Owner for services rendered by the Engineer as specified in the Supplementary Conditions.

M. Submittals for sequencing, shutdowns, start-ups and demolition plans or any plan required for interfacing with existing facilities shall include step by step, detailed plan. Generalized descriptions will not be accepted.

1.04 SHOP DRAWINGS

A. When used in the Contract Documents, the term "Shop Drawing" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project. Shop Drawings shall be complete and detailed and shall consist of fabrication, erection, setting and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Catalogs cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive information to required Shop Drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.

B. Manufacturer's catalog sheets, brochures, diagrams, illustrations, and other standard descriptive data shall be clearly marked to identify pertinent materials, products, or models. Delete information which is not applicable to the Work by striking or cross-hatching.

C. Each Shop Drawing shall be submitted with an 8-1/2" by 11" cover sheet which shall include a title block for the submittal. Each Shop Drawing cover sheet shall have a blank area 3-1/2 inches high by 4-1/2 inches wide, located adjacent to the title block. The title block/cover sheet shall display the following:

1. Project Title and Number.

2. Name of project building or structure.

3. Number and title of the Shop Drawing.

4. Date of Shop Drawing or revision.

5. Name of Contractor and subcontractor submitting drawing.

6. Supplier/manufacturer.

7. Separate detailer when pertinent.

8. Specification title and Section number.

9. Applicable Drawing number.

D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, catalog cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction, and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish, and all other pertinent Data.

E. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address, and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

F. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

G. All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least two (2) years unless specified otherwise in the Specification Section applicable.

1.05 WORKING DRAWINGS

A. When used in the Contract Documents, the term "Working Drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework for underpinning, and for such other work as may be required for construction but does not become an integral part of the Project.

B. Copies of working drawings as noted in paragraph 1.05 A. above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for the Work.

C. Working Drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida, and shall convey, or be accompanied by, calculations or other sufficient information to completely

explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the Engineer, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract.
All risks to new or existing work are assumed by the Contractor; the Owner and Engineer shall have no responsibility therefor.

1.06 SAMPLES

A. The Contractor shall furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the Engineer.

B. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.

2. Full range of color, texture, and pattern.

3. A minimum of three (3) samples of each item shall be submitted.

C. Each sample shall have a label indicating:

1. Name of Project.

2. Name of Contractor and subcontractor.

3. Material or equipment represented.

4. Place of origin.

5. Name of producer/supplier and brand (if any).

6. Location in Project.

7. Submittal and specification numbers.

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

D. The Contractor shall prepare a transmittal letter and a description sheet for each shipment of samples. The description sheet shall contain the information required

in Paragraphs 1.06B and C above. He shall enclose a copy of the letter and description sheet with the shipment and send a copy of the letter and description sheet to the Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work, at the Pre-Construction Conference, and as otherwise specified or requested to be submitted earlier as evidence of the Apparent Low Bidder's qualifications.

2. Upon request of the Engineer support the values with data which will substantiate their correctness. The data shall include, but not be limited to quantity of materials, all sub-elements of the activity, and their units of measure.

1.02 SUBMITTALS

A. Submit three copies of a Preliminary Schedule of Values within fifteen (15) days after the Notice to Proceed.

B. Submit three copies of a proposed final detailed Schedule of Values within twenty (20) days after receipt of Notice to Proceed as per the General Conditions.

C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by Project Manager. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.

D. List installed value of each major item of work and each subcontracted item of work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.

E. Coordinate listings with the Progress Schedule.

F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid.

G. The sum of values listed shall equal the total Contract Amount for the Work or the Contract Amount for a part of the Work with a separate Contract Amount provided for by the Contract Documents.

H. When the Project Manager requires substantiating information, submit data justifying line item amounts in question.

1.03 DEFINITION

A. Schedule of Values (SOV) – Schedule that divides the Contract Amount into pay items, such that the sum of all pay items equals the Contract Amount for the Work, or for any portion of the Work having a separate specified Contract Amount.

1.04 REQUIREMENT

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

B. No payment will be made for work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the Project Manager.

C. The equitable value of work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.05 PRELIMINARY SCHEDULE OF VALUES

A. The preliminary schedule of values listing shall include, at a minimum, the proposed value for the following major work:

1. Mobilization, General Requirements and Demobilization as per the specified percentage of Contract Amount.

2. The total value of access road construction inclusive of clearing and grubbing, stripping, excavation, fill construction, paving, road removal, site restoration, and all incidental work associated with access roads. This total value shall be broken down into separate values for each access road.

3. The total value of pipeline construction work inclusive of fabrication, excavation, pipe installation, pipe structures (air-release valves, blowoff valves, and vents), backfilling, testing, site restoration, and all incidental work associated with pipeline construction. The total value shall be broken down into separate values for each pipeline section.

4. The total value of reinforced concrete and building construction work by structure and building inclusive of all excavation, dewatering, subgrade preparation, backfill, and incidental work for all new structures. Additionally, this total value shall be broken down into separate values for each new

structure constructed as a part of the work. Miscellaneous and minor concrete work may be listed as one item in this breakdown.

5. The total value of all mechanical work (HVAC and plumbing), including piping, valves, and equipment.

6. The total value of process piping, valves, and mechanical equipment (such as pumps).

7. The total value of electrical work.

8. The total value of instrumentation and control work including fiber-optic cable system.

9. The total value of all other work not specifically included in the above items.

B. The Contractor and County Project Manager shall meet and jointly review the preliminary schedule of values and make any adjustments in value allocations if, in the opinion of the Project Manager, these are necessary to establish fair and reasonable allocation of values for the major work components. Front-end loading will not be permitted. The Project Manager may require reallocation of major work components from items in the above listing if, in the opinion of the Project Manager, such reallocation is necessary. This review and any necessary revisions shall be completed within 15 days from the date of the notification of the required reallocation.

1.05 DETAILED SCHEDULE OF VALUES

A. Base the detailed schedule of values on the accepted preliminary schedule of values for major work components. Because the ultimate requirement is to develop a detailed schedule of values sufficient to determine appropriate monthly progress payment amounts verifiable by cost loaded of Progress Schedule activities, provide sufficient detailed breakdown to meet this requirement. The County shall be the sole judge of acceptable numbers, details, and description of values established. If, in the opinion of the County, a greater number of schedule of values items than proposed by the Contractor is necessary, the Contractor shall add the additional items so identified by the County as a condition to processing the payment requests.

B. The minimum detail of breakdown of the major work components is indicated below.

C. Mobilization/General Requirements/Demobilization. Mobilization/General Requirement/ Demobilization costs on the Schedule of Values shall not exceed 5% of the Contract Amount. All Work included in the Schedule of Value that falls under this heading as described in this paragraph (including such Work by Subcontractors) will be added and checked for compliance with the 5% limitation. Any actual cost in excess of this amount shall be distributed proportionately to Schedule of Values

items for direct Work items not covered by this heading. Work under this heading may be detailed on Schedule of Value line items identifying each as to whether it is mobilization or initial costs, maintenance or overhead cost or finalization or demobilization cost. The subdivision of this Work into Schedule of Values line items shall be done to support the payment process that shall be distributed as follows: 50% for the first progress payment, 10% for the final payment following demobilization and restoration, and 40% spread evenly over payments made in between.

D. Access road and site construction shall be broken down by clearing and grubbing, stripping, excavation, full construction, erosion control, paving, paving removal, site restoration, and any other items determined to be necessary for the establishment of pay and schedule activity items.

E. Pipeline construction work shall be broken down separately by pipeline segment, which shall not exceed 500-foot-long sections of the pipeline. Each pipeline segment shall be broken down into excavation, pipe fabrication (by wall thickness), pipe installation, pipe structures (air-release valves, blowoff valves, and vents), backfilling, testing, site restoration, and any other items determined to be necessary for the establishment of pay and schedule activity items.

F. Concrete structures and buildings shall be broken down by structure into excavation, subgrade preparation, and appurtenant prefoundation work; concrete foundation construction; slabs on grade; walls/columns; roof structures and roofing, doors and windows, lifting and other equipment; interior and exterior finishes; miscellaneous metalwork; and backfill.

G. Mechanical (HVAC and plumbing) Work shall be broken down by building and to identify individual piping and ductwork and equipment installation and equipment testing.

H. Process piping, valves, and equipment Work shall be broken down by structure into individual piping systems, equipment installation by equipment (including valves, actuators, etc.), name and number, and equipment testing and checkout.

I. Electrical Work shall be broken down by structure into conduit and raceway installation, cable and wire installation, electrical equipment installation, terminations, and lighting. Yard facilities shall be broken down by duct bank designation and substations.

J. Instrumentation and control Work shall be broken down by structure and by pull boxes, duct, fiber-optic cable, and installation and testing.

K. Equipment testing and start-up broken down by process and building.

L. Other work not specifically included in the above items shall be broken down as necessary for establishment of pay and schedule activity items.

M. The Contractor and County shall meet and jointly review the detailed schedule of values within 40 days from the date of Notice to Proceed. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed to provide cost loading of the Progress Schedule activities. Make any adjustments deemed necessary to the value allocation or level of detail, and submit a revised detailed schedule of values within 10 days from the date of the review meeting.

1.06. INCORPORATION OF SCHEDULE OF VALUES INTO CPM PROGRESS SCHEDULE

A. Following acceptance of the detailed schedule of values, incorporate the values into the cost loading portion of the CPM Progress Schedule. The CPM activities and logic shall have been developed concurrent with development of the detailed schedule of values; however, it may be necessary to adjust the detailed schedule of values to correlate to individual schedule activities. It is anticipated that instances may occur, due to the independent but simultaneous development of the schedule of values and the CPM schedule activities, where interfacing these two documents will require changes to each document. Schedule activities may need to be added to accommodate the detail of the schedule of values. Schedule of Value items may need to be added to accommodate the detail of the CPM schedule activities. Where such instances arise, the Contractor shall propose changes to the schedule of values and to the CPM schedule activities to satisfy the CPM schedule cost loading requirements.

B. Cross-Reference Listing - To assist in the correlation of the schedule of values and the CPM schedule, provide a cross-reference listing, furnished in two parts. The first part shall list each scheduled activity with the breakdown of the respective Schedule of Values items making up the total cost of the activity. The second part shall list the Schedule of Values item with the respective scheduled activity or activities that make up the total cost indicated. In the case where a number of schedule activities make up the total cost for a Schedule of Values item, the total cost for each schedule activity should be indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Scope of Work: The Contractor shall employ a competent photographer to take construction record photographs prior to start of work and periodically during the course of the Work. All photographs shall be taken digitally and provided to the Owner on a flash drive.

B. Related Requirements Described Elsewhere:

1. Project Requirements: Section 01000

2. Summary of Project: Section 01010

3. Project Record Documents: Section 01720

1.02 PHOTOGRAPHY REQUIRED

A. Photographs taken in conformance with this Section shall be furnished to the Engineer with each pay request.

B. Photographs shall be taken at each of the major stages of construction and as directed by the Engineer.

C. Non Aerial photographs may be taken by the Contractor's personnel but must be of professional quality as herein specified. Photographs which are deemed unsatisfactory by the Engineer will be rejected and retakes will be required at no additional cost to the Owner.

D. Aerial photographs shall be taken and reproduced by a professional aerial photography service. Aerial photos reproduced by the Contractor will not be accepted. Photographs which are deemed unsatisfactory by the Engineer will be rejected and retakes will be required at no additional cost to the Owner.

E. Views and Quantities Required:

1. Six (6) prints of one (1) view of each activity as directed by the Resident Project Representative, up to a limit of fifteen (15) activities photographed per month.

2. Six (6) prints of five (5) views of overall Project site monthly, as directed by the Resident Project Representative.

3. Two (2) prints of three (3) views of preliminary aerial photographs of the site upon completion of the project.

4. Aerial photography required:

a. Provide four (4) aerial photographs (N, S, E, and W) at the following stages of construction:

1) Site before commencement of any construction at the facility.

2) At 1-month intervals, progress photography during construction of facilities.

3) Upon completion of all Contract work.

b. Five (5) prints of selected aerial photographs enlarged for framing from the preliminary set of aerial photos. Submit aerial for approval prior to final print.

F. Negatives:

1. The photographer shall maintain negatives of the entire Project and then shall convey the negatives to the Owner at the completion of the Project.

2. The photographer shall agree to furnish additional prints to Owner and the Engineer at commercial rates applicable at time of purchase.

1.03 COST OF PHOTOGRAPHY

A. The Contractor shall pay costs for specified photography and prints. Parties requiring additional photography or prints will pay the photographer directly.

PART 2 - PRODUCTS

2.01 PRINTS

A. Type of Print:

1. Paper: Single weight, color print paper.

2. Finish: Smooth surface, glossy.

3. Size: 8 inch x 10 inch for construction photos and preliminary aerial photos, 16 inch x 20 inch for selected aerial photos.

B. Identify each print on back, listing:

1. Name of project.

2. Detailed description of view, including point from which exposure made, compass direction of view, vertical direction of view (horizontal, looking up, looking down, etc.), identification of main features in view and any other data and information pertinent to the purpose and identification the exposure photographer feels necessary to include.

3. Date and time of exposure.

4. Name and address of photographer.

5. Photographer's numbered identification of exposure.

6. Weather conditions under which exposure made.

C. Aerial Photographs

1. Each aerial photograph shall be scaled to picture the plant side within no less than 80 percent of the print total area. Each selected enlarged aerial print shall be provided mounted within a black frame, non-glare glass front, behind a minimum 2-inch wide, two-tone double beveled mat.

D. Print Mounting

1. Each print to be inserted in a clear plastic envelope designed for the purpose.

a. Print deterioration not to be caused by envelope material or fabrication.

b. Designed to prevent print from accidently slipping out of the envelope.

c. Front and back of print to be visible through the plastic envelope.

d. Permit convenience removal and insertion of print.

e. To have 1 inch hinged binding edge suitable for binder insertion.

PART 3 - EXECUTION

3.01 TECHNIQUE

A. Factual Presentation.

B. Correct exposure and focus.

1. High resolution and sharpness.

2. Maximum depth-of-field.

3. Minimum distortion.

3.02 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate condition of construction and state of progress.

1. At successive periods of photography, take at least one photograph from the same overall view as previously photographed.

2. Consult with the Engineer at each period of photography for instructions concerning views required.

3.03 DELIVERY OF PRINTS

A. Deliver prints to the Engineer to accompany each Application For Payment.

B. Distribution of construction prints as soon as processed is anticipated to be as follows:

1. Owner (two (2) sets)

2. Engineer (two (2) sets)

3. Project record file (one (1) set to be stored by Contractor until the end of the project which shall be delivered with Project Record Documents as specified in Section 01720).

4. Contractor (one (1) set)

END OF SECTION

SECTION 01390

COLOR VIDEO
PRECONSTRUCTION RECORD

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Prior to commencing work, the Contractor shall have a continuous color video recording taken along the entire length of the Project and at all proposed construction sites within the Project area to serve as a record of pre-construction conditions. Contractor shall provide video of all manufacturer's and contractor training required in Section 01650. Video and audio shall be done in standard MPEG2 format. Audio portion shall describe the location of the video footage. Provide a copy of all videos to the Owner on flash drives.

B. Contractor to lay out Project along with pipe alignment and station points prior to video.

1.02 QUALITY ASSURANCE

A. The Contractor shall engage the services of a professional electrographer. The color video recording shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business or preconstruction color video recording documentation.

B. The electrographer shall furnish to the Engineer a list of all equipment to be used for the recording, i.e., manufacturer's name, model number, specifications and other pertinent information.

C. Additional information to be furnished by the electrographer are the names and addresses of two references that the electrographer has performed color video recording for, on projects of a similar nature, within the last 12 months.

D. Owner's Representative must be present during filming. Provide Owner forty-eight (48) hours notice prior to start of filming.

E. No construction shall begin prior to review and approval of the video recording covering the construction area by the Owner and Engineer. The Engineer shall have the authority to reject all or any portion of a recording not conforming to specifications and order that it be redone at no additional charge.

F. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the video recording coverage.

G. The video recording shall not be made more than ninety (90) days prior to construction in any area. All videos and written records shall become property of Owner.

PART 2 - PRODUCTS

2.01 FLASH DRIVES

A. Flash drives shall be new USB flash drives.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. All equipment, accessories, materials and labor to perform this service shall be furnished by the Contractor.

B. The total audio-video system shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of imperfection. The audio portion of the recording shall reproduce the commentary of the camera operator with proper volume, clarity and be free from distortion and interruptions.

C. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be more than ten (10) feet. In some instances, video recording coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or-special conveyance provided by the Contractor.

D. The color video camera used in the recording system shall have a horizontal resolution of 350 lines at center, a luminance signal to noise ratio of 45 dB and a minimum illumination requirement of one (1) foot candle.

3.02 RECORDED INFORMATION - AUDIO

A. Each video recording shall begin with the current date, project name and municipality and be followed by the general location, i.e., viewing side and direction of progress. The audio track shall consist of an original live recording. The recording shall contain the narrative commentary of the electrographer,

recorded simultaneously with his fixed elevation video record of the zone of influence of construction.

B. The Owner and Engineer reserves the right to supplement the audio portion of the recording as deemed necessary. A representative of the Owner or Engineer shall be selected to provide such narrative.

3.03 RECORDED INFORMATION - VIDEO

A. All video recordings shall, by electronic means, display on the screen the time of day, the month, day and year of the recording. This time and date information must be continuously and simultaneously generated with the actual recording.

B. Each flash drive shall have a log of that flash drive's contents. The log shall describe the various segments of coverage contained on that video recording in terms of the names of streets or easements, coverage beginning and end, directions of coverage, video unit counter numbers, engineering stationing numbers and the date.

3.04 LIGHTING

A. All video shall be done during time of good visibility. No recording shall be done during precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.

3.05 SPEED OF TRAVEL

A. The rate of speed in the general direction of travel of the vehicle used during recording shall not exceed 44 feet per minute. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

3.06 AREA OF COVERAGE

A. Video coverage shall include all surface features located within the zone of influence of construction supported by appropriate audio coverage. Such coverage shall include, but not be limited to, existing driveways, sidewalks, curbs, pavements, ditches, mailboxes, landscaping, culverts, fences, signs, and headwalls within the area covered, all the way to the right-of-way line and include station points and addresses.

END OF SECTION

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Owner will employ, and pay for services of an Independent Testing Laboratory to perform Testing specifically indicated on the Contract Documents or specified in the Specifications and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.

2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

3. Employment of laboratory by Owner shall in no way relieve Contractor's obligations to perform the Work of the Contract.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.

2. Respective section of Specifications: Certification of products.

3. Each Specification section listed: Laboratory tests required, and standards for testing.

1.02 LABORATORY DUTIES: LIMITATIONS OF AUTHORITY

A. Submit five copies of inspection reports to the Owner. The reports shall include the following components:

1. Project title, Owner’s job number, and Engineer’s job number;

2. Testing laboratory name and address;

3. Date of report issuance;

4. Name and signature of field technician;

5. Date of inspections, sampling, and/or testing;

6. Record of weather conditions;

7. Identification of product tested and associated specification section;

8. Testing location;

9. Description of testing performed;

10. Observations made regarding compliance with the Contract Documents.

B. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Approve or reject any portion of work.

3. Perform any duties of the Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with Owner's personnel, provide access to Work and manufacturer's operations.

B. Secure and deliver to the Owner adequate representational samples of materials proposed to be used and which require testing.

C. Provide to the Owner the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Owner may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.

E. Contractor shall not have direct contact with laboratory or laboratory personnel. All testing shall be coordinated through Owner.

F. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

G. Notify Owner sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

H. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

I. If the test results indicate the material or equipment complies with the Contract Documents, the Owner shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall pay for the laboratory costs directly to the Owner or the total costs shall be deducted from any payments due to the Contractor.

TEST	**NOTES**	**PAID FOR**
Soil Compaction	A. Pipe Work: Every 300 ft. at each lift of compaction B. Structures: As a minimum one test per 2000 SF of fill area per lift, or at least 2 tests per structure, per lift. As specified in material specifications sections	Owner
Low Pressure Air Exfiltration	Each section of gravity sewer pipe between manholes or lift station	Contractor
Hydrostatic Pressure	All segments of pressure piping (24-hour test).	Contractor
Hydrostatic Leakage	All segments of pressure piping (2-hour test).	Contractor
Bacteriological	As required by local and state agencies	Owner
Asphaltic Concrete Paving	As required by Owner	Owner
LBR	Each 600 SY of pavement	Owner
Concrete	Slump test each delivery, cylinders every 20 CY	Owner
Asbestos	Environmental testing of materials	Owner
All Other Testing	As specified in various sections of the Project Manual	As Indicated

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide temporary facilities required which shall include but are not necessarily limited to the following:

1. By Contractor:

a. Telephone.

b. Storage sheds.

c. Temporary water service.

d. Temporary sanitary facilities.

e. Temporary electrical service.

f. Contractor's field office.

g. Owner’s field office.

2. By Owner:

a. None.

1.02 TEMPORARY ELECTRIC POWER

A. Purchase electric power or provide portable electric power for the construction of the project. Provide for the extension of utility lines to the point of usage. The Contractor is responsible for the permitting and the provisions required in order to provide temporary power for construction facilities. Power will not be provided by Owner without written consent.

1.03 TEMPORARY WATER

A. Make arrangements for developing water sources and supply all labor and equipment to collect, load, transport, and apply water as necessary for compaction of materials, concrete construction operations, testing, dust control, and other construction use.

B. Furnish potable drinking water in suitable dispensers and with cups for use of all employees at the job site during the entire construction period.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide temporary toilet facilities separate from the job office. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Provide enough chemical toilets to conveniently serve the needs of all personnel.

B. Chemical toilets and their maintenance shall meet the the State and local health regulations and ordinances. Any facilities or maintenance methods these requirements shall be corrected immediately.

1.05 CONSTRUCTION STAKING

A. The Contractor shall provide all construction staking for the work.

1.06 SILT BARRIERS, TURBIDITY CURTAINS, AND SCREENS

A. See Section 01568 – Temporary Erosion and Sedimentation Control.

1.07 PROJECT SIGNS

A. Provide and erect one sign near the project site in accordance with Section 01580.

1.08 CONTRACTOR'S FIELD OFFICE AND STORAGE SHEDS

A. Provide field office with parking spaces, a telephone and storage sheds for the performance of the work, and protection of materials and equipment. Provide personnel to answer the telephone during working hours. Contractor to coordinate field office locations with the Coutny. It is anticipated that the field offices will be located in the general vicinity of Process Building 80. If the facilities are located off the project site, the Contractor shall indemnify and insure the owner of the land against claims for accident, theft, and other items in accordance with the General Conditions.

1.09 OWNER'S FIELD OFFICE

A. Furnish, equip, and maintain an office trailer for the sole use of the Owner, with secure entrance doors and one key per occupant. Provide entrance/exit steps at all exterior doors. Provide parking areas for County vehicles. No Contractor employees or equipment parking will be permitted on Owner parking areas. Contractor shall have Owner's field office fully functional prior to any construction activities.

1. Area: 600 square feet minimum, with minimum dimensions 12 feet x 50 feet.

    a. Divide trailer into two offices, one on each end, reception area, restroom, and conference hall.
    b. Obtain prior approval of Engineer of floor plan. Each room shall have doors with integral locks, keyed alike.

2. Windows:

    a. Minimum: 3, with a minimum total area of 10 percent of floor area.
    b. Operable sash and insect screens.
    c. Locate to provide view of construction areas.
    d. Provide operable Venetian blinds for all windows.

3. Flooring:

    a. Provide VTC flooring throughout interior of trailer.

4. Furniture:

    a. Two (2) conference tables 30 inches x 96 inches with conference chairs.
    b. Two (2) standard size desks, 3-foot x 5-foot with four drawers.
    c. Two (2) office chairs with armrest, high back, swivel and reclining.
    d. Two (2) plan tables: 36 inches x 60 inches.
    e. Two (2) plan table stools with cushion and high backs.
    f. One (1) plan rack to hold a minimum of six sets of project drawings.
    g. Two (2) standard four-drawer legal size metal filing cabinet with lock and keys (one key per occupant).
    h. Two (2) wooden bookshelves with four shelves each.
    i. Four (4) office chairs with armrest (2 per office).
    j. Four (4) wastebaskets.

k. One (1) tack board, 30 inches x 48 inches.
l. One (1) dry erase board, 30 inches x 42 inches.
m. One (1) coat rack.
n. One (1) 5 cubic-foot refrigerator.
o. One (1) 1.5 cubic-foot microwave oven.
p. One (1) table for printer, copier, fax.
q. One (1) personnel Laptop computer with minimum 14-inch flat screen. It shall be equipped with a Windows Vista operating system, Intel Core i5 Processor 4 GB DDR3 memory , 500 GB Hard Drive, WIFI, Webcam MS Pro Office Suite, Anti Virus Program, Contractor Compatible Software package, Overdrive Pro 3G/4G Mobile Hotspot (equivalent) 3 year in house warranty.

5. Office Equipment and Supplies:

a. Two (2) fire extinguishers (per code).
b. One (1) plain paper facsimile wireless (fax) machine with independent phone line.
c. One (1) water cooler dispenser with hot and cold-water valves, including water service for the duration of the Project.
d. One (1) copier machine (sorter, double side letter, legal and 11 x 17) with software computer to operate.
e. One (1) color printer EPSON CX6600 or equal copying, for o.c.
f. Provide paper for copies in all sizes for the duration of the Project.
g. Provide standard office supplies for the duration of the Project.
h. One (1) 8 people first-aid kit.

6. Office Communications:

a. One (1) telephone system with minimum 3 digital lines and 3 receivers, caller ID.
b. One (1) telephone digital answering machine for 3 lines.
c. Three (3) top rate high-speed internet connections, at a minimum DSL, Roadrunner, etc., including e-mail service with connections in each office for the duration of the Project.
d. Two (2) surge protector power strips.
e. One (1) HTC 4G speed, Android 2.20S BMP camera 4.3" display and 1GHz (Equivalent)or better and should include charger, car charger and blue tooth accessories for hands-free operation.
f. The field office telephone numbers will not be published publicly.
g. Provide wiring to access printer from each office.
h. Coordinate with Orange County IT/ISS to provide Orange County server to RPR.

7. Services (AOD) :

a. Lighting: 50-foot-candles at desktop height.
b. Exterior lighting at entrance door.
c. Automatic heating and mechanical cooling equipment sufficient to maintain comfort conditions.
d. Minimum of four-110 volt duplex electrical convenience outlets, at least one on each wall.
e. Electric distribution panel: two circuits minimum, 110-volt, 60-hertz service.
f. Equip washroom with flush toilet, washbasin with two faucets, medicine cabinet with supplies, toilet tissue holder, 10-gallon capacity automatic electric water heater, and paper towel holder.
g. Provide potable water service to all trailer fixtures.
h. Provide a single waste discharge to sanitary disposal system.
i. Cleaning service for the duration of the Project (min. once per week) .
j. Furnish, replace, and replenish light bulbs, fluorescent tubes, toilet paper, paper towels, soap, etc.

B. Removal of Temporary Construction When No Longer Needed

1. When temporary facilities, services, and controls are no longer needed and before the Work is completed, remove the various temporary facilities, services, and controls and legally dispose of them. Portions of the site used for temporary facilities shall be reconditioned and restored to their previous condition.

C. Construction Solid Waste Disposal

1. Provide a roll-off container for construction debris for the duration of the construction contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01505

MOBILIZATION

PART I - GENERAL

1.01 DEFINITION AND SCOPE

A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the Work. Mobilization shall include, but not be limited to, the following principal items.

1. Move onto the site all Contractor's plant and equipment required for first month operations.

2. Provide a temporary field office for the Contractor's use.

3. Provide a temporary field office for the Engineer's use.

4. Install temporary construction power, wiring, and lighting facilities.

5. Establish fire protection plan and safety program.

6. Secure construction water supply.

7. Provide on-site sanitary facilities and potable water facilities as required by agencies having jurisdiction.

8. Arrange for and erect Contractor's work and storage yard and employee's parking facilities.

9. Submit all required insurance certificates and bonds.

10. Obtain all required permits.

11. Post all OSHA, EPA, Department of Labor, and all other required notices.

12. Submit a detailed construction schedule acceptable to the Engineer as specified.

13. Submit a schedule of values of the Work. Mobilization and Demobilization shall not be more than 5.0% of the bid amount.

14. Submit a schedule of submittals.

15. Install project sign.

1.02 DEMOBILIZATION

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01525

CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish, install and maintain required construction aids, remove on completion of Work.

B. Related Requirements Described Elsewhere:

1. Summary of Project: Section 01010.

C. Comply with applicable requirements specified in Sections of Divisions 2 through 16.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate execution of the Work: scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment such as temporary valves and fittings. Refer to respective Sections for particular requirements for each trade.

B. When permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.

C. Maintain facilities and equipment in first-class condition.

PART 3 - EXECUTION

3.01 PREPARATION

A. Consult with the Engineer, review site conditions and factors which affect construction procedures and construction aids, which may be affected by execution of the Work.

3.02 GENERAL

A. Comply with applicable requirements specified in sections of Divisions 2 through 16.

B. Relocate construction aids as required by progress of construction, by storage of work requirements and to accommodate legitimate requirements of Owner and other contractors employed at the site.

3.03 REMOVAL

A. Completely remove temporary materials, equipment and services:

1. When construction needs can be met by use of permanent construction.

2. At completion of work.

B. Clean and restore areas damaged by installation by use of temporary facilities.

1. Remove foundations and underground installations for construction aids.

2. Grade and grass areas of site affected by temporary installations to required elevations, slopes, ground cover and clean the area.

C. Restore permanent facilities used for temporary purposes to specified condition or in kind if not specified.

END OF SECTION

SECTION 01568

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as required by applicable rules and regulations and permit conditions.

2. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.

3. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.

4. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

B. Related Work Described Elsewhere:

1. Solid Sodding: Section 02822

PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Sodding is specified in Section 02822.

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

2.02 SEDIMENTATION CONTROL

A. Bales shall be clean, seed-free cereal hay type.

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

C. Filter stone shall be crushed stone which conforms to Florida Department of Transportation (FDOT) Specifications.

D. Concrete block shall be hollow, non-load bearing type.

E. Concrete shall be exterior grade not less than 1-inch thick.

PART 3 - EXECUTION

3.01 EROSION CONTROL

A. Minimum procedures for grassing are:

1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.

2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.

3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.

4. Apply netting over mulched areas on sloped surfaces.

5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

6. Stake and secure sodding as needed to prevent erosion.

3.02 SEDIMENTATION CONTROL

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

3.03 PERFORMANCE

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

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish, install and maintain project signs.

2. Remove signs on completion of construction.

3. Allow no other signs to be displayed.

B. Related Requirements Described Elsewhere:

1. Painting: Section 09900.

1.02 PROJECT SIGNS

A. One (1) painted sign approximately 4-feet by 8-feet.

B. Erect on the plant site at a location of high public visibility, as approved by the Engineer and the Owner.

C. Information:

1. Project Sign:

a. Owner title, logo, and Commissioners/Administrator names.

b. Project name.

c. Contractor.

d. Engineer.

e. All consultants employed by Engineer.

1.03 QUALITY ASSURANCE

A. Sign Painter: Professional experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

1.04 SUBMITTALS

A. An 11 inch by 17 inch sketch of the project sign shall be submitted to the Engineer for approval prior to final preparation of the project sign.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition, structurally adequate and suitable for specified finish.

B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.

1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

C. Rough Hardware: Galvanized.

D. Paint: Exterior quality, as specified in Section 09900: Painting.

PART 3 - EXECUTION

3.01 PROJECT IDENTIFICATION SIGNS

A. Paint exposed surface of supports, framing and surface material; one (1) coat of primer and one (1) coat of exterior paint.

B. Paint graphics in styles, sizes, and colors selected.

3.02 MAINTENANCE

A. Maintain sign and supports in a neat, clean condition; repair damages to structures, framing or signs.

3.03 REMOVAL

A. Remove sign, framing, supports and foundations at completion of project.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Material and equipment incorporated into the Work:

1. Manufactured and fabricated products:

a. Design, fabricate and assemble in accord with the best engineering and shop practices.

b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

c. Two (2) or more items of the same kind shall be identical, by the same manufacturer.

d. Products shall be suitable for service conditions.

e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

2. Do not use material or equipment for any purpose other than that for which it is designed or specified.

1.02 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five copies to the Engineer.

1. Maintain one (1) set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

2. Do not proceed with work without clear instructions.

C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.03 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with progress schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

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

1.04 STORAGE AND PROTECTION

A. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry, noncorrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this Project. Storage of equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants in equipment, etc. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.

B. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather-tight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

3. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. All materials and equipment to be incorporated in the work shall be handled and stored by the Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

D. Cement, sand and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel, and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete beams shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.

E. All materials, which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work, and the Contractor shall receive no compensation for the damaged material or its removal.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

G. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.

H. The Contractor shall be responsible for all material, equipment and supplies sold and delivered to the Owner under this Contract until final inspection of the work and acceptance thereof by the Owner. In the event any such material, equipment and supplies are lost, stolen, damaged or destroyed prior to final inspection and

acceptance, the Contractor shall replace same without additional cost to the Owner.

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

1.05 STORAGE AND HANDLING OF EQUIPMENT ON SITE

A. Because of the long period allowed for construction, special attention shall be given to the storage and handling of equipment on site. As a minimum, the procedure outlined below shall be followed:

1. Materials shall not be shipped until approved by the Engineer. The intent of this requirement is to avoid unnecessary delivery of unapproved materials and to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall major equipment or finish products be delivered to the site more than one month prior to installation without written authorization from the Engineer. Materials shipped to the site, or temporarily stored off-site in approved locations, shall be stored in accordance with Paragraph 1.04, herein.

2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the Engineer, until such time as the equipment is to be installed.

3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.

4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed with the Engineer. These instructions shall be carefully followed and a written record of this kept by the Contractor.

5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half the load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.

6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the Owner.

7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.06 SPARE PARTS

A. Spare parts for certain equipment provided under Divisions 11: Equipment; 13: Special Construction; 15: Mechanical; and 16: Electrical have been specified in the pertinent sections of the Specifications. The Contractor shall collect and store all spare parts so required in an area to be designated by the Engineer. In addition, the Contractor shall furnish to the Engineer an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivered cost. Contractor shall package in large military grade containers with all information needed labeled on outside of container such as equipment item, manufacturer, specification, facility, etc.

1.07 GREASE, OIL AND FUEL

A. All grease, oil and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.

B. The Contractor shall be responsible for changing the oil in all drives and intermediate drives of each mechanical equipment after initial break-in of the equipment, which in no event shall be any longer than three (3) weeks of operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01650

START-UP AND DEMONSTRATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Demonstrate to Owner and Engineer that the Work functions as a complete and operable system under normal and emergency operating conditions.

B. Requirements

1. Equipment testing and plant startup is requisite to satisfactory completion of the contract and, therefore, shall be completed within the required contract time for substantial completion.

2. The Contractor shall furnish all personnel, power, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

3. The Contractor may use potable water from the water supply facility in the testing of equipment, process subsystems, and plant start-up. The Contractor shall notify the Owner of the amount of water required for the test at the time the testing is scheduled. The Owner reserves the right to limit the amount of water or set the time of day and dates of the deliveries of water to the Contractor if deliveries of such water unduly affects Owner's system operation and to maintain customer service.

4. Disposal of Non-Acceptable Water. It shall be the sole responsibility of the Contractor to dispose of plant flow produced during any equipment, process subsystem, and plant startup testing in a manner approved by regulatory agencies and to the satisfaction of the Owner. The Contractor shall identify the disposal method in its testing protocol submittal.

5. Prior to commencement of any discharge from equipment testing and plant start-up, the Contractor shall obtain all regulatory approval, in writing, and submit it to the Engineer. If only the Owner may apply for a specified permit regarding the disposal of testing water, the Contractor shall notify the Owner and furnish all the regulatory

requirements. The Contractor shall prepare all necessary regulatory agency submittals for the Owner to review and execute.

6. Disinfection of piping and structure shall be performed prior to start-up.

7. All start-up and demonstration activities shall be coordinated with and witnessed by the Owner. Owner shall be notified in advance of proposed start-up and demonstration testing.

8. The WSF shall remain operational during start-up and demonstration testing.

C. Related Work Described Elsewhere:

1. Construction Progress Schedules: Section 01310.

2. Operating and Maintenance Data: Section 01730.

3. Equipment: Division 11.

4. Mechanical: Division 15.

5. Electrical: Division 16.

1.02 START-UP GUIDELINES

A. The Contractor shall startup and test all equipment, subsystems, and the complete plant under the guidelines listed below. The startup and testing shall be performed in the following segments:

1. Individual Equipment Units. The startup and testing of the individual equipment units shall not commence until all disinfection and pressure testing of pipelines, hydraulic structures, and equipment is complete. Sequence as determined by Contractor. Description and requirements for startup and testing of individual equipment units are located under the equipment's individual specification section.

2. Process Subsystems. The startup and testing of the process subsystems shall not commence until the startup and testing of the individual equipment units is complete. Sequence as determined by Contractor. Description of startup and testing of process subsystems is located under the system's specification section or herein as noted. This segment includes functional tests of instrumentation and control system loop validation tests.

3. Plant Startup. The startup of the complete plant shall not commence until the startup and testing of the process subsystems is complete and approved by the Engineer. This segment shall demonstrate operation of the facility for a specified length of time and provide evidence of satisfactory water quality.

4. Performance Testing. Performance testing of the plant shall not commence until the startup of the plant is complete and plant finished water can be introduced to the existing water storage and distribution system with the permission of regulatory agencies having jurisdiction. This segment shall demonstrate that the entire work will function properly and reliably as a system and that the system will function to meet the specified standards over the stated period of time.

PART 2 - PRODUCTS

2.01 START-UP PLAN

A. Submit for approval by the Engineer a detailed start-up plan outlining the schedule and sequence of all tests and start-up activities, including submittal of checkout forms, submittal of demonstration test procedures, start-up, demonstration and testing, submittal of certification of completed demonstration and training. Start-up and commissioning may not begin until the plan is approved by the Engineer. Start-up plan shall be submitted and approved a minimum of 14 days in advance of start-up activities. Operation and Maintenance Manuals shall be approved and provided to the Owner prior to testing and start-up.

B. Provide adequate chemicals to perform start-up services. After completion and acceptance of the performance testing, all bulk chemical storage tanks shall be completely filled.

PART 3 - EXECUTION

3.01 COMPONENT TEST AND CHECK-OUT

A. Start-up Certification: Prior to system start-up, successfully complete all the testing required of the individual components of the Work. Submit three (3) hard copies and an electronic copy of CHECK-OUT MEMO'S for each individual component or piece of equipment, signed by the Contractor or the subcontractor and the manufacturer's representative. All copies of the Operation and Maintenance Manuals must be provided before start-up may begin. These forms

shall be completed and submitted before Instruction in Operation to Owner or a request for initiating any final inspections. Insert one (1) copy of this form into the applicable section of each Operation and Maintenance Manual.

B. Demonstrate to the Engineer and the Owner's representative, that all temporary jumpers and/or bypasses have been removed and that all of the components are operating under their own controls as designated.

C. Coordinate start-up activities with the Owner's operating personnel at the treatment plant site and with the Engineer prior to commencing system start-up.

3.02 START-UP

A. Confirm that all equipment is properly energized, that the valves are set to their normal operating condition and that the flow path through the new Work is unobstructed.

B. Confirm that all process subsystems have been tested and are ready for operation. The process subsystems are listed below:

1. Chemical Feed Subsystems. Verify the control, operation, and performance of the chemical feed systems.

2. Electrical and Process Control Subsystems. Verify the performance of the electrical equipment and process and control systems.

C. Slowly fill each hydrostatic structure in the process flow stream with water.

D. Initiate start-up and training in accordance with and with the use of the plant operation and maintenance manuals.

E. Observe the component operation and make adjustments as necessary to optimize the performance of the Work.

F. Coordinate with Owner for any adjustments desired or operational problems requiring debugging.

G. Make adjustments as necessary.

3.03 START-UP DEMONSTRATION AND TESTING

A. After all Work components have been constructed, field tested, and started up in accordance with the individual Specifications and manufacturer requirements, and after all Check-Out Forms have been completed and submitted, perform the Start-

Up Demonstration and Testing. The demonstration period shall be held upon completion of all systems at a starting date to be agreed upon in writing by the Owner or his representative. Prior to beginning the start-up demonstration testing, the Contractor shall submit a detailed schedule of operational circumstances for approval by the Engineer. The schedule of operational circumstances shall describe, in detail, the proposed test procedures for each piece of equipment. Provide similar test procedure forms for each piece of equipment or section of the Work to include all particular aspects and features of that equipment or section of the Work and as specified in the Technical Sections of the Specifications.

B. The Start-Up Demonstration Testing will be conducted for seven (7) consecutive days. The Work must operate successfully during the seven (7) day testing period in the manner intended. If the Work does not operate successfully, or if the start-up is interrupted due to other contracts, the problems will be corrected and the test will start over from day one. The party causing the interruption will be subject to the assessment of actual damages due to delay.

C. During the start-up demonstration period, operate the Work, instruct designated plant operating personnel in the function and operation of the Work, and cause various operational circumstances to occur. As a minimum, these circumstances will include average and peak daily flows, random equipment or process failures, tank overflows, surcharges, interlocks and bypasses. Demonstrate the essential features of the equipment and its relationship to other equipment. The approved schedule of operational circumstances and Demonstration Test Procedures Forms will be used as the agenda during the Start-Up Demonstration Testing period for all equipment and sections of the Work. Coordination of the demonstration test schedule will be accomplished through the Engineer.

D. Acceptability of the Work's performance will be based on the Work performing as specified under these actual and simulated operating conditions, to provide water treatment facilities functioning as intended and as defined in the Contract Documents. The intent of the start-up demonstration and testing is for the Contractor to demonstrate to the Owner and the Engineer that the Work will function as a complete and operable system under normal, as well as emergency operating conditions, and is ready for final acceptance.

E. Demonstrate the essential features of the whole system as it applies to the Work, including the mechanical equipment, piping, structures, finishes, controls, instrumentation, power distribution and lighting systems. Use the approved procedures and circumstances to demonstrate the system. Any minor deficiencies found shall be noted and included on a punch list attached to the Certificate of Completed Demonstration. The system shall be demonstrated only once, after completion of start-up tests. If circumstances arise that interrupt the test procedures (such as weather, unforeseen process problems, or problems caused by the Contractor whether or not the problems are the fault of the Contractor, etc.,)

then the test shall be terminated and rescheduled to a later date after the problem is corrected. The test shall be run in its entirety if so directed by the Engineer.

F. Demonstrate the essential features of all the mechanical systems including, but not limited to, the following as they apply to the Work:

1. Chemical storage and feed systems.

2. Mechanical Systems

   a. Valves
   b. Pumps
   c. Fire Protection System

7. Heating, Air Conditioning, and Ventilating Systems and Controls.

   a. Air Conditioning/Heating System
   b. Ventilating System

G. Demonstrate the essential features of all electrical and instrumentation systems including, but not limited to, the following as they apply to the work:

1. Electrical systems controls and equipment.

   a. Electrical power equipment.
   b. Motor control centers.
   c. Motor control devices.
   d. Relays.
   e. Special transformers.
   f. Starting devices.

2. Supervisory control and data acquisition system.

3. Communications systems.

4. Lighting fixtures (including relamping and replacing lenses).

   a. Exit and safety fixtures.
   b. Fixtures, indoor and outdoor.
   c. Floodlighting.

5. Panelboards.

   a. Distribution panels.
   b. Lighting panels.
   c. Main panels, power panels.
   d. Switchboard.

6. Wiring devices.

    a. Face plates.
    b. Low-voltage controls.
    c. Outlets: convenience, special purpose.
    d. Switches: regular, time.

H. Upon successful completion of the Start-up, Demonstration and Testing, the Owner's personnel will receive the specified training for each system. Training of the Owner's personnel will not be considered valid unless it takes place using a system that has successfully passed the Start-up, Demonstration and Testing. Training shall be a minimum of two (2) days for each system, unless the individual specifications require more.

I. All training required by the specifications shall be videotaped with approved equipment and microphones in accordance with Section 01390 and shall be submitted to the County on individual flash drives.

J. Training for Instrumentation and Controls shall include a minimum of 8 hours on-site for two (2) separate groups of staff and 8 hours at the Eastern Regional Water Supply Facility.

K. Upon completion of all specified operator training, the Contractor shall submit to the Engineer three (3) copies of the Certificate of Completed Demonstration Form, for each item of equipment or system in the Work, signed by the Contractor, Subcontractor, Engineer, and the Owner. Insert one (1) copy of this form in the applicable section of each Operation and Maintenance Manual. A sample Certificate of Completed Demonstration Form is provided in the General Conditions.

CHECK OUT FORM

[]	OWNER	Orange County Utilities	No. Copies	____	CHECK-OUT
[]	ENGINEER:	Tetra Tech	No. Copies	____	MEMO NO. _____
[]	ARCHITECT:	_____	No. Copies	____	
[]	CONTRACTOR:	_____	No. Copies	____	
[]	FIELD:	_____	No. Copies	____	
[]	OTHER:	_____	No. Copies	____	

PROJECT DATA

NAME: _____
LOCATION: _____
OWNER: _____
OTHER: _____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING NO: _____
SPECIFICATION
SECTION: _____

Name of equipment checked:

Name of manufacturer of equipment:

1. The equipment furnished by us has been checked on the job by us. We have reviewed, where applicable, the performance verification information submitted to us by the Contractor.

2. The equipment is properly installed, except for items noted below.*

3. The equipment is operating satisfactorily, except for items noted below.*

4. The written operating and maintenance information, where applicable, has been presented to the Contractor, and been discussed with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to him.

Checked By:

_____	_____
Name of Manufacturer's Rep.	Name of General Contractor
_____	_____
Address and Phone # of Rep.	Authorized Sig./Title/Date
_____	_____
Sig./Title/Pers. Making Chk.	Name of Subcontractor
_____	_____
Date Checked	Authorized Sig./Title/Date

Manufacturer's Representative Notations: Exceptions noted at time of check were:

_____

_____

_____

_____

Manufacturer's Representative to note adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate adequacy of related systems or equipment):

_____

_____

_____

_____

CERTIFICATE OF COMPLETED DEMONSTRATION FORM

[]	OWNER	Orange County Utilities	No. Copies	____	CERTIFICATE
[]	ENGINEER:	Tetra Tech	No. Copies	____	OF COMPLETED
[]	ARCHITECT:	_____	No. Copies	____	DEMONSTRATION
[]	CONTRACTOR:	_____	No. Copies	____	MEMO NO. _____
[]	FIELD:	_____	No. Copies	____	
[]	OTHER:	_____	No. Copies	____	

PROJECT DATA

NAME: _____
LOCATION: _____
OWNER: _____
OTHER: _____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING NO: _____
SPECIFICATION SECTION: _____

NOTE TO CONTRACTOR:

Submit five (5) copies of all information listed below for checking at least one (1) week before scheduled demonstration of the Work. After all information has been approved by the Engineer, give the Owner a Demonstration of Completed Systems as specified and have the Owner sign five (5) copies of this form. After this has been done, a written request for a final inspection of the system shall be made.

MEMORANDUM:

This memo is for the information of all concerned that the Owner has been given a Demonstration of Completed Systems on the work covered under this Specification Section. This conference consisted of the system operation, a tour on which all major items of equipment were explained and demonstrated, and the following items were given to the Owner:

(a) Owner's copy of Operation and Maintenance Manual for equipment or systems specified under this Section containing approved submittal sheets on all items, including the following:

(1) Maintenance information published by manufacturer on equipment items.

(2) Printed warranties by manufacturers of equipment items.

(3) Performance verification information as recorded by the Contractor.

(4) Check-Out Memo on equipment by manufacturer's representative.

(5) Written operating instructions on any specialized items.

(6) Explanation of guarantees and warranties on the system.

(b) Prints showing actual "As-Built" conditions.

(c) A demonstration of the system in operation and of the maintenance procedures which will be required.

_____
(Name of General Contractor)

By: _____
(Authorized Signature, Title and Date

_____
(Name of Subcontractor)

By: _____
(Authorized Signature, Title and Date

Operation and Maintenance Manuals, Instruction Prints, Demonstration and Instruction in Operation Received:

_____
(Name of Owner)

By: _____
(Authorized Signature/Title/Date

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

B. Related Requirements Described Elsewhere:

1. Start-Up: Section 01650

2. Cleaning: Section 01710.

3. Project Record Documents: Section 01720.

4. Operating and Maintenance Data: Section 01730.

5. Warranties and Bonds: Section 01740.

6. Miscellaneous Work and Cleanup: Section 01800.

1.02 SUBSTANTIAL COMPLETION

A. The Work will not be substantially complete, and Contractor may not request substantial completion inspection unless the following submittals and work is completed:

1. All Operation and Maintenance manuals have been submitted and approved to the requirements of Section 01730. Final operation and maintenance manuals shall be turned over to the Owner.

2. All equipment has been checked-out by the equipment manufacturer and Certificates of Manufacturer's Check-Out have been submitted as required by Section 01650.

3. All start-up and demonstration testing completed and Certificates of Completed Demonstration submitted to the requirements of Section 01650.

4. Project Record Documents are complete and have been submitted and reviewed to the requirements of Section 01720.

5. All training of Owner's personnel completed.

6. All areas to be used and occupied are safe, operable in automatic and complete.

7. All building occupancy certificates have been issued by the appropriate building permitting agency.

8. All painting, finishes, fencing, cleanup, final grading, grassing, planting, sidewalk construction, and paving shall have been completed and are ready for inspection.

9. All deficiencies noted on inspection reports or nonconformances are corrected or the correction plan approved.

10. No partial substantial completions will be considered.

B. When the conditions of paragraph 1.02 A. are met the Contractor shall submit to the Engineer:

1. A written notice that he considers the Work, or portion thereof, is substantially complete, and request an inspection.

2. A punch list of items to be corrected. (Uncompleted work which is not related to the safe, effective, efficient use of the Project may be allowed on the punch list with the Engineer's approval.)

C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.

D. Should the Engineer determine that the Work is not substantially complete:

1. The Engineer will promptly notify the Contractor in writing, giving the reasons therefor.

2. Contractor shall remedy the deficiencies in the Work and send another written notice of substantial completion to the Engineer.

3. The Engineer will within reasonable time, reinspect the Work. The Contractor will be liable for reinspection fees as described in Paragraph 1.04, herein.

E. When the Engineer finds that the Work is substantially complete, he will:

1. Schedule a walk-through of the facility to include the Owner. Engineer shall determine the completeness of the punch list and readiness of the facility for occupancy by the Owner.

2. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with the tentative punch list of items to be completed or corrected before final inspection.

3. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected. Any incomplete work allowed on a punch list must be reinspected upon completion and any deficiencies found will be added to the punch list.

1.03 FINAL INSPECTION

A. Prior to Contractor's request for a final inspection the following submittals and work must be complete:

1. Project Record Documents must be approved.

2. All spare parts and maintenance materials must be suitably delivered to the Owner per the requirements of the Technical Sections of the Specifications.

3. Contractor to submit evidence of compliance with requirements of governing authorities.

B. After satisfying the requirements of Paragraph 1.03 A. and when Contractor considers the Work complete, he shall submit written certification that:

1. Contract Document requirements have been met.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.

5. All punch list items have been corrected or completed and the Work is ready for final inspection.

C. The Engineer will, within reasonable time, make an inspection to verify the status of completion after receipt of such certification.

D. Should the Engineer consider that the Work is incomplete or defective:

1. The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies, and send another written certification to the Engineer that the Work is complete.

3. The Engineer will, within a reasonable amount of time, reinspect the Work and the Contractor shall be liable for reinspection fees as described in Paragraph 1.04, herein.

E. When the Engineer finds that the Work is acceptable under the Contract Documents, the Contractor may make closeout submittals.

1.04 REINSPECTION FEES

A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Contractor will compensate the Owner for such additional services.

2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Warranties and Bonds: To requirements of Section 01740.

B. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.

C. Certificate of Insurance for Products and Completed Operations.

D. Provide copies of all closed permits

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the Engineer.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

a. Previous change orders or written amendments.

b. Allowances.

c. Unit prices.

d. Deductions for uncorrected work.

e. Penalties and bonuses.

f. Deductions for liquidated damages.

g. Deductions for reinspection payments.

h. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum remaining due.

C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Execute cleaning, during progress of the Work and at completion of the Work.

1.02 DISPOSAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations or personal activities.

B. Provide on-site containers for the collection of waste materials, debris and rubbish.

C. Remove waste materials, debris and rubbish from the site periodically, or as directed by the Owner, and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

A. The Contractor shall employ construction techniques that minimize the production and distribution of dust.

B. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

C. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

C. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 PURPOSE AND DESCRIPTION OF WORK

A. The purpose of the Project Record Documents is to provide the County with factual information regarding all aspects of the Work, both concealed and visible, to enable future location, identification and modification of the Work without lengthy and expensive site measurement, investigation or examination.

B. Maintenance, certification and submittal of Record Documents.

1. Throughout progress of Work, maintain accurate records of progress and changes of Contract Documents and in the Record Drawings.

2. Obtain the services of a Surveyor to certify the as-built asset attribute data for the location of the Work and transfer the data to the Record Drawings.

3. Upon Surveyor certification of the location of completed work, transfer the information from the as-built asset attribute data to electronic record documents.

4. Provide final record documents to the County.

1.02 DEFINITIONS

Except where specific definitions are used within a specific section, the following terms, phrases, words and their derivation shall have the meaning given herein when consistent with the context in which they are used. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. The word "shall" is mandatory, and the word "may" is permissive.

A. As-Built Asset Attribute Data: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements so that the constructed facilities can be delineated in such a way that the location of the constructed improvements may be compared with the construction drawings. A completed table similar to the Table 01720-2 Asset Attribute Data Form Example in this Section shall be provided and certified by the Surveyor.

B. As-Built Drawings: Drawings prepared by the Contractor's Surveyor shall depict the actual location of installed utilities for the completed WORK in a full size hard copy and an electronic AutoCAD file (dwg) format.

C. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 61G17-6 'Minimum Technical Standards', FAC.

D. Electronic As-Built Asset Attribute Data: Shall mean documents that are signed and sealed electronically by a Surveyor by creating a "signature" file and are transmitted electronically following the procedures and definitions of Chapter 61G17-7.0025, FAC.

E. Record Documents: Shall mean full size hard and electronic copies of Boundary Surveys and As-Built Asset Attribute Data certified by a Surveyor, reports and other documents presented in Article 2.01.

F. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a professional surveyor and mapper pursuant to Chapter 472, F.S.

G. Survey Map Report: As a minimum the Survey Map Report shall identify or describe the locations where the pipe centerline was constructed within three feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary, any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained.

1.03 RELATED REQUIREMENTS

A. All General Conditions, Supplements to the General Conditions, and any Addenda issued by the County are a part of this Section in the same manner as if fully written herein, and shall govern the Work of this Section, except where more stringent articles or requirements are stipulated, then they shall govern this Section.

B. The Contract Documents are complementary and what is required by anyone shall be as binding as if required by all.

C. Other requirements affecting Record Documents may appear in pertinent other sections of these specifications.

1.04 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of the Record Documents to one person on the Contractor's staff as approved by the County.

B. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of drawings and other documents where such entry is required to show progress and changes properly.

C. Make entries within 24-hours after receipt of information has occurred.

D. Survey documents shall comply with the minimum technical standards of Chapter 61G17-6 of the Florida Administrative Code (FAC) and Table 01720-1 Minimum Survey Accuracies specified in, whichever are more stringent. Asset attribute data shall be signed, sealed and dated by the Surveyor. All coordinates shall be geographically registered in the Florida State Plan Coordinate System using the contract drawings control points for horizontal and vertical controls.

1.05 SUBMITTALS

A. Comply with pertinent provisions of Section 01340 "Shop Drawings, Working Drawings, and Samples" and other submittal requirements in the different Articles of this Section and the rest of these specifications.

B. As a prerequisite for progress payments, the CONTRACTOR shall exhibit the currently updated Record Documents for review by the COUNTY. Payment will be withheld at the COUNTY'S discretion based on the status of the Record Documents or if they are not properly maintained.

C. The Work will not be placed into operation until the asset attribute data (see Table 01720 Asset Attribute Data Form Example) certified by the Surveyor for the Record Drawings is approved by the County.

D. Prior to submitting request for final payment or the County issuing a Certificate of Completion for the Work, Contractor shall submit the final Record Documents to the County for approval. Retainage funds will be withheld at the County's discretion based on the quality and accuracy of the final Record Documents.

E. Required Submittal Documents:

1. Full size, hard copy set of the final Record Documents including but not limited to:

a. As-built asset attribute data added to the Record Drawings by the Contractor, boundary surveys of pump stations, Surveys and Survey Report for the location of constructed pipes within any easements and pump station site.

b. Other Final Record Documents.

Table 01720-1
Minimum Survey Accuracies

Asset/Location	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: horizontal center and vertical top, unless otherwise specified
Bench Marks	N/A	0.01	Point
Horizontal Control	0.01	N/A	Point
Easements and Tracts	*	N/A	Survey Monuments
Civil Site, Topo and Foundation Drawings	0.1	0.01	All
Hydrants	0.01	N/A	Operating Nut
Blow off Valves	0.01	N/A	Valve Enclosure
Air Release Valves	0.01	N/A	Valve Enclosure
Master Meters	0.01	N/A	Register
Meter Box	0.01	N/A	Top of Meter Box
Clean-out	0.01	N/A	Top of Clean-out
Pump Station	0.01	0.01	Top Center of Wet Well and Pipe Inverts
Manholes	0.01	0.1	Top Center of Cover
Manhole	N/A	0.01	Pipe Inverts
System Valves	0.01	0.1	Operating Nut and Valve Body
Fittings	0.01	0.1	Top of Fitting and Ground
Piping at 100’ max intervals	0.01	0.1	Top of Pipe and Ground
Restrained Pipe	0.01	N/A	Limits
Electrical Conduit	0.01	N/A	Limits
Connections	0.01	0.1	Pipe Invert
Bore & Jack Casing	0.01	0.1	Top of Casing at Limits of Casing
Existing Utilities**	0.01	0.1	Conflicts

*Shall conform to the requirements of the “Chapter 61G17-6, ‘Minimum Technical Standards’, FAC”, certified by a Surveyor.
**Existing utilities including but not limited to water, wastewater, reclaimed water, storm, fiber optic cable, electric, gas and structures within the limits of construction.

2. Digital Set of the final Record Documents including but not limited to:

    a. Scanned digital copies of the Record Drawings updated to match the as-asset attribute data table.

    b. Electronic Survey documents electronically sealed by the Surveyor.

    c. Final Record Documents information.

    d. Digital Record Drawing in the Engineer's current version of AutoCAD file (dwg) format for the Contract Drawings, updated to match the final Record Drawing information.

1.06 RECORD DOCUMENTS AT SITE

A. Maintain at the site and always available for County's use one record copy of:

1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.

2. Change Orders, Verbal Orders, and other modifications to Contract.

3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).

4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests.

5. Field test records, inspection certificates, manufacturer certificates and construction photographs.

6. Partial Surveyor's as-built assets attribute data, pipe deflection data, and gravity main data.

B. Maintain the documents in an organized, clean, dry, legible condition and completely protected from deterioration and from loss and damage until completion of the Work, transfer of all record data to the final Record Documents and for submittal to the County.

Table 1720-2
Asset Attribute Data Form Example

Asset Type	I.D. Number	Utilities Asset Number	UTILITIES Asset Coordinates		
			Northerly	Easterly	Elevation
Bench Marks	BM-1		1605466	450720.5	86.04
Horizontal control	HC-1		1605700	450879	N/A
Horizontal control	HC-2		1605333	450773.1	N/A
Fire hydrant	FH-1		1605630	450920.4	N/A
Fire hydrant	FH-2		1605162	450024.6	N/A
					Depth
Gate valve	GV-1		1605631	450533.2	2.9
Gate valve	GV-2		1605400	450765.8	3.4
Plug valve	PV-1		1605024	450123.7	3.3
Plug valve	PV-2		1605626	450245.4	2.6
Blow off valve	BO-1		1605805	450057.3	N/A
Blow off valve	BO-2		1605030	450126.2	N/A
Air release valve	ARV-W1		1605647	450939.9	N/A
Air release valve	ARV-FM2		1605978	450490.1	N/A
Master meter	MM-1		1605290	450130.2	N/A
Master meter	MM-2		1605900	450883.9	N/A
Detector check meter	DCM-1		1605244	450848.8	N/A
Detector check meter	DCM-2		1605829	450035.9	N/A
Clean-out	CO-1		1605290	450130.2	N/A
Clean-out	CO-2		1605900	450883.9	N/A
Force Main Fitting	FMF-1		1605024	450123.7	3.3
Water Main Fitting	WMF-1		1605626	450245.4	3.6
Reclaimed Water Fitting	RWMF-1		1605680	450302.7	3

Asset Type	I.D. Number	Utilities Asset Number	UTILITIES Asset Coordinates			Notes
			Northerly	Easterly	Elevation	
Water Piping	WM-1		1605290	450130.2	2.8	
Force Main Piping	FM-1		1605900	450883.9	4	
Reclaimed Water Main Piping	RWM-1		1605900	450883.9	3.2	
Restrained Water Main	RSWM-1		1605631	450533.2		Limits of restraint
Restrained Force Main	RSFM-1		1605400	450765.8		Limits of restraint
Restrained Reclaimed Water Main	RSRWM-1					Limits of restraint
			1605024	450123.7		
Water Main Connection	WMC-1		1605626	450245.4		
Force Main Connection	RMC-1		1605030	450126.2		
RW Main Connection	RWMC-1		1605805	450057.3		
Water B&J Casing	WMBJC-1		1605900	450883.9		
Force Main B&J Casing	FMBJC-1		1605647	450939.9		
RW B&J Casing	RWBJC-1		1605978	450490.1		
Other Utility Line Conflicts	CONFL-1		1605290	450130.2		

	I.D. Number	Asset Number					
			1605829	450035.9	Top Center	Infl. Pipe Invert	Wet Well Bottom
PS top center of wetwell	PS-1		1605643	450370.8	87.04	73.25	68.20

	I.D. Number	Asset Number	Asset Coordinates		Top Elevation	Invert Elevations	
			Northerly	Easterly		N	S
Manhole	MH-1		1605320	450196.7	88.19	73.50	73.60
Manhole	MH-2		1605160	450726.7	87.48	75.35	75.45

PART 2 - PRODUCTS

1.01 RECORD DOCUMENTS

A. As-Built Drawings: After obtaining one complete set of all documents comprising the Contract and other Documents described in paragraph 1.06 Record Documents at site, the Contractor shall maintain and create the As-Built Drawings including:

1. Pump station site boundary survey and map report: Provide the pump station site boundary survey showing the real property boundaries and site improvements. The boundary survey field work and survey map shall be performed after the Work at the site has been completed and before the start-up inspection. Provide a survey map report in addition to the boundary survey.

2. Survey Map Report for the As-Built Asset Attribute Data Table: As a minimum the Survey Map Report shall identify or describe the locations where the pipe centerline was constructed within three feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary, any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained. Survey map report shall be dated after the Work within the right-of-ways or easements have been completed.

3. Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements and certify a completed table similar to the Table 01720-2 Asset Attribute Data Form Example.

4. Surveyor shall prepare a certified table to include as a minimum the pipe lengths, manhole inverts, and slopes for gravity mains.

5. Surveyor shall calculate and prepare a certified table for horizontal and vertical pipe deflections of pipe that will include as a minimum the pipe lengths, coordinates of pipe deflections, horizontal or vertical deflections, the manufacturer's recommendations for pipe deflections, and meets or exceeds the manufacturer's recommendations.

B. Final Record Documents: Contractor shall provide final version of the Record Documents both as paper copies and electronic format described below.

1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.

2. Change orders, verbal orders, and other modifications to Contract.

3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).

4. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.

5. Field test records, inspection certificates, manufacturer certificates and construction photographs.

6. As-Built Drawings described in paragraph A. above.

PART 3 - EXECUTION

3.01 MAINTENANCE AND CREATION OF RECORD DOCUMENTS

A. Promptly following the receipt of the County's notice to proceed, secure from the County, at no charge to the Contractor, one (1) complete electronic set of construction drawings. Maintain the As-Built Drawings and create documents to add to it as described herein.

B. Construction Progress Meetings

1. Identify each paper document and sample with the title "RECORD DOCUMENTS" using one inch high letters or higher.

2. Print a paper copy of the current draft electronic As-Built Drawings and As-Built Asset Attribute Data Table (all partially constructed improvements).

3. Print a paper copy of the current table shall for pipe deflections (horizontal and vertical) depicting if the deflections meet the manufacturer's recommendations.

4. Print a paper copy of the current table of manhole elevations, pipe lengths, and slopes. The table shall be updated before progress meetings when the wastewater pipes that enter the manholes are backfilled.

C. Survey Documents: Contractor shall obtain the services of a Surveyor to acquire the As-Built Assets Attribute Data, pump station Boundary Survey(s), and re-establish easement corners with pins if destroyed by the Work.

1. Pump station site boundary survey and map report.

2. Survey Map Report for the As-Built Asset Attribute Data Table.

3. Complete a table similar to the Table 01720-2 Asset Attribute Data Form Example and the final table shall be certified by the Surveyor.

4. Gravity main slope table prepared certified by Surveyor.

D. Electronic As-Built Drawing Entries:

1. Maintain the electronic As-Built Drawings to accurately record progress of Work and change orders throughout the duration of the Contract.

2. Date all entries. Enter RFI No., Change Order No., etc. when applicable.
3. Call attention to the entry by highlighting with a "cloud" drawn around the area affected.

4. In the event of overlapping changes, use different colors for entries of the overlapping changes.

5. Make entries in the pertinent other documents while coordinating with the Engineer and the County for validity.

6. Entries shall consist of graphical representations, plan view and profiles, written comments, dimensions, State Plane Coordinates, details and any other information as required to document field and other changes of the actual Work completed. As a minimum, make entries to also record:

a. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed as well as any changes made by Field Order, Change Order or other.

b. Depths of various elements of foundation in relation to finish floor datum and State Plane Coordinates and elevations.

c. Plan view and profile drawings, station and offset dimensions, State Plane coordinates for all fittings, valves and appurtenances of underground piping in the Work once lying uncovered in the trench. Show locations for equipment, facilities and other Work relocated or changed in the field.

d. When manholes, boxes, or underground conduits and plumbing are involved as part of the Work, record true elevations and locations, dimensions between manholes, slope of gravity mains, invert and top elevations.

e. Actually installed pipe or other Work materials, class, pressure rating, diameter, size, specifications, etc. Similar information for

other encountered underground utilities, not installed by Contractor, their owner and actual location if different than shown in the Contract Documents.

f. Location of utilities, appurtenances and other Work concealed in the construction, referenced to visible and accessible permanent improvements.

g. Details, not on original contract Drawings, as needed to show the actual location of the Work completed in a manner that allows the County to find it in the future.

h. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar items shown schematically on the construction documents and show on the As-Built Drawings the actual horizontal and vertical alignments and locations.

i. Major architectural and structural changes including relocation of doors, windows, etc. Architectural schedule changes according to contractor's records and shop drawings.

E. Storage and Preservation:

1. Store Record Documents and samples at a protected location in the project field office apart from documents used for construction.

a. Provide files and racks for storage of documents

b. Provide locked cabinet or secure space for storage of samples.

2. File documents and samples in accordance with CSI format with section numbers matching those in the Contract Documents.

3. In the event of loss of recorded data, use means necessary to again secure the data to the County's approval.

a. Such means shall include, if necessary in the opinion of the County, removal and replacement of concealing materials.

b. In such cases, provide replacements of the concealing materials to the standards originally required by the Contract Documents.

3.02 FINAL RECORD DOCUMENTS SUBMITTAL

A. Refer to Article 1.05 Submittals for relevant information regarding final submittal.

B. Refer to Article 2.01 for relevant information for Final Record Documents.

C. Scanned Documents: Scan the Survey Documents and other Record Documents reflecting changes from the Bid Documents.

1. The scanned record drawing sets shall be complete and include the title sheet, plan/profile sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-Built Drawings shall be included in the electronic drawings, with each sheet being converted into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4 at 400 dpi resolution to maintain legibility of each drawing.
Then, the tif images shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set. Review all Record Documents to ensure a complete record of the project

D. Contractor's Surveyor shall review and check for accuracy the As-Built Drawings and ascertain that all data furnished and other documents are accurate and truly represent the Work as actually installed.

E. As-Built Drawings: Provide an encompassing digital AutoCAD file that includes all the information of the Drawings and any other graphical information in the As-Built Drawings. It shall include the overall Work, utility system layout and associated parcel boundaries and easements. Feature point, line and polygon information for new or altered Work and all accompanying geodetic control and survey data shall be included. The surveyor's certified as-built asset attribute data shall be added to the As-Built Drawings and Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).

F. Submit the Final Record Documents at or prior to Substantial Completion.

G. Participate in review meetings as required.

H. Make required changes and promptly deliver the Final Record Documents to the Engineer and County.

3.01 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor has no responsibility for recording changes in the Work after final completion, except for changes resulting from work performed under guarantee.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

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

a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Requirements Described Elsewhere:

1. General Requirements: Division 1.

2. Equipment: Division 11.

3. Special Construction: Division 13.

4. Mechanical: Division 15.

5. Electrical: Division 16.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.

2. Familiar with requirements of this Section.

3. Skilled as technical writer to the extent required to communicate essential data.

4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format:

1. Size: 8-1/2 inches x 11 inches.

2. Paper: 20 pound minimum, white, for typed pages.

3. Text: Manufacturer's printed data, or neatly typewritten.

4. Drawings:

a. Provide reinforced punched binder tab, bind in with text.

b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches x 17 inches.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.

a. Provide typed description of projects and major component parts of equipment.

b. Provide identified tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

a. Title of Project.

b. Identity of separate structure as applicable.

c. Identity of general subject matter covered in the manual.

7. Provide electronic versions of each submittal in PDF format with bookmarks for each section. Once each O&M manual is approved, Contractor shall provide one (1) PDF version of all O&M manuals combined into one file with bookmarks and a searchable table of contents.

C. Binders:

1. Commercial quality, three D-ring type binders with durable and cleanable white plastic covers. Binders shall be presentation type with clear vinyl covers on front, back and spine. Binders shall include two sheet lifters and two, horizontal inside pockets.

2. Maximum D-ring width: 2 inches.

3. When multiple binders are used, correlate the data into related consistent groupings.

1.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

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

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

3. List, with each product, name, address and telephone number of:

a. Subcontractor, manufacturer and installer name, addresses and telephone numbers.

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

c. Identify area of responsibility of each.

d. Local source of supply for parts and replacement equipment including name, address and telephone number.

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

B. Product Data:

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

2. Annotate each sheet to:

a. Clearly identify specific product or part installed.

b. Clearly identify data applicable to installation.

c. Delete references to inapplicable information.

3. Operation and maintenance information as herein specified.

4. Record shop drawings as submitted and approved with all corrections made for each product.

C. Drawings:

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

a. Relations of component parts of equipment and systems.

b. Control and flow diagrams.

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

3. Do not use Project Record Documents as maintenance drawings.

D. Written test, 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 instruction of each procedure.

E. Copy of each warranty, bond and service contract issued.

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

a. Proper procedures in event of failure.

b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit six (6) copies of complete manual in final form and six (6) electronic PDF copies and one (1) Microsoft Word version.

B. 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 reordering special manufacturing products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.

b. Cautions against cleaning agents and methods which are detrimental to product.

c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture protection and weather-exposed products:

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

a. Applicable standards.

b. Chemical composition.

c. Details of installation.

2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: Respective sections of Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit six (6) copies of complete manual in final form and six (6) electronic PDF copies and one (1) Microsoft Word version.

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. Summary of information listed on equipment and motor data plates.

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.

3. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting".

c. Disassembly, repair and reassembly.

d. Alignment, adjusting and checking.

4. Servicing and lubrication required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

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 by controls manufacturer.

9. Each Contractor's coordination drawings.

    a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with location and function of each valve.

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

12. Other data as required under pertinent sections of specifications.

13. Approved record shop drawings with all corrections made, and a copy of the warranty statement, checkout memo, demonstration test procedures and demonstration test certification.

C. Content, for each electric and electronic systems, as appropriate:

1. Description of system 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.

2. Circuit directories and panelboards.

    a. Electrical service.

    b. Controls.

    c. Communications.

3. As installed color coded wiring diagrams.

4. Operating procedures:

    a. Routine and normal operating instructions.

    b. Sequences required.

    c. Special operating instructions.

5. Maintenance procedures:

   a. Routine operations.

   b. Guide to "trouble-shooting".

   c. Disassembly, repair and reassembly.

   d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

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

8. Other data as required under pertinent sections of specifications.

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

E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.07 SUBMITTAL SCHEDULE

A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents of Operation and Maintenance Manuals within 90 days after Notice to Proceed.

B. Submit two (2) copies of completed data in preliminary form no later than 20 days following Engineer's review of the last shop drawing of a product and/or other submittal specified under Section 01340, but no later than delivery of equipment. One (1) copy will be returned with comments to be incorporated into the final copies and the other copy will be retained on-site for use in any early training.

C. Submit six (6) copies of approved manual in final form directly to the offices of the Engineer within 10 days after the reviewed copy or last item of the reviewed copy is returned.

D. Provide six (6) copies of addenda to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to demonstration test, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with Owner's operating and maintenance personnel in full detail to explain all aspects of operations and maintenance.

C. All on-site training shall require both classroom instruction and field instruction. Allow Owner’s personnel to attend each session for each major system and equipment. A minimum of two (2) days shall be allotted for each session, unless additional time is required in the individual equipment specifications.

D. Instructors shall be fully qualified personnel as outlined within the individual equipment specifications. If no specific training specifications are listed with the equipment, the Contractor shall provide the instruction with qualified Contractor personnel.

E. The Contractor shall provide a list to the Owner indicating the proposed date, time and instructors that will be present for all training sessions. The Owner will review and approve the training schedule prior to training events and facilitate the classroom training location as needed.

F. The instructors shall provide for and prepare lesson scopes and handouts for individuals designated by the Owner that outline the items to be covered. Separate sessions for operation and maintenance instruction shall be provided consecutively. Handouts shall be submitted to the Owner with at least one week's notice prior to the training sessions.

G. All instruction sessions shall be recorded with portable recording devices and saved on flash drives supplied by the Contractor. Video recording shall be made by the Contractor under the direction of the Owner using standard MPEG2 format compatible recording equipment and shall include audio recording. Provide C.A.R. for scheduling training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Described Elsewhere:

1. Contract Closeout: Section 01700.

1.02 SUBMITTAL REQUIREMENTS

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 orderly sequence. Provide complete information for each item.

1. Product of work item.

2. Firm, with name of principal, address and telephone number.

3. Scope.

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

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

6. Provide information for Owner's personnel:

a. Proper procedure in case of failure.

b. Instances which might affect the validity or warranty or bond.

7. Contractor, name of responsible principal, address and telephone number.

D. The contractor shall provide a Certificate of Installation and materials from the manufacturer on all equipment and materials installed. The Certificate of Installation shall be on manufacturer's letterhead with names and phone numbers.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2 inches by 11 inches, punch sheets for standard three (3) ring binder.

a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:

a. Title of Project.

b. Name of Contractor.

C. Binders: Commercial quality, three (3) D-ring type binders with durable and cleanable white plastic covers and maximum D-ring width of two (2) inches. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year, unless otherwise specified, commencing at Final Completion of the project.

B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Divisions 11: Equipment; 13: Special Construction; 15: Mechanical; and 16: Electrical and which has at least a 1 hp motor or which lists for more than $1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.

C. In the event that the equipment manufacturer or supplier is unwilling to provide a one (1) year warranty commencing at the start of the Correction Period, the

Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two (2) year warranty from the manufacturer shall not relieve the Contractor of the one (1) year warranty, starting at the time of Owner's acceptance of the equipment.

D. The Owner shall incur no labor or equipment cost during the guarantee period.

E. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer or the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01800

MISCELLANEOUS WORK AND CLEANUP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section includes operations which cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent to work involved. The Contractor shall furnish all labor, materials, equipment and incidentals to complete the work under this Section.

2. The work of this Section includes, but is not limited to, the following:

a. Restoring of fences.

b. Cleaning up.

c. Incidental work.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 RESTORING OF FENCES

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

3.02 CLEAN UP

A. The Contractor shall remove all construction material, buildings, equipment and other debris remaining on the job as the result of construction operations and shall render the site of the work in a neat and orderly condition. All suitable excess excavated material shall remain on site.

3.03 INCIDENTAL WORK

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

END OF SECTION

DIVISION 2

SITEWORK

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This section includes furnishing all labor, materials, equipment, and incidentals required for demolition of the existing sodium hypochlorite generation system as shown in the drawings and as specified herein.

2. This section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping mechanical, electrical, existing (to be abandoned) piping and miscellaneous appurtenances encountered during demolition operations.

3. The sequence of demolition of the existing structures will be in accordance with the approved Demolition and Removal Plan as specified in Paragraph 1.06 of this Section. The Contractor is solely responsible for the demolition sequencing of the work.

4. The Contractor shall be responsible for:

a. Approximate locations and dimensions of piping and structures are shown in the Contract Drawings demolition plans.

b. All piping and equipment to be demolished associated with the Eastern Regional Water Supply Facility Improvements shall be demolished and removed according to this Specification.

c. Capping of all subsurface water piping as referenced in the Contract Drawings demolition plan.

d. Termination and plugging of all subsurface water piping as referenced in the Contract Drawings demolition plans.

e. Termination of all electric in accordance with local codes and NEC.

f. Final grading and site restoration.

g. Disposal of non-salvageable and excess unacceptable materials as specified below.

h. All concrete slabs shall be removed before filling and compacting the depression with clean fill.

i. Water service shall not be disturbed, irrigation piping shall not be disturbed, and overhead electric shall not be disturbed except as noted above.

5. The Contractor shall examine the various drawings regarding the proposed site, visit the proposed site and determine for himself the extent of the work, the extent of the work affected therein and all conditions under which he is required to perform the various operations.

1.02 PERMITS AND NOTICES

A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses performing the work and shall furnish a copy of same to the Engineer prior to commencing work. The Contractor shall comply with the requirements of the permits.

B. Notices: If applicable, Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Engineer.

C. Utility Services: If applicable, Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove equipment owned by them in structures to be demolished and to remove, disconnect, cap or plug their services to facilities demolition.

1.03 CONDITIONS OR STRUCTURES

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

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

1.04 RULES AND REGULATIONS

A. The Standard Building Codes shall control demolition, modification or alteration of the existing buildings or structures.

B. No blasting shall be done on site. The Contractor shall not bring or store any explosives on site.

1.05 DISPOSAL OF MATERIAL

A. Salvageable material shall become the property of the Owner, if the Owner requests any specific item. Softeners are to be salvaged, coordinate other salvageable items with the Owner. The Contractor shall dismantle all materials to such a size that it can be readily handled, and deliver any of this salvageable material requested by the Owner to a storage area designated by the Owner.

B. The following type of materials are examples of what the Owner may desire to keep:

1. Pipes and valves.
2. Equipment.
3. Miscellaneous metals and other materials at the discretion of the Owner.

C. Any materials that the owner rejects shall become the Contractor's property and must be removed from the site. Unless identified as a salvageable item by the Owner, all of the sodium hypochlorite generation equipment and storage tanks shall become the Contractor's property after they are taken out of service. The Contractor shall be responsible for cleaning, demolition, removal from the site, and proper disposal. Any chemical disposal required as part of the demolition of the existing system shall be the responsibility of the Contractor. Chemical shall be disposed of at an EPA approved facility

D. Concrete, concrete block and non-salvageable bricks shall be hauled to a waste disposal site by the Contractor.

E. All other material shall be hauled to a waste disposal site by the Contractor.

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

G. The Contractor is responsible for the dewatering of pipelines.

H. A certified contractor in the disposal of hazardous waste material shall be utilized to dispose of equipment and pipes associated with chemical feed systems to be demolished.

1.06 SUBMITTALS

A. Submit to the Engineer in accordance with Section 01340 for approval the proposed demolition and removal plan for the structures, equipment and modifications as shown on the Drawings or as specified herein prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility service as required and supply and startup of the temporary storage, and feed systems required to maintain operations.

The demolition and removal plan shall include as a minimum, the following:

1. A detailed sequence of demolition and removal work to insure the uninterrupted progress of the Owner's operations, and the expeditious completion of the Contractor's work.

2. Evidence (by signature) of approval of the Owner's Plant Supervisor and Owner's Inspector of the work plan.

3. Contractor to be used in the cleaning and disposal of hazardous material.

B. Before commencing demolition work, all modifications necessary to bypass the affected structure will be completed. Contractor shall coordinate with the Owner's personnel to determine the locations of the affected valves and fittings.

1.07 TRAFFIC AND ACCESS

A. Conduct demolition and modification operation, and the removal of equipment and debris to ensure minimum interference with roads, streets or walks both on-site and off-site and to ensure minimum interference with occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the existing site.

C. Do not close or obstruct streets or walks without permission from the Owner and Engineer. Provide alternate traffic routes around closed or obstructed access ways.

1.08 DAMAGE

A. Promptly repair damage caused to adjacent facilities or structures within the Eastern Regional Water Supply Facility by demolition operations and at no cost to the Owner.

1.09 UTILITIES

A. Maintain existing utilities to remain in service and protect against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Owner and the Engineer. Provide temporary service during interruptions to existing utilities as acceptable to the Owner.

C. The Contractor shall cooperate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.

D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under this jurisdiction of utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.10 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions or work. Comply with the governing regulations.

B. Clean structures and improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer. Return areas to conditions existing prior to the start of work.

1.11 QUALITY CONTROL

A. Protect all existing materials and equipment either in operation or to be salvaged or reused, from damage.

B. Cap or plug all lines to be abandoned. Place covers and label all junction boxes, conduits, and wire as abandoned.

C. Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition of the existing structures and equipment will be in accordance with the approved Demolition and Removal Plan as specified in Paragraph 1.06 of this Section.

B. See Specification Section 01010 for outline of the sodium hypochlorite conversion sequence.

3.02 TEMPORARY STORAGE AND METERING PUMP

A. In order to complete the demolition and modification work of the sodium hypochlorite system, a temporary storage and feed system will be required to maintain disinfection at all times.

B. See Specification Section 11400 for the temporary chemical feed system requirements.

3.03 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING AND APPURTENANCES

A. Existing equipment, piping, buried and non-buried valving, and appurtenances shall be removed or abandoned in-place as shown or dictated or the Drawings, and/or specified herein.

B. All equipment piping and appurtenances shall be cleaned, flushed, and drained. Equipment to be retained by the Owner as specified in Paragraph 1.05 above shall be dismantled sufficiently to permit thorough cleaning and draining. All valves shall be left open. All abandoned piping shall be capped and sleeves and openings remaining after removal of the existing equipment, piping, and appurtenances shall be plugged and sealed as shown on the Drawings, and/or specified herein.

3.04 STRUCTURES TO BE COMPLETELY DEMOLISHED

A. Existing structures shall be completely demolished as shown on the Drawings. Structures shall be demolished to make room for construction of new facilities, unless otherwise shown on the Drawings. All demolished material and equipment shall be removed from site.

3.05 MISCELLANEOUS CONCRETE SLABS, ROADWAYS AND SIDEWALKS

A. Remove concrete slabs, roadways and sidewalks where shown on the drawings or where necessary for the construction of the new structures or modifications of existing structures. All concrete sidewalks and curbing not required after the new plant is in operation shall be removed and disposed of as specified herein.

B. All areas, where slabs are removed, shall be filled with clean fill and sodded in open areas.

END OF SECTION

SECTION 02110

CLEARING, GRUBBING, AND STRIPPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This Section describes the work included in clearing, grubbing, stripping, and otherwise preparing the project site for construction operations.

B. Related Work Specified Elsewhere:

1. Earthwork: Section 02200.

C. Definitions:

1. Clearing: Remove and dispose of shrubs, brush, limbs, and other vegetative growth. Remove all evidence of their presence from the surface including sticks and branches. Remove and dispose of trash piles and rubbish that currently is scattered over the construction site or collects there during construction. Protect trees, shrubs, vegetative growth, and fencing which are not designed for removal. Clearing operations shall be conducted so as to prevent damage to existing structures and installations, and to those under construction, so as to provide for safety of employees and others.

2. Grubbing: Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs, and any other organic or metallic debris remaining after clearing not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

3. Stripping: Remove and dispose of all organics and sod, topsoil, grass, and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. Grass, grass roots and organic material in areas to be excavated or filled shall be stripped to the depth as noted in the soils report. In areas so designated, topsoil shall be stockpiled. Strippings and unsuitable material, such as organic material, shall be disposed of by the Contractor unless directed otherwise by the Engineer.

PART 2 - MATERIALS

2.01 GENERAL

A. Trees and Shrubbery: Existing trees, shrubbery, and other vegetative material is not shown on the Drawings. Inspect the site as to the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein. Preserve, in place, trees that are specifically shown on the Drawings and designated to be preserved.

B. Preservation of Trees, Shrubs, and Other Plant Material:

1. All plant materials (trees, shrubbery, and plants) beyond the limits of clearing and grubbing shall be saved and protected from damage resulting from the work. No filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants. To prevent soil compaction within the drip line area, no equipment will be permitted within this area.

2. When trees are close together, restrict entry to area within drip line by fencing. In areas where no fence is erected, the trunks of all trees 2 inches or greater in diameter shall be protected by encircling the trunk entirely with boards held securely by 12-gauge wire and staples. This protection shall extend from ground level to a height of 6 feet. Cut and remove tree branches where such cutting is necessary to affect construction operation. Remove branches other than those required to affect the work to provide a balanced appearance of any tree. Scars resulting from the removal of branches shall be treated with a tree sealant.

PART 3 - EXECUTION

3.01 GENERAL

A. Clearing and Grubbing Limits: All excavation areas associated with new structures, slabs, and roadways shall be cleared and grubbed to the following depths:

1. Roadway and Paved Area: 2 feet below existing grade and replace with compacted backfill.

2. Proposed Structures: 2 feet below existing grade within a 5 foot margin of each structure and replaced with compacted backfill as specified herein.

3. Building Site Areas not specifically noted above: 2 feet below existing grade and replaced with compacted backfill as specified herein.

4. All other areas: 1 foot below completed surface.

B. Disposal of Clearing and Grubbing Debris: Do not burn combustible materials. Remove all cleared and grubbed material from the work site and dispose of in accordance with all local laws, codes, and ordinances.

C. Areas to be Stripped: All excavation and embankment areas associated with new structures, slabs, walks, and roadways shall be stripped. Stockpile areas shall be stripped.

D. Disposal of Strippings: Remove all stripped material and dispose off-site, unless otherwise directed to stockpile material.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work to be performed under this Section shall include the design and installation of a temporary wellpoint system until completion of construction to dewater subsurface waters from structures as required. Contractor shall obtain all permits for the dewatering operations.

B. Related Work Described Elsewhere:

1. Shop Drawings, Working Drawings, and Samples: Section 01340.

2. Earthwork: Section 02200.

1.02 QUALITY ASSURANCE

A. Qualifications: The temporary dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date.

B. Standards: The dewatering of any excavation areas and the disposal of water during construction shall be in strict accordance with all local and State government rules and regulations.

1.03 SUBMITTALS

A. Materials and Shop Drawings: Shop drawings required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 01340: Shop Drawings, Working Drawings, and Samples. Submittals shall include at minimum the following:

1. Design notes and drawings.

2. Descriptive literature of the temporary dewatering system.

3. Layout of all piping involved.

4. Bill of materials.

5. Proposed discharge locations and methods.

6. Copies of all local or State permits obtained by the Contractor associated with the proposed dewatering system.

1.04 CRITERIA

A. The wellpoint system shall be developed to the point that is capable of dewatering such that groundwater levels are maintained at least three (3) feet below the bottom of excavations. Each wellpoint system shall be capable of dewatering and maintaining groundwater levels at the respective structures. Observation wells shall be constructed for the purpose of testing each system.

PART 2 - PRODUCTS

2.01 GENERAL

A. The equipment specified herein shall be standard dewatering equipment of proven ability as designed and manufactured by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods.

B. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the work and require such modifications as may be required to assure that the systems will perform satisfactorily. Dewatering systems shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils and to preserve the integrity of adjacent structures.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Dewatering: The Contractor shall install a temporary wellpoint dewatering system for the removal of subsurface water encountered during construction of the proposed structures.

3.02 PROTECTION AND SITE CLEAN-UP

A. At all times during the progress of the Work the Contractor shall use all reasonable precautions to prevent either tampering with the wellpoints or the entrance of foreign material.

B. After the wellpoint system is no longer needed, the Contractor shall remove all of his equipment, materials, and supplies from the site of the work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the Engineer.

END OF SECTION

SECTION 02200

EARTHWORK

PART I - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of excavating, trenching, sheeting/shoring, filling, grading, backfilling, and compacting those soil materials required for the construction of the embankments, structures, piping, ditches, utility structures and appurtenances as shown on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Clearing, Grubbing, and Stripping: Section 02110.

C. Definitions

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material as determined by ASTM D1557.

2. Optimum Moisture Content: The optimum moisture content shall be determined by ASTM D 1557 to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable material shall be non-cohesive, non-plastic granular local sand that is free from vegetation, organic material, marl, silt or muck. The materials shall also meet detailed requirements specified herein. The Contractor shall furnish all additional fill material required.

5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 in accordance with AASHTO Designation M 145.

6. Open Areas: Open areas shall be those areas that do not include building sites, limerock areas, access road right-of-way and parking areas.

D. Plan For Earthwork

1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work.

2. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall reflect the equipment and methods to be employed in the excavation. Prices established in the Proposal for the work to be done will reflect all costs pertaining to the work. No claims for extras based on substrata or groundwater table conditions will be allowed.

E. Trench Safety Act: The Contractor shall comply with all of the requirements of the Florida Trench Safety Act (Chapter 90-96, CS/CB 2626, Laws of Florida). The Contractor shall acknowledge that included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act.

F. Related Work Described Elsewhere

1. Shop Drawings, Working Drawings, and Samples: Section 01340.

2. Testing and Testing Laboratory Services: Section 01410.

3. Temporary Erosion and Sedimentation Control: Section 01568.

4. Clearing, Grubbing, and Stripping: Section 02110.

5. Dewatering: Section 02140.

6. Mechanical: Division 15.

1.02 APPLICABLE PUBLICATIONS

A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE

A. The requirements for testing and laboratory services are specified in Section 01410: Testing and Testing Laboratory Services.

1.04 FEDERAL AND STATE REGULATORY REQUIREMENTS

A. All trench excavations which exceed 5 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S. 1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act."

1.05 JOB CONDITIONS

A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price.

1.06 SUBMITTALS

A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction and backfilling for the various portions of the work. Review shall be for information only. The Contractor shall remain responsible for the adequacy and safety of the methods. Where sheeting and bracing is required for construction, the design shall be performed by a Professional Geotechnical Engineer.

B. Submit six (6) copies of a report from a testing laboratory verifying that off-site borrow material conforms to the gradation specified.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. All fill material from on and off-site sources shall be subject to the approval of the Engineer.

2. All fill material shall be unfrozen and free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material

1. Common Fill shall be sand not containing stones, rock, concrete or other rubble larger than 2 inches in diameter. No more than 10% of the material, by weight, shall pass a 200 mesh sieve and organic matter in the material shall be less than 1% by weight.

2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.

3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

C. Select Common Fill

1. Select Common Fill material shall be free from stones larger than 1 1/2 inches and no more than 5% of the material shall pass a 200 mesh sieve. The amount of organic matter in the material shall not exceed 1% by weight.

2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.

3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

D. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

U.S. Sieve Size	Percent Passing By Weight
1 - inch	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-10

E. Bedding Rock: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing and grubbing shall be performed in accordance with Section 02110.

B. Protection

1. Sheeting and Bracing:

a. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Owner is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.

b. The Contractor shall construct sheeting outside the neat lines of the foundation unless another configuration is desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. Any deformation shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.

c. Where sheeting and bracing is required for construction, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall conform with the design, and certification of this shall be provided by the Professional Geotechnical Engineer.

d. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.

e. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the Owner directs him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.

f. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the Owner.

g. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

h. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one (1) foot above the top of any pipe.

2. Pumping and Drainage

a. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The installed dewatering system shall be in conformity with the overall construction plan. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.

b. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bottom of the excavation and to preserve the integrity of adjacent structures. Well or sump installations shall be constructed with proper sand filters to prevent intermixing of finer grained soil from the surrounding ground.

c. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

d. The Contractor shall take all additional precautions to prevent buoyant uplift of any structure during construction.

e. The conveying of dewatered liquids in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. The Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the Owner or the authority having jurisdiction, at no cost to the Owner.

f. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.

g. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by the Contractor.

h. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.02 EXCAVATION

A. General

1. Excavation consists of removal, storage and disposal, if necessary, of material encountered when establishing required grade elevations and in accordance with the notes shown in the Drawings. This work shall include shaping and sloping and other work necessary in bringing the earthwork to the required grade, alignment and cross section.

2. Sandy Organic Muck identified in the Geotechnical Investigation and other unsuitable materials shall be removed under all proposed structures, pipes, and roads. Also, the unsuitable materials described above shall be removed outside of the structures, pipes, and roads by a margin equal to the depth of material, or 5 feet, whichever is greater. Replacement material shall be Common Fill placed and compacted as specified herein.

3. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

4. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the Engineer. Unauthorized excavation, as well as remedial work shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise specified or directed by the Engineer.

5. When excavation has reached required subgrade elevations, make an inspection of conditions. If the material is unsuitable or has clay and/or organic material, and if authorized by Engineer to remove, carry excavation deeper and replace excavated material with Bedding Rock. Removal and replacement of unsuitable subgrade

material, as directed by the Engineer, will be paid for as extra work by unit prices established in the Bid Form.

6. If the Contractor excavates below grade through error or for his own convenience or through failure to properly dewater the excavation or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the preceding paragraph, in which case the work of excavating below grade and finishing and placing the refill shall be performed at his own expense.

7. Stockpile satisfactory excavated materials at a location approved by the Engineer until required for backfill or fill. Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located away from the edge of excavations. Excess soil materials shall be disposed of by the Contractor.

B. Trench Excavation

1. Excavation for all trenches required for the installation of pipes shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry.

2. Excavation shall not exceed normal trench width. Normal trench width is defined as indicated on the Drawings. Any excavation which exceeds the normal trench width, shall require special backfill requirements as determined by the Engineer.

3. Rock shall be removed to provide at least eight inches clearance around the bottom and sides of the pipe being laid.

4. Where pipe is to be laid in Bedding Rock or encased in concrete, the trench may be excavated to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

5. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. Manually trim and shape trench bottom to receive pipe at correct line and grade. Shape trench to provide a uniform, continuous support along the entire length of the barrel of each pipe section. Hand-shape firm unyielding bedding so that the bottom segment will be in continuous contact with the pipe barrel.

3.03 PLACEMENT OF MATERIALS

A. Fills

1. Material placed in fill areas shall be deposited within the lines and to the grades shown on the Drawings making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved. If sufficient Common Fill material is not available from excavation on site, the Contractor shall provide borrow as required.

2. Fill shall be brought up in substantially level lifts not exceeding 8 inches in depth. The entire surface of the work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section. Fill shall not be placed against concrete structures until they have attained sufficient strength.

3. During the process of placing fill, all roots, debris and stones greater in size than specified herein shall be removed from the fill areas and the Contractor shall assign a sufficient number of employees to this work to insure satisfactory compliance with these requirements.

4. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.

5. All fill materials shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas as required to perform the work in such a manner that will preserve the undisturbed state of the natural soils. The Contractor shall not claim excavated material as unsuitable due to moisture content. The Contractor shall sufficiently dewater excavated materials for use as backfill.

6. Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials. Plow strip or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with the existing surface.

7. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each classification.

B. Bedding and Backfilling for Pipes

1. Bedding for pipe shall be as shown on the Drawings. The Contractor shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

2. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with suitable material to the mid-diameter of the pipe. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings.

3. After the pipe is laid to line and grade, place and carefully compact pipe bedding material for the full width of the trench to the springline of the pipe. Place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping equipment supplemented by "walking in" and slicing with a shovel to assure that all voids are filled. Place backfill in 6-inch layers and carefully compact the area above the pipe springline with pipe cover material to a point 12 inches above the top outside surface of the pipe barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material. The backfilling shall be carried up evenly on both sides of the pipe. The remainder of the trench backfill shall then be filled and thoroughly compacted in uniform layers not exceeding 12 inches in depth.

C. Backfill around structures shall be placed in uniform layers not exceeding 8 inches in depth. Backfill material shall be Common Fill meeting requirements set forth in Paragraph 2.01. All backfill shall be placed and compacted "in-the-dry." Backfill operations around structures shall not be started until the concrete has attained sufficient strength to resist the loads imposed by the backfill material.

3.04 COMPACTION

A. General

1. The Contractor shall control soil compaction during construction to provide the densities specified. It shall be the Contractor's responsibility to notify the Engineer in writing that compaction tests can be performed. Written notice from the Contractor shall precede completion of compaction operations by at least two (2) working days.

2. Material which is too wet shall be spread over the fill area and permitted to dry, assisted by harrowing if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied to provide a satisfactory moisture content. If too much water is added, the area shall be

permitted to dry before compaction is continued. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and other materials and equipment necessary to place water in the fill in the manner specified.

3. When a trench or excavation bottom has a density less than that specified herein for the particular area classification, the Contractor shall compact the material to the required depth and percentage of maximum density.

B. Percentage of Maximum Density Requirements

1. All fill and backfill in unpaved areas shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557, unless specified otherwise.

2. All fill and backfill under roadways, driveways, sidewalks, or any other type of paving, shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557.

C. Special Foundation Preparation Requirements for Process Structures and Buildings

1. After clearing, grubbing, and removal of unsuitable materials, the existing ground beneath proposed tanks, building foundations and equipment base slabs and slabs on grade shall be removed and the area proof-rolled. Proof-rolling shall consist of at least 10 passes of a self-propelled roller that imparts a force of not less than 40,000 pounds per drum to the soils. Each pass shall overlap the preceding pass by 30 percent to insure complete coverage. The areas shall be compacted to a density of not less than 95 percent of Modified Proctor Dry Density as determined by ASTM D1557 (latest edition) for a depth of not less than 2-feet below the bottom of the foundations or concrete slabs. Any unsuitable foundation material shall be removed and replaced with Common Fill.

2. Any soft soils found as a result of proof-rolling shall be excavated in accordance with Paragraph 3.02 and replaced with Common Fill placed in lifts not exceeding 8 inches in depth.

3.05 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers.

B. If, in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.06 FINAL GRADING

A. After other earthwork work has been finished, and filling and backfilling operations are completed, all areas on the site of the work which are to be graded shall be brought to grade within a tolerance of +/- 0.1 feet at the indicated elevations, slopes, and contours where seeding or sodding is not required or, where sodding is required, within three (3) inches of finished grade. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least one percent shall be provided.

3.07 EXCESS EXCAVATED MATERIALS

A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All excess excavated material shall be disposed of off-site by the Contractor.

B. The Contractor shall segregate different types of excavated materials (i.e. sands, clayey sands) in the stockpile area. All unsuitable materials shall be disposed of by the Contractor offsite in a legal manner.

C. The Contractor shall slope and compact the stockpile with a light roller to maintain stability.

D. The Contractor shall maintain proper soil and erosion control measures.

END OF SECTION

SECTION 02210

SITE GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work in this section consists of furnishing all necessary labor, equipment, material and transportation necessary to bring the roads, drives, building sites, paved areas and open areas to the lines and grades shown on the Drawings. The work includes removal of existing shrub, brush and ground cover at the sites of the culvert replacements.

B. The Contractor must determine for himself the volume of fill material is required for the site.

C. Definitions:

1. Open Areas: Open areas shall be those areas that do not include building sites, paved areas, and parking areas.

2. Maximum Density: Maximum weight in pounds per cubic foot (pcf) of a specific material.

3. Optimum Moisture: Percentage of water in a specific material at maximum density.

4. Rock Excavation: Excavation of any hard natural substance which requires the use of special impact tools such as, jackhammers, sledges, chisels, or other similar devices specifically designed for use is cutting or breaking rock, but exclusive of trench excavating machinery.

PART 2 - PRODUCTS

2.01 MATERIALS

It is intended that existing on-site materials be reused for embankment construction and trench backfill to the extent feasible and practicable. If additional materials are needed for fill, the material shall meet the requirements for fill specified in Section 02220 Excavation, Backfilling, and Compaction.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Excavation:

1. Excavation shall conform to the limits indicated on the plans or specified herein. This work shall include shaping, sloping and other work necessary in bringing the earthwork to the required grade, alignment and cross section.

2. All suitable materials removed from the excavation shall be used as far as practicable in the formation of the embankments, subgrades, shoulders, building sites and other places as directed. No excavated material shall be wasted without permission. If excess suitable excavated material is available at the completion of the project shall be stockpiled on site at the direction of the Engineer. Unsuitable material shall be removed to the required depth and replaced to the satisfaction of the Engineer with suitable material. Unsuitable material existing in open areas may remain, and these open areas may be used for disposal areas for the unsuitable material as directed by the Engineer.

B. Fills:

1. Fills shall be formed of suitable material placed in layers of not more than 12 inches in depth measured loose and rolled and/or vibrated with suitable equipment until compacted. Thickness of layers may be increased provided the equipment and methods used are proven by field density testing to be capable of compacting thicker layers to specified densities. Layer thickness shall be decreased if equipment and methods used are proven to be incapable of compacting the layers to specified densities.

2. Rock that will not pass through a 1.5-inch diameter ring shall not be placed within the top 12 inches of the completed fill. Broken concrete, asphaltic pavement, or other similar deleterious material shall not be used in fills.

3. Fill within the roadways, walkways, parking areas, and building sites shall be compacted to a density of not less than 98 percent (98%) of its modified proctor maximum dry density as determined by AASHTO Method T-180 or ASTM D-1557.

4. Muck or other unsuitable material may be used in areas designated in the drawings or as directed by the Engineer. Muck material used as fill shall be placed in layers of not more than 12 inches in depth measured loose. When dry or as directed by the Engineer, this layer shall be disced and harrowed to break up large pieces of the material placed.

5. Final elevations shall be within 0.1 foot of the required elevation and surfaces shall be sloped to drain as shown on the Drawings.

END OF SECTION

SECTION 02212

FINISH GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Finish grade sub-soil.

2. Cut out areas to receive stabilizing base course materials for limerock access road and parking areas.

3. Place, finish grade and compact topsoil.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.

2. Solid Sodding: Section 02822.

1.02 PROTECTION

A. Prevent damage to existing fencing, trees, landscaping, natural features, bench marks and utility lines. Correct damage at no cost to the City.

PART 2 - PRODUCTS

2.01 GENERAL

A. Contractor to provide topsoil for use under sod areas.

2.02 MATERIALS AND EQUIPMENT

A. Topsoil: Friable loam free from subsoil, roots, grass, excessive amounts of weeds, stones, and foreign matter; acidity ranges (pH) of 5.5 to 7.5; containing a minimum of 4 percent (4%) and a maximum of 25 percent (25%) organic matter. Use topsoil stockpiles on site if conforming to these requirements.

PART 3 - EXECUTION

3.01 PREPARATION

A. Sub-soil Preparation:

1. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. Remove sub-soil which has been contaminated with petroleum products.

2. Cut out areas to sub-grade elevations, which are to receive stabilizing base for paving and sidewalks.

3. Bring sub-soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.

4. Slope grade away from building minimum 2 inches in 10 feet unless indicated otherwise on the Drawings.

5. Cultivate sub-grade to a depth of 3 inches, where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compact sub-soil.

3.02 INSTALLATION

A. Placing Topsoil:

1. Place topsoil in areas where seeding, sodding, and planting are to be performed. Place to the following minimum depths, up to finished grade elevations.

a. 6 inches for seeded areas.

b. 4-1/2 inches for sodded areas.

2. Use topsoil in relatively dry state. Place during dry weather.

3. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of sub-grade.

4. Remove stone, roots, grass, weeds, debris and other foreign material while spreading.

5. Manually spread soil around trees, plants, buildings, to prevent damage which may be caused by grading equipment.

6. Lightly compact placed topsoil.

B. Surplus Material:

1. Remove surplus sub-soil and topsoil from site.

2. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 02240

STABILIZED SUBGRADE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work specified in this Section consists of the construction of a stabilized roadway subgrade where indicated on the Drawings. Construction shall be to the uniformity, density and bearing ratio specified hereinafter. Parking areas shall be stabilized to a minimum depth of 12 inches below the bottom grade of the base material and to a width 6 inches outside each pavement or concrete curb edge. Roadways and streets shall be stabilized to the depths and dimensions indicated on the Drawings.

B. Related Work Described Elsewhere:

1. Testing and Testing Laboratory Services: Section 01410.

2. Clearing, Grubbing and Stripping: Section 02110.

3. Earthwork: Section 02200.

C. Definitions: The stabilizing shall be Florida Department of Transportation (FDOT) Type B as described hereinafter. The required bearing ratio value shall be obtained either by constructing the subgrade or selected materials from the roadway and borrow area(s), or by stabilizing the subgrade material by the addition and mixing in of suitable stabilizing material. Such work shall be done in accordance with these specifications, lines, grades, thicknesses and notes shown on the Drawings.

PART 2 - PRODUCTS

2.01 GENERAL

A. The particular type of stabilizing material to be used shall be in accordance with Paragraph 2.02.D hereinafter and shall meet the following requirements.

2.02 MATERIALS AND EQUIPMENT

A. Use of Materials from Existing Base:

1. When the utilization of materials from an existing base is called for, (as all, or a portion, of the stabilizing additives) the Engineer will direct the locations, placing and distribution of such materials, and this work shall be done prior to the spreading of any additional commercial or local materials. Removal of any section of existing base will not be required until the need for it in maintaining traffic is fulfilled.

2. The utilization of materials from an existing base may be called for in combination with the designated type of stabilizing.

B. Commercial Materials:

1. General: Materials which are designated as Commercial Materials which are to be used for this stabilizing may be either commercial limerock or limerock overburden.

2. Limerock: Specific requirements for limerock and limerock overburden: For limerock and limerock overburden, the percentage of carbonates of calcium and magnesium shall be at least 70, and the plasticity index shall not exceed 10. The gradation of both commercial limerock and limerock overburden shall be such that 97 percent (97%) of these materials will pass a 1-1/2 inch sieve.

C. Local Material:

1. General: Local materials used for this stabilizing may be high-bearing value soils or sand-clay material. The material passing the 40-mesh sieve shall have a liquid not greater than 30 and a plasticity index not greater than 10.

2. Blending: No blending of materials to meet these requirements will be permitted unless authorized by the Engineer. When blending is permitted, the blended material shall be tested and approved before being spread on the roadway.

D. Type B Stabilization:

1. The type of materials, Commercial or Local, shall be at the Contractor's option.

2. No separate payment for stabilizing materials will be made.

3. Bearing Value determinations will be made by the Limerock Bearing Ratio (LBR) Method. For this project, a minimum LBR of 40 shall be required for any base material selected by the Contractor in Section 2.02.D.1.

4. Under this method, it shall be the Contractor's responsibility that the finished roadbed section meets the bearing value requirements, regardless of the quantity of stabilizing materials necessary to be added. Also under this method, full payment will be made for any areas where the existing sub-grade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources, within the limits of the stabilizing.

5. After the roadbed grading operations have been substantially completed, the Contractor shall make his own determination as to the quantity (if any) of stabilizing material, of the type selected by him, necessary for compliance with the bearing value requirements. The Contractor shall notify the Engineer of the approximate quantity to be added, and the spreading and mixing in of such quantity of materials shall meet the approval of the Engineer as to uniformity and effectiveness.

2.03 QUALITY CONTROL (Manufacturer & Supplier product quality control specifics required for project)

A. Material testing shall be performed as directed in Section 01410, Testing and Testing Laboratory Services.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:

1. Prior to the beginning of stabilizing operations, the area to be stabilized shall have been constructed to an elevation such that upon completion of stabilizing operations the completed stabilized subgrade will conform to the lines, grades and cross sections shown in the plans. Prior to the spreading of any additive stabilizing material, the surface of the roadbed shall be bought to a plane approximately parallel to the plane of the proposed finished surface.

2. The subgrade to be stabilized may be processed in one (1) course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction and other desired results, in which case, the Engineer will direct that the processing be done in more than one (1) course.

3.02 INSTALLATION

A. Stabilizing Material:

1. When additive stabilizing materials are required, the designated quantity shall be spread uniformly over the area to be stabilized.

2. When materials from an existing base are to be utilized in the stabilizing at a particular location, all of such materials shall be placed and spread prior to the addition of other stabilizing additives.

3. Commercial stabilizing material shall be spread by the use of mechanical material spreaders except that where use of such equipment is not practicable other means of spreading may be used, but only upon written approval of the proposed alternate method.

B. Mixing:

1. The mixing shall be done with rotary tillers, or other equipment meeting the approval of the Engineer. The area to be stabilized shall be thoroughly mixed throughout the entire depth and width of the stabilizing limits.

2. The mixing operations, as specified, will be required regardless of whether the existing soils, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

3. As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may direct that the mixing operations (and the work of stabilizing) be waived and no payment for stabilization will be made for such sections of the roadway.

C. Maximum Particle Size of Mixed Materials: At the completion of mixing, all particles of material within the limits of the area to be stabilized shall pass a 3-1/2 inch ring. Any particles not meeting this requirement shall be removed from the stabilized area or shall be broken down so as to meet this requirement.

D. Compaction: After the mixing operations have been completed and requirements for bearing value, uniformity and particle size have been satisfied, the stabilized

area shall be compacted, in accordance with Paragraph 3.03B., hereinafter. The materials shall be compacted at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either water shall be added or the material shall be permitted to dry until the proper moisture content for the specified compaction is reached.

E. Finish Grading: The completed stabilized subgrade shall be shaped to conform with the finished lines, grades and cross-section indicated in the Drawings. The subgrade shall be checked by the use of elevation stakes, or other means approved by the Engineer.

F. Requirements for Condition of Completed Subgrade:

1. After the stabilizing and compacting operations have been completed, the subgrade shall be firm and substantially unyielding, to the extend that it will support construction equipment and will have the bearing value required by the Drawings.

2. All safe and yielding material, and any other portions of the subgrade which will not compact readily, shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, with proper allowance for subsequent compaction.

G. Maintenance of Completed Subgrade: After the subgrade has been completed as specified above, the Contractor shall maintain it free from ruts, depressions and any damage resulting from the hauling or handling of materials, equipment, tools, etc. It shall be the Contractor's responsibility to maintain the required density until the subsequent base or pavement is in place. Such responsibility shall include any repairs, replacement, etc. of curb and gutter, sidewalk, etc. which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Any such work required for recompaction shall be at the Contractor's expense. Ditches and drains shall be constructed and maintained along the completed subgrade section.

3.03 INSPECTION AND TESTING (FIELD QUALITY CONTROL)

A. Bearing Value Requirements:

1. General: Bearing value samples will be obtained and tested by the Testing Laboratory at completion of satisfactory mixing of the stabilized area. For any area where the bearing value obtained is deficient from the value indicated in the Drawings, in excess of the tolerances established herein, additional stabilizing material shall be spread and mixed in accordance with Paragraphs 3.02A.3., 3.02B.1. and 3.02B.2., herein. This

reprocessing shall be done for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

2. Tolerances In Bearing Value Requirements: The following undertolerances from the specified bearing value will be allowed as based on tests performed on samples obtained after mixing operations have been completed:

Specified Bearing Value	Undertolerances
Lime Bedrock Ratio 40	5.0

B. Density Requirements - General: Within the entire limits of the width and depth of the areas to be stabilized, the minimum density acceptable at any location will be 98 percent (98%) of the maximum density as determined by AASHTO T-180, Test Method D: Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54 Kg (10 lb) Rammer and a 457 mm (18 in) Drop.

C. Testing Frequency: Tests for Bearing Values and Density will be taken at intervals not to exceed 500 feet on center. Test shall be taken alternating between left, right, and center to insure a uniform sample of the product.

END OF SECTION

SECTION 02520

CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of furnishing all labor, material equipment and transportation for the construction of the concrete pavement to the lines and grades as shown on the Drawings.

B. Related Work Described Elsewhere:

1. Stabilized Subgrade: Section 02570.

2. Cast-In-Place Concrete: Section 03300.

1.02 SUBMITTALS

A. All materials specified shall be certified by the producer or manufacturer that the furnished material meets the specific requirements of the specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Concrete shall be Class B that conforms to the requirements of Section 03300.

B. Reinforcing and Welded Wire Fabric: Joint reinforcing and welded wire fabric shall be as shown on the Drawings.

C. Joint Sealer for Pavement:

1. Hot Poured Type: Joint sealer shall conform to the requirements of AASHTO Designation M 173.

2. Cold Applied Type: In lieu of the hot poured type, joint sealer shall be a one or two part polysulfide base self leveling sealant for horizontal surfaces that has been developed for foot and vehicular traffic. The sealant shall be listed on the Thiokol approved product list.

D. Preformed Joint Filler: Preformed joint filler shall be nonextruding and resilient bituminous type and shall conform to the requirements of ASTM Designation D 1751.

E. Membrane Curing Compound: Membrane curing compound shall be clear fugitive dye and conform to the requirements of AASHTO Designation M 148, Type 1-D.

PART 3 - EXECUTION

3.01 PREPARATION

A. Subgrade Condition:

1. The finished subgrade shall be maintained in a smooth, compact condition and any areas which are disturbed prior to placing of the concrete shall be restored at the Contractor's expense. The subgrade shall be moist at the time the concrete is placed. Water shall be uniformly applied ahead of the paving operations as directed by the Engineer. If the Contractor does not maintain the subgrade in the required condition, a vapor barrier sheet will be required between the subgrade and the concrete.

2. The subgrade shall be accurately trimmed to the required elevation with a 1/4-inch tolerance. High areas shall be trimmed to proper elevation. Low areas may be filled with suitable material and compacted to the specified density or filled with concrete integrally with the placing of the pavement.

B. Setting Forms: The forms shall be accurately set to line and grade such that they rest firmly, throughout their entire length upon the compacted subgrade surface. Forms shall be joined neatly and tightly and braced to resist the pressure of the concrete and the finished operations. The alignment and grade of all forms shall be approved before and immediately prior to the placing of concrete.

C. Mixing Concrete: Concrete shall be mixed in accordance with the requirements of Section 03300.

3.02 EXECUTION

A. Placing Concrete:

1. The concrete shall be distributed on the subgrade to such depth that, when it is consolidated and finished, the slab thickness required by the Drawings will be obtained at all points and the surface will at no point be below the grade specified for the finished surface, after application of the allowable tolerance. The concrete shall be deposited on the subgrade in a manner which will require as little

rehandling as possible. Placing of the concrete shall be continuous between transverse joints, without the use of intermediate bulkheads.

2. Concrete shall be deposited a near to expansion and contraction joint assemblies as possible without disturbing them, but shall not be dumped from the discharge bucket or hopper onto an assembly unless the bucket or hopper is centered directly over the assembly.

3. Fabric reinforcement shall be placed at midslab depth and the fabric shall be maintained at this location during the placing and finishing operations.

4. Concrete shall be thoroughly consolidated against and along the faces of all forms, and along the full length and on both sides of all joint assemblies, by means of hand-operated, vibrators. Vibrators shall not be permitted to come in contact with a joint assembly, the subgrade or a side form. Vibration at any one location shall not continue so long as to produce puddling or the accumulation of excessive grout on the surface. In no case shall the vibrator be operated longer than 15 seconds in any one location.

B. Striking-off, Consolidating and Finishing Concrete: Immediately after the placing, the concrete shall be struck off, consolidated and finished, to produce a finished pavement conforming to the cross section, width and surface finished required by the Drawings and Specifications. The sequence of operations shall be as follows: strike-off: vibratory consolidation; screeding; floating; removal of laitance; straightedging; and final surface finish. Strike-off, consolidation and finishing shall be accomplished in a manner such as to avoid damage to, or misalignment of, joint assemblies, dowels, and other embedded items.

C. Straightedging and Surface Corrections:

1. After floating has been completed and the excess water removed, but while the concrete is still in a plastic state, the surface of the concrete shall be tested for trueness with an accurate 12-foot straightedge. The straightedge shall be furnished by the Contractor. The straightedge shall be held in successive positions parallel to the road or driveway center line, in contact with the surface, and the whole area tested from one side of the slab to the other as necessary. The advance along the road shall be in successive stages of not more than one-half the length of the straightedge. Any depressions shall be immediately filled with freshly mixed concrete and struck-off, consolidated and refinished. High areas shall be cut down and refinished. Straightedge testing and surface correction shall continue until the entire surface appears to conform to the required grade and cross section.

2. As soon as the concrete has hardened sufficiently to be walked on, straightedging shall again be done. All surface irregularities exceeding 1/4 inch in 10-foot shall be corrected by grinding as directed by the Engineer.

D. Final Finish: As soon as the water sheen has disappeared from the surface of the pavement and just before the concrete becomes non-plastic, a light broom finish shall be given to the surface.

E. Edging:

1. After the final finish has been applied, but before the concrete has become non-plastic, the edges of the pavement along each side of the strip being placed, on each side of transverse expansion joints and construction joints and along any structure extending into the pavement, shall be carefully rounded to a 1/4 inch radius except as otherwise indicated. A well-defined and continuous radius shall be produced and a smooth, dense mortar finish obtained. All concrete shall be completely removed from the top of the joint filler.

2. All joints shall be checked with a straightedge before the concrete has become non-plastic and, if one side of the joint is higher than the other or the entire joint is higher or lower than the adjacent slabs, corrections shall be made as necessary.

F. Joints:

1. Transverse Construction Joints: Transverse construction joints shall be constructed at the end of all pours and at other locations where the paving operations are stopped for as long as 30 minutes. Construction joints, however, shall not be placed within ten feet of any other transverse joint or of either end of a section of pavement. If sufficient concrete has not been placed to form a slab at least ten feet long, the excess concrete, back to the last preceding joint, shall be removed. The joints shall be formed by placing a wood or metal bulkhead accurately and securely in place, in a plane perpendicular to the profile and center line of the pavement. Dowel bars shall be installed at the construction joints, in accordance with the details shown or the Drawings for contraction joints. Construction joints shall be sawed, in a manner similar to contraction joints, so that a groove will be formed for holding the joint sealing compound.

2. Transverse Contraction Joints: Transverse contraction joints shall be constructed at the interval indicated on the plans and shall consist of planes of weakness created by sawing a groove in the surface of the hardened concrete. The groove shall be perpendicular to the surface of the pavement. Load-transfer devices shall be installed in transverse contraction joints as indicated on the Drawings.

a. It shall be the Contractor's responsibility to see that the sawing equipment does not damage the pavement and to saw the transverse contraction joints

as soon as the pavement has hardened to the degree that tearing and raveling are not excessive and before uncontrolled shrinkage cracking begins. If, at any time, uncontrolled cracking occurs, the Contractor will be required to modify his methods, and remove damaged slabs.

b. The joint sawing shall be accomplished in two steps. The initial cut shall be 1/8-inch wide by a depth of not less than 20 percent nor more than 25 percent of the pavement thickness, and in general will be made when the concrete is between four and twelve hours old. A second saw cut, to provide the joint dimensions indicated on the Drawings shall be made as soon as there is no danger of raveling.

c. After the final sawing, the joint shall be cleaned, the bond breaker shall be installed and the joint sealed.

3. Longitudinal Joints: The plane of weakness shall be constructed either by sawing a groove in the hardened concrete or by forming a groove by depressing a tool or by insertion of an approved plastic device into the plastic concrete. Sawing shall be done within 15 calendar days after the placing of the concrete, and prior to opening of the pavement to any type of traffic.

a. Deformed steel tie bars shall be placed at the required depth, parallel to the finished surface, at right angles to the joint and at the uniform spacing. The bars shall not be painted or coated with any material before placement in the concrete. They shall be placed in the plastic concrete by use of approved equipment, or shall be rigidly supported on the subgrade by approved devices capable of preventing displacement prior to placing of the concrete.

4. Expansion Joints Around Structures: Expansion joints shall be formed by placing premolded expansion joint material about all structures and features projecting through, into or against the pavement. Unless otherwise indicated, such joints shall be 1/2 inch in width.

5. Transverse Expansion Joints: Transverse expansion joints shall be formed using preformed joint filler and shall be provided with dowel load transfer bars in accordance with the details shown on the Drawings. Joint sealer shall be provided as shown in the Drawings.

6. Cleaning and Sealing Joints: Joints which are to be sealed, shall be filled with joint sealing material before the pavement is opened to traffic and as soon after completion of the curing period as is feasible. Just prior to sealing, each joint shall be thoroughly cleaned of all foreign material (including any membrane curing compound) and the joint faces shall be clean and surface-dry when the sealer is applied.

a. The sealing material shall be applied to each joint to conform to the details shown on the Drawings and in accordance with the manufacturer's recommendation. The pouring shall be done in such manner that the material will not be spilled on the exposed surfaces of the concrete. Any excess material on the surface of the concrete pavement shall be removed immediately and the pavement surface cleaned.

b. All cracks occurring in the pavement prior to its acceptance shall be cleaned out and sealed as specified above, except that the cracks and fractures shall be completely filled with joint sealer and any excess filler material cut down level with the pavement surface.

G. Curing:

1. After the finishing operations have been completed and as soon as the concrete has hardened sufficiently that marring of the surface will not occur, the entire surface and the edges of the newly placed concrete shall be covered and cured with membrane curing compound.

2. Curing compound shall be uniformly applied to the surfaces to be cured, in a single coat, continuous film, at the rate of one gallon to not more than 200 square feet, by a mechanical sprayer.

3. Curing compound shall not be applied during periods of rainfall. Curing compound shall not be applied to the inside faces of joints to be sealed. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound. Upon removal of side forms the sides of the slabs exposed shall immediately be coated to provide a curing treatment equal to that provided for the surface.

END OF SECTION

SECTION 02525

CONCRETE CURBS AND GUTTERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials and construction of curbs, valley gutters, curb and gutter, and Miami curb.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.

C. Standards

1. Determine the density of soil in place by the sand cone method, ASTM D1556; by nuclear methods, ASTM D2922 or D3017.

2. Determine laboratory moisture-density relations of soils by ASTM D1557 (Modified Proctor).

3. Determine the relative density of cohesionless soils by ASTM D2049.

4. Sample backfill material by ASTM D75.

5. "Relative density" is the ratio, expressed as a percentage, of the inplace dry density to the laboratory maximum dry density as determined by ASTM D1557 (Modified Proctor).

6. Testing: An independent testing laboratory will make density tests for determination of specific compaction and concrete cylinder tests. The Contractor is responsible for the costs of testing to determine conformance with these specifications.

1.02 SUBMITTALS

A. All materials specified shall be certified by the producer or manufacturer that the furnished materials meet specified requirements of the specification.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Make all concrete curbs with Class 1 concrete, minimum 28-day compressive strength of 3000 psi, in accordance with the applicable sections of these specifications.

B. Concrete shall comply with the requirements of these specifications.

C. Reinforcement, Joint Materials, and Forms: Comply with applicable sections of these specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Foundation: Excavate or backfill to the required depth. Stabilize the foundation material upon which the curb is to be set as shown on the construction plans with an even surface, true to line, grade and cross section, and soaking wet at the time that the concrete is placed.

B. Forms: Place forms straight, free from warp or bends, and set to the line and grades shown on the drawings.

C. Placing Concrete: Place concrete in the forms. Tamp and spade until mortar entirely covers its surface. Float the top of the concrete smooth and round the edges to the radius shown in the plans.

D. Joints: Except for machine-placed items, at the option of the Contractor, contraction joints may be formed by the use of dummy joints (either formed or sawed) or by the use of sheet metal templates. If sheet metal templates are used, make them 1/4-inch thick and other dimensions same as cross section of form. Hold templates firmly during the placing of the concrete and leave in place until the concrete has set sufficiently to hold its shape, but remove while the forms are still in place.

For machine-placed items, unless otherwise approved, saw contraction joints approximately 3/16-inch wide and 1-1/2-inch deep in curb and gutter as soon as the concrete has hardened to the degree that excessive raveling will not occur and before uncontrolled shrinkage cracking begins. Space contraction joints at intervals of 10 feet, except where lesser interval is required for closure, but make no section less than 4 feet in length.

Construct expansion joints at all inlets, at all radius points, in other locations indicated in the plans at intervals of 500 feet between other expansion joints or ends of a run. The joints shall be 1/2-inch in width.

E. Finishing: Finish all exposed surfaces while the concrete is still green. In general, only a brush finish will be required. For any surface areas, however, which are too rough or have other surface defects which make additional finishing necessary, rub the curb to a smooth surface with a soft brick or wood block, with water used liberally.

F. Curing: Continuously cure the concrete for a period of at least 72 hours. Commence curing after finishing has been completed and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Replace immediately any curing material removed or damaged during the 72-hour period. Curing will be done by the membrane curing compound method.

To cure by the membrane curing compound method, apply clear membrane curing compound or white pigmented curing compound by a hand sprayer in a single coat continuous film and uniform coverage of at least one gallon to each 200 square feet. Thoroughly agitate the curing compound in the drum prior to application and during application as necessary to prevent settlement of pigment. Re-coat immediately any cracks, chips or other defects appearing in the coating.

G. Backfilling and Compacting: After the concrete has set sufficiently, fill the spaces in back of the curb to the required elevation with suitable material and compact to 90 percent relative density.

H. Machine Laid Curb: Concrete curbs may be installed by machines without forming, provided that the finished product is straight, free from warp or bends, and does not deviate from the design line and grade or cross section.

I. Driveways: When construction is through areas previously "built up", construct drop curbs for driveway aprons at all existing driveways and as shown on the plans. When construction is in "new" areas, construct drop curbs as shown in the plans.

J. Testing: Sample and cure the concrete in accordance with ASTM C31, except take not less than five (5) 6-inch by 12-inch cylinders for each 50 cubic yards poured or each day's pour less than 50 cubic yards. A slump test may be taken in conformity with ASTM C143, and the cylinders shall be tested in accordance with ASTM C39.

The finished curbs, valley gutters, and curb and gutters, and Miami curbs shall be within 0.02 feet of the lines and grades shown on the plans. The finished concrete shall be smooth to within 1/4-inch in ten feet, without cracks (other tan contraction joints) and without puddled or tapped water deeper than 1/4-inch.

Remove and replace all work that does not meet above requirements.

END OF SECTION

SECTION 02551

PRIME AND TACK COATS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work consists of the application of bituminous material on a previously prepared base and on an existing pavement surface.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with Owner's instructions showing the materials to be used and manufacturer's certificates showing compliance with the specifications.

PART 2 - PRODUCTS

2.01 PRIME COAT

The material used for prime coat shall be:

A. Cut-back Asphalt Grade RC-70 or RC-250 meeting the requirements of AASHTO M81 except that the penetration range shall be from 60-120 instead of 80-120:

For Grade RC-3000, in addition to the requirements shown in Table I of AASHTO M81 the following valves shall be added to the requirements for Distillation Test:

Distillate, percentage by volume of total distillate to 680 deg. F.	Grade RC-3000 Max.
to 320 deg. F.	0
to 374 deg. F.	10
to 437 deg. F.	40

All other requirements for the distillation test (and for other properties included in the table) shall be as shown in Table I of AASHTO M81.

B. Emulsified Asphalt Grades SS-1 or CCS-1, SS-1H or CCS-1H diluted in equal proportion with water; asphalt emulsified asphalt grade AE-60, AE-90, AE-150 or AE-200 diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; special MS-Emulsion diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Asphalt Emulsion Prime (AEP) meeting the following:

1. Anionic Emulsified Asphalt shall meet the requirements of AASHTO M140 with the exception that the cement mix test will be waived when the asphalt is used in non-mix application, such as tack coats and primes.

2. Cationic Emulsified Asphalt shall meet the requirements of AASHTO M208.

3. Emulsified Asphalt Grades AE-60, AE-90, AE-150 and AE-200 shall meet the requirements as shown on Table 02551-1 and Table 02551-2.

4. Special MS-Emulsion shall meet the requirements as shown on Table 02551-3 with a minimum application temperature of 170°F.

5. Emulsified Asphalt Grade CRS-2H shall meet the requirements as shown in Table 02551-4.

6. Asphalt Emulsion Prime shall meet the requirements as shown in Table 02551-5.

2.02 COVER MATERIAL FOR PRIME COAT

A. If an emulsified asphalt is used for prime coat, the cover material shall be hot-asphalt coated (mix to contain from two to four percent asphalt-cement) to achieve a prime coat which will remain reasonably intact until the surface course is placed.

B. If material other than emulsified asphalt is used for the prime coat, the cover material shall be either sand (bare or hot-asphalt coated) or screenings. The sand shall be nonplastic and free from any appreciable amount of silt, clay balls and root particles,, and from any noticeable sticks, trash vegetation or other organic matter. Screenings shall be Miami Oolitic rock screenings as specified in FDOT Specification Section 902-5.2-3.

2.03 TACK COAT

A. Unless a specific type or grade of material is called for in the plans or specifications, the material used for tack coat may be any of the following:

Emulsified Asphalt, Grades RS-2 or CRS-2; emulsified Asphalt, Grades SS-1 or CSS-1, SS-1H or CSS-1H (all diluted in equal proportions with water) ; Emulsified Asphalt,, Grades AE-60, AE-90, AE-150 or AE-200, diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Emulsified Asphalt, Grade CRS-2H; Special MS-Emulsion; Asphalt Emulsion Prime (AEP) (may be diluted with water at the ratio not to exceed 6 parts emulsified asphalt to 4 parts water).

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Pressure Distributor: The pressure distributor shall be equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. The distance between the centers of openings of the outside nozzles of the spray bar shall be equal to the width of the application required, within an-allowable variation of two inches. The outside nozzle at each end of the spray bar shall have an area of opening not less than 25 percent nor more than 75 percent, in excess of the other nozzles. All other nozzles shall have uniform openings. When the application covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzles.

3.02 CLEANING BASE AND PROTECTION OF ADJACENT WORK

A. Before any bituminous material is applied, all loose material, dust, dirt, caked clay and other foreign materials which might prevent proper bond with the existing surface shall be removed for the full width of the application. Particular care shall be taken in cleaning the outer edges of the strip to be treated, to insure that the prime or tack coat will adhere.

B. When the prime or tack coat is applied adjacent to curb and gutter, valley gutter or any other concrete surfaces, such concrete surfaces (except where they are to be covered with a bituminous wearing course) shall be covered with heavy paper, or otherwise protected while the prime or tack coat is being applied. Any bituminous material deposited on such concrete surfaces shall be removed.

3.03 WEATHER LIMITATIONS

A. Prime and Tack Coats: No material shall be applied when the air temperature is less than 50 degrees Fahrenheit (°F) in the shade or when the weather conditions or the condition of the existing surfaces are unsuitable. In no case shall prime and tack coat material be applied while rain is falling or when there is water on the surface to be covered.

3.04 APPLICATION OF PRIME COAT

A. General: The surface to be primed shall be clean and the moisture content of the base shall not exceed 90 percent of the optimum moisture. The temperature of the prime material shall be between 100° and 150°F. The actual temperature shall be that which will insure uniform distribution. The material shall be applied by means of a pressure distributor. The amount to be applied will be dependent on the character of the surface and shall be sufficient to coat the surface thoroughly and uniformly, with no excess. A prime coat is required on newly constructed limerock, shell, and sand clay bases.

B. Rate of Application

1. Limerock, Limerock Stabilized, and Local Rock Bases: For these bases, the rate of application shall be not less than 0.10 gallon per square yard.

2. Sandy-Clay, Shell and Shell Stabilized Bases: The rate of application for these bases shall be not less than 0.15 gallon per square yard.

C. Partial Width of Application: If warranted by traffic or site conditions, the application may be made on only one-half of the width of the base at one time, in which case positive means shall be used to secure the correct amount of bituminous material at the joint.

D. Sanding

1. If an emulsified asphalt is used to prime coat, the primed base shall be uniformly covered by an application of sand-bituminous hot mix or screenings at an approximate rate of ten pounds per square yard. The entire surface of the sand-bituminous hot mix or screenings cover material shall be rolled with a traffic roller as required to produce a reasonable dense mat.

2. If material other than emulsified asphalt is used for prime coat, the primed base shall be covered by a light uniform application of cover material. If considered necessary for proper distribution of spread, the cover material shall be lightly dragged with a drag broom, after which it shall be rolled with a traffic roller, for at least ten passes over the entire area.

3.05 APPLICATION OF TACK COAT

A. General: Where a bituminous surface is to be laid and a tack coat is required, the tack coat shall be applied as specified herein below.

B. Use a tack coat on existing pavement to be resurfaced, primed bases in areas which have become excessively dirty and cannot be cleaned, or in areas where the prime has cured and lost its bonding effect.

C. Method of Application: The tack coat shall be applied with a pressure distributor. The bituminous material shall be heated to a suitable temperature and shall be applied in a thin, uniform layer.

D. Rate of Application: The rate of application shall be between 0.02 and 0.08 gallon per square yard. For tack coat applied on concrete pavement which is to be surfaced, the rate of application may exceed the upper limit.

E. Curing and Time of Application: The tack coat shall be applied sufficiently in advance of the laying of the bituminous mix to permit drying but shall not be applied so far in advance that it might lose its adhesiveness as a result of being covered with dust or other foreign material.

F. Protection: The tack coat surface shall be kept free from traffic until the subsequent layer of bituminous hot mix has been laid.

TABLE 02551-1

HIGH FLOAT EMULSIONS

	Asphalt Emulsion Grade			
	AE-60		AE-90	
	Min.	Max.	Min.	Max.
Tests on Emulsion:				
Saybolt Furol Viscosity at 122°F, sec.	75	400	75	400
Settlement 5 days, %	--	5	--	5
Storage Stability 24 Hr., %	--	1	--	1
Sieve Test, %	--	0.10	--	0.10
Demulsibility, 50 ml $CaCl_2$ 0.10N, %	75	--	75	--
Residue by Distillation, %	65	--	65	--
Oil Portion, % by Volume (500°F Dist)	--	1	--	2
Test on Residue:				
Penetration 77°F 100 g 5 sec	40	--	70	--
Absolute Viscosity, poise 140°F	3200	--	1600	--
Ductility 77°F 5 cm/min, cm	40	--	40	--
Float Test 140°F, sec	1200	--	1200	--
Solubility in Trichlorethylene, %	97.5	--	97.5	--

TABLE 02551-2

GRADE AE-150 AND AE-200 EMULSIONS

	Asphalt Emulsion Grade			
	AE-150		AE-200	
	Min.	Max.	Min.	Max.
Tests on Emulsion:				
Saybolt Furol Viscosity at 122°F, sec.	75	400	75	--
Settlement 5 days, %	--	5	--	5
Storage Stability 24 Hr., %	--	1	--	1
Sieve Test, %	--	0.10	--	0.10
Demulsibility, 50 ml $CaCl_2$ 0.10N, %	75	--	--	--
Residue by Distillation, %	65		62	
Oil Portion, % by Volume (500°F Dist)	--	3	--	8
Test on Residue:				
Penetration 77°F 100 g 5 sec	125	--	150	--
Absolute Viscosity, poise 140°F	800	--	400	--
Ductility 77°F 5 cm/min, cm	40	--	--	--
Float Test 140°F, sec	1200	--	1200	--
Solubility in Trichlorethylene, %	97.5	--	97.5	--

TABLE 02551-3

SPECIAL MS-EMULSION

	Min.	Max.
Tests on Emulsion:		
Saybolt Furol Viscosity at 77°F, sec.	45	--
Storage Stability 24 Hr., %	--	1
Sieve Test, %	--	0.10
Demulsibility, 50 ml $CaCl_2$ 0.10N, %	65	--
Residue by Distillation, %	62	--
Oil Portion, % by Volume (500°F Dist)	--	8
Test on Residue:		
Penetration 77°F 100 g 5 sec	60	--
Ductility 77°F 5 cm/min, cm	40	--
Absolute Viscosity, poise 140°F	800	--
Solubility in Trichlorethylene, %	--	97.5

TABLE 02551-4

EMULSIFIED ASPHALT GRADE CRS-2H

	Min.	Max.
Tests on Emulsion:		
Saybolt Furol Viscosity at 122°F, sec.	100	400
Settlement 5 days, %	--	5
Storage Stability 24 Hr., %	--	1
Demulsibility, 35 ml Sodium dioctyl Sulfosaccinate, %	40	--
Particle Charge	Positive	--
Sieve Test, %	--	0.1
Residue, %	65	--
Test on Residue:		
Penetration 77°F 100 g 5 sec	80	140
Ductility 77°F 5 cm/min, cm	40	--
Solubility in Trichlorethylene, %	97.5	--

TABLE 02551-5

ASPHALT EMULSION PRIME (AEP)

	Min.	Max.
Tests on Emulsion:		
Saybolt Furol Viscosity at 77°F, sec.	20	150
Settlement 5 days, %	--	5
Storage Stability 24 Hr., %	--	1
Sieve Test, %	--	0.1
Demulsibility, 50 ml 50 ml $CaCl_2$ 0.10N, %	65	--
Residue, %	55	--
Oil Portion, % by Volume (500°F Dist)	--	12
Test on Residue:		
Penetration 77°F 100 g 5 sec	40	200
Ductility 77°F 5 cm/min, cm	40	--
Solubility in Trichlorethylene, %	97.5	--

Where Emulsified Asphalt is deficient from the minimum percentage of residue required in the applicable specifications, payment for such material will be made at reduced rates as shown in Table 02551-6.

TABLE 02551-6

DEFICIENCY ADJUSTMENT

Deficiency from Minimum Percent Residue	Percentage of Original Contract Price
1-3	95
4-9	85
7-9	75
*More than 9	50

* At the discretion of the Engineer, the asphaltic mixture, the base material, the surface treatment, or the mineral seal coat containing this material may be left in place with 50 percent payment made therefor, or be removed to the extent required by the Engineer and acceptably replaced.

The viscosity requirements for all grades of Emulsified Asphalt used as tack coat or prime coat may be waived by the Engineer if satisfactory results are being obtained.

END OF SECTION

SECTION 02572

SOIL CEMENT BASE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish and install base course using a combination of soil, Portland cement, and water.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:

1. AASHTO T-88: Particle Size Analysis of Soils
2. AASHTO T-89: Determining the Liquid Limit of Soils
3. AASHTO T-90: Determining the Plastic Limit and Plasticity Index of Soils
4. AASHTO T-134: Moisture-Density Relations of Soil-Cement Mixtures
5. AASHTO T-135: Wetting and Drying Test of Compacted Soil-Cement Mixtures
6. AASHTO T-267: Determination of Organic Content in Soils by Loss on Ignition

B. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, latest implemented edition:

1. Specification Section 911: Limerock Material for Base and Stabilized Base
2. Specification Section 916: Bituminous Materials
3. Specification Section 921: Portland Cement and Blended Cement

1.03 QUALITY ASSURANCE

A. For density and thickness determination, a LOT is defined as 2,500 square yards of base, plus any small section of base at the end of a day's operation in the preceding LOT. The County may include small irregular areas as part of another LOT. Areas such as an intersection, crossover, and ramp will be considered as a separate LOT. No LOT shall include more than 3,500 square yards or it shall be considered as a separate LOT.

B. Five (5) density tests shall be performed at locations randomly selected by the County within each LOT.

C. Five (5) thickness measurements shall be performed at locations randomly selected by the County within each LOT. Three-inch minimum diameter test holes are required to determine the thickness.

1.04 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

1. Soil-cement design mix

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

A. Cement shall be Portland cement, Type I, II, III, or Type 1-P per FDOT Specification Section 921.

B. Use water that is free from substances deleterious to hardening of the soil-cement mixture.

C. Curing Material shall be per FDOT Specification Section 916.

D. Emulsified asphalt shall be Grade SS, RS, or MS as approved by the County. Dilute as recommended by the manufacturer.

E. Soils for base course construction shall be either limerock material per FDOT Specification Section 911 or soils meeting the following requirements:

Table 02572-1
Soil Requirements

Physical Characteristic	Acceptance Level	Testing Standard
Organic Material	Maximum 5%	AASHTO T-267
Total Clay and Silt Content (Minus No. 200 Sieve)	Maximum 25%	AASHTO T-88
Plastic Index	Maximum 10%	AASHTO T-90
Liquid Limit	Maximum 25%	AASHTO T-89

Table 02572-2
Soil Gradation Requirements

Soil Gradation Requirements (Per AASHTO T-88)	
Passing 2-inch sieve	Minimum 100%
Passing No. 4 sieve	Minimum 55%
Passing No. 10 sieve	Minimum 37%

2.03 PROPORTIONING OF MIX

A. Submit for approval a design mix for the soil proposed for use in soil-cement construction prepared by a testing laboratory approved by the County. The design mix submittal shall include the results of tests run to verify that the soil meets the requirements; results of tests used to establish the cement content; and a final design laboratory sample. Submit the design mix to the County for approval a minimum of 60-calendar days prior to beginning of soil-cement construction for Brush Loss Design Method or 15-calendar days prior to beginning of soil-cement construction for Strength Design Method. Express the cement as a percentage of the dry unit weight of the soil. For mixed-in-place construction, use a ratio of cement based on the maximum density of the soil determined in accordance with AASHTO T-99 and rounded up to the nearest pound per cubic yard.

B. When proportioning the soil-cement mixture in accordance with strength design, determine the minimum cement content using FM 5-520. The design compressive strength specified shall be achieved in 7-days. Ensure that the cement content is not less than 5% by weight except as noted below.

C. When proportioning the soil-cement mixture in accordance with Brush Loss Design criteria, determine the minimum cement content in accordance with AASHTO T-135. Ensure that the cement content is not less than 5% by weight except as noted below. Ensure that the soil-cement loss at the completion of 12 cycles of testing conforms to the limits in the following table.

Table 02572-3
Soil Limits

Soil Group	Limits
AASHTO Soils Groups A-1, A-2-4, A-2-5, and A-3	Not over 14%
AASHTO Soils Groups A-2-6, A-2-7, A-4, and A-5	Not over 10%
AASHTO Soils Groups A-6 and A-7	Not over 7%

D. When proportioning of soil-cement mixture by the Brush Loss Design Criteria Method and processing by Central-Plant-Mixing where the requirements noted below are met, the County will not require strength testing of field specimens. Verify the

properties of the parent material during the processing, on a random frequency, to ensure that the final mix has not changed from the original design. Provide the County a printout of each day's production that shows proportioning of the mixture meets the approved Brush Loss Design, including cement.

E. Do not apply the minimum 5% cement content specified above if obtaining the soil material used in producing a soil-cement mixture from a commercial source (not to exclude recycled materials) where soil properties are consistently uniform, and if processing the mixture in a central mix plant that automatically weighs components and automatically records the weight of each component on a printed ticket, tape, or other digital record.

PART 3 - EXECUTION

3.01 GENERAL

A. Use any machine, combination of machines, or equipment that is in good, safe working condition and that will produce results meeting the requirements for cement application, soil pulverization, mixing water application, compaction, finishing, and curing, as required herein. Compaction equipment shall be used that will produce a base at the required density.

3.02 SUBGRADE PREPARATION

A. Subgrade shall be completed before beginning base construction operations. Ensure that the subgrade is firm enough to support the equipment used in the soil-cement base operations without appreciable distortion or displacement. Remove any unsuitable material and replace it with suitable material.

B. When constructing the base with central-plant-mixed soil-cement, grade and shape the subgrade to the lines, grades, and typical cross-section shown in the plans. Ensure that the subgrade is moist but not ponded at the time of placing the mixed base course material.

3.03 BASE SOIL FOR MIXED-IN-PLACE PROCESSING

A. Grade and shape the area over which the base is to be constructed to an elevation that will provide a base in conformance with the grades, lines, thickness, and typical cross-sections shown on the plans. Remove all roots, sticks, and other deleterious matter during processing.

3.04 PROCESSING OF SOIL-CEMENT MIXTURE

A. Mix the soil, cement, and water either by mixed-in-place or central-plant-mix methods.

B. Do not allow the percentage of moisture in the soil at the time of cement application

to exceed the quantity that will permit a uniform and intimate mixture of soil and cement during mixing operations.

C. During seasons of freezing temperature, do not spread any cement or soil-cement mixture unless the ambient temperature is at least 40°F in the shade.

D. At the completion of moist-mixing, pulverize the soil so that 100% passes a 1-1/2-inch sieve, 95 to 100% passes the 1-inch sieve and a minimum of 80% passes a No. 4 sieve, exclusive of gravel, shell, or stone.

E. Operations shall be completed within a period of 4-hours starting at the time mixing commences.

3.05 MIXED-IN-PLACE METHOD

A. Where feasible, process the entire width of the base in a single operation. Uniformly spread the design quantity of cement on the soil at the required rate of application, by means of an approved method. Replace spread cement that becomes displaced before starting mixing. Check the uniformity of spread rate by:

1. Weight of cement spread/square yards covered for a short trial section that is between 100 and 300-feet in length; or

2. Use of a square yard cloth/box

B. After applying the cement, begin mixing within 60-minutes. Initially mix the soil and cement until the cement has sufficiently blended with the soil to prevent formation of cement balls when applying additional water; then add water if necessary, and re-mix the soil-cement mixture. Do not perform windrow mixing.

C. Process up to the full depth in 1 course, provided the distribution of cement and water and the specified density are satisfactory to the County. If not, construct courses of such thickness to obtain satisfactory results. Make provisions to achieve adequate bonding between courses.

D. Immediately after mixing of the soil and cement, add any additional water that is necessary. If the moisture content exceeds that specified, manipulate the soil-cement mixture by re-mixing or grading as required to reduce the moisture content to within the specified range. Avoid excessive concentrations of water. Continue mixing during and after applying water until obtaining a uniform mixture of soil, cement, and water.

E. As an alternative to the above-described procedure, the Contractor may use an approved machine that will blend the cement and the soil. Additional water may be added and mixed as necessary.

3.06 CENTRAL-PLANT-MIXED METHOD

A. Mix the soil, cement, and water in a pugmill of either the batch or continuous-flow type. Equip the plant with feeding and metering devices that will accurately proportion the soil, cement, and water in the quantities specified. Mix soil and cement sufficiently to prevent cement balls from forming when adding additional water. Continue mixing until obtaining a uniform mixture of soil, cement, and water.

B. Haul the mixture to the roadway in trucks equipped with protective covers. Place the mixture on the moistened subgrade in a uniform layer with suitable equipment. Do not allow more than 60-minutes to elapse between placing of soil-cement in adjacent passes of the spreader at any location, except at construction joints. Ensure that the layer of soil-cement is uniform in thickness and surface contour and in such quantity that the completed base will conform to the required grade and cross-section. Do not perform windrow mixing.

3.07 CONSTRUCTION JOINTS

A. Prior to joining any previously constructed section of base, form a vertical construction joint by cutting back into the completed work to form a true vertical face of acceptable soil-cement to the full depth of the base course. Moisten the vertical face as needed prior to placing new material against it.

3.08 SHAPING AND FINISHING

A. Prior to final compaction, shape the surface of the soil-cement to the required lines, grades, and cross-section. In all cases where adding soil-cement mixture to any portion of the surface, lightly scarify the surface with a spring tooth harrow, spike drag, or other approved device to uniformly loosen the surface prior to adding material and prior to the initial set of the soil-cement mixture. Compact the resulting surface to the specified density. Continue rolling until all rutting ceases and until the base conforms to the density requirements.

B. Ensure that the surface material is moist but not ponded, and maintained at not less than 2% below its specified optimum moisture content, during finishing operations. Perform surface compaction and finishing in such a manner as to produce a smooth dense surface, free of compaction planes, construction cracks, ridges, and loose material.

C. If the time limits specified above are exceeded, either remove and replace the base or leave the base undisturbed for a period of 7-days, after which, the County will examine it to determine its suitability. If found unsuitable, remove and replace the base at no additional cost to County.

3.09 COMPACTION

A. Begin compacting the soil-cement mixture immediately after mixing or placing. Do not allow more than 30-minutes to elapse between the last pass of moist-mixing or spreading and the start of compaction of the soil-cement mixture at a particular location.

B. Determine the optimum moisture content and the maximum density in the field by the methods prescribed in AASHTO T-134 on representative samples of the soil-cement mixture obtained immediately after the initial mixing. Determine the density for each day's run or change of material.

C. Uniformly compact the loose material to meet the density requirements specified below. During compaction operations, reshape the material to obtain required grade and cross-section.

3.10 PROTECTION AGAINST DRYING

A. While finishing and correcting the surface, keep the surface of the base continuously moist by sprinkling water as necessary until applying the emulsified asphalt curing material. As soon as practicable, protect the base from drying for 7-days by applying the emulsified asphalt at the rate of 0.20 to 0.25-gallons of the diluted mixture per square yard. Provide complete coverage without excessive runoff. While applying the bituminous material, ensure that the soil-cement surface is dense, free of all loose and extraneous material, and contains sufficient moisture to prevent excessive penetration of the bituminous materials.

B. If it is necessary to allow construction equipment or other traffic to use the completed base before the bituminous material has cured sufficiently to prevent pickup or displacement, sand the bituminous material, using approximately 10-lbs of clean sand per square yard. Do not use cover material containing organic acids or other compounds detrimental to the soil-cement base.

C. Maintain the curing material during the 7-day protection period.

3.11 OPENING TO TRAFFIC

A. Do not allow traffic on the base subsequent to completion of the finishing operations for a minimum period of 72-hours. As an exception to this requirement, allow equipment necessary for correction of surface irregularities, application of water, and application of curing materials on the base, if the tire contact pressures of such equipment do not exceed 45-psi. Under special conditions (i.e. low speed limit, low traffic volume, urban conditions), the County may waive the 72-hour period.

3.12 MAINTENANCE

A. Maintain the base to a true and satisfactory surface until the wearing surface is constructed. If the County requires any repairing or patching, extend the repair or patch to the full depth of the base, and make them in a manner that will ensure restoration of a uniform base course in accordance with the requirements of these Specifications. Do not repair the base by adding a thin layer of soil-cement or concrete to the completed work. Make full depth repairs to small or minor areas, such as at manholes or inlets, with Class I concrete.

B. For patching of deficient areas less than 100-square feet and less than 1-inch in depth, correct the areas using Type S-III Asphalt Concrete. For patching of deficient areas less than 100-square feet and greater than 1-inch in depth, remove the areas to full depth and replace them using Asphalt Base Course Type 3, Type S Asphaltic Concrete, or soil-cement.

3.13 DENSITY TESTING REQUIREMENTS

A. As soon as possible after completing compaction, perform field density testing to ensure that the density is 97% of the maximum density as determined by methods prescribed in AASHTO T-134.

B. If an individual test value within a LOT is less than 94% of the maximum density, determine the extent of this deficiency by performing density tests using a 5-foot grid pattern until a test value of 95% or greater is located in all directions. Remove the delineated area of base, and replace it with base meeting all requirements of this section, at no cost to the County.

C. As an exception to the foregoing, if 3 or more of the original 5 individual test values within a LOT are less than 94% of the maximum density, the County will reject the entire LOT, and the Contractor shall remove all base within the LOT and replace it with base meeting all requirements of this Section, at no expense to the County.

3.14 SURFACE FINISH ACCEPTANCE REQUIREMENTS

A. After compacting and finishing, and not later than the beginning of the next calendar day after constructing any section of base, measure the surface with a template cut to the required cross-section and a 15-foot straightedge placed parallel to the centerline of the road. Both templates shall be provided by the Contractor. Correct all irregularities greater than 1/4-inch to the satisfaction of the County with a blade adjusted to the lightest cut which will ensure a surface that does not contain depressions greater than 1/4-inch under the template or the straightedge. The County may approve other suitable methods for measurement.

3.15 THICKNESS ACCEPTANCE REQUIREMENTS

A. Construction tolerances for thickness are as follows:

Table 02572-4
Thickness Tolerances

	Allowable Deviation From Plan Thickness
Central-Plant-Mixed Processing	-1-inch
Mixed-in-Place Processing	+/- 1-inch

B. When any thickness measurement is outside the construction tolerance, the County will take additional thickness measurements at 10-foot intervals parallel to the centerline in each direction from the measurement which is outside the construction tolerance until a measurement in each direction is within the construction tolerance.

C. The County will evaluate an area of base found to have a thickness outside the construction tolerance and may require the Contractor to remove and replace it with acceptable base of the thickness shown in the plans at no expense to the County.

3.16 STRENGTH TESTING OF FIELD SPECIMENS

A. Check the adequacy of cement content and uniformity of distribution of cement within the base by sampling and testing the completed mix.

B. Take samples at the project site just prior to final compaction and perform a minimum of 2 Strength Test Values (STV) each day, with at least 1 STV per each 2,500 square yards mixed.

C. Ensure that each STV is the average strength value of a minimum of 3 individual specimens.

D. Take representative samples of the mixed soil-cement material for determining an STV just prior to final compaction, recording the sample location, and ensuring that the samples are large enough to mold 3 or more compressive strength test specimens as prescribed in FM 5-520.

E. Mold test specimens at the field moisture content and cast the individual test specimens as close to identical as possible

F. Rest the molds during compaction of strength test specimens on a 200-pound concrete block that the Contractor provides.

G. Gently extrude these test specimens from the compaction mold, and carefully place them in a moist curing environment (not in direct contact with water) such as a tightly closed container under wet cloth or burlap at locations where they will not be disturbed.

H. Continue the initial field cure for at least 24-hours, and if after 24-hours it is determined that the specimens have not gained sufficient strength to be moved without probable damage, continue field curing until the County determines that each specimen can be safely moved without probable damage occurring. When the County determines that the specimens can be safely moved, transport them to the laboratory where they will be cured, as described in the design procedure (FM 5-520), to 7-days of age.

   At 7-days of age, test the individual specimen for determination of compressive stress and ensure that the loading procedure and rates are the same, as described in FM 5-520.

I. If an STV is less than 60% of the Laboratory Design Strength, remove and replace the material represented by the STV, at no expense to the County.

J. When the LOT average thickness of soil-cement base is deficient by more than 1-inch and the judgment of the County is that the area of such deficiency should not be removed and replaced, payment for the area retained will be at 50%.

K. When multiple deficiencies occur, the applicable percent payment schedule will be applied to the LOT of base that is identified with each deficiency. The penalty for each deficiency will be applied separately to the unit price.

END OF SECTION

SECTION 02574

ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Work included under this Section consists of installation of asphaltic concrete pavement as shown in the drawings and any miscellaneous cutting, removing, protecting and replacing existing pavements and driveways.

B. Protection of Existing Improvements: The Contractor shall be responsible for the protection of all pavements, sidewalks and other improvements within the work area. All damage to such improvements, as a result of the Contractor's operations, beyond the limits of the work of pavement replacement as described herein, shall be repaired by the Contractor at his expense.

C. Related Work Described Elsewhere:

1. Earthwork: Section 02200.

1.02 SUBMITTALS

A. Informational Submittals:

1. Asphalt Concrete Mix Formula (in general accordance with Section 334 of FDOT Standard Specifications):

a. Submit minimum of 15 days prior to start of production.

b. Submittal to include the following information:

1) Gradation and portion for each aggregate constituent used in mixture to produce a single gradation of aggregate within specified limits.
2) Bulk specific gravity for each aggregate constituent.
3) Measured maximum specific gravity of mix at optimum asphalt content determined in accordance with ASTM D2041.
5) Percent of asphalt lost due to absorption by aggregate.

6) Index of Retained Strength (TSR) at optimum asphalt content as determined by AASHTO T283.
7) Percentage of asphalt cement, to nearest 0.1 percent, to be added to mixture.
8) Optimum mixing temperature.
9) Optimum compaction temperature.
10) Temperature-viscosity curve of asphalt cement to be used.
11) Brand name of any additive to be used and percentage added to mixture.

2. Test Report for Asphalt Cement:

a. Submit minimum 10 days prior to start of production.

b. Show appropriate test method(s) for each material and the test results.

3. Manufacturer's Certificate of Compliance for the following materials:

a. Aggregate: Gradation, source test results.
b. Asphalt for Binder: Type, grade, and viscosity-temperature curve.
c. Prime Coat: Type and grade of asphalt.
d. Tack Coat: Type and grade of asphalt.
e. Additives.
f. Mix: Conforms to job-mix formula.

4. Statement of qualification for independent testing laboratory.

5. Test Results

a. Mix design.
b. Asphalt concrete core.
c. Gradation and asphalt content of uncompacted mix.
d. Field density.
e. Quality control.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Independent Testing Laboratory: In accordance with ASTM E329.

2. Asphalt concrete mix formula shall be prepared by approved certified independent laboratory under the supervision of a certified asphalt technician.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials, including stabilized subgrade, base, bituminous prime and tack coat, and asphaltic concrete for the above work shall meet the requirements established herein.

1. Stabilized subgrade shall conform to Project Specification 02240 and Section 160 of the Florida Department of Transportation (FDOT) Standard Specification of Road and Bridge Construction (latest edition).

2. Base material shall be crushed concrete conforming to Graded Aggregate Base requirements specified in Section 204 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

3. Bituminous prime and tack coat materials shall conform to Section 300 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

4. Asphalt concrete shall match the pavement detail in the Drawings and conform to Section 334 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

5. Portland cement concrete shall conform to Section 350 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

PART 3 - EXECUTION

3.01 GENERAL

A. Traffic Control:

1. Minimize inconvenience to traffic, but keep vehicles off freshly treated or paved surfaces to avoid pickup and tracking of asphalt.

B. Driveways: Repave driveways from which pavement was removed. Leave driveways in as good or better condition than before start of construction.

3.02 LINE AND GRADE

A. Provide and maintain intermediate control of line and grade, independent of underlying base, to meet finish surface grades and minimum thickness.

3.03 APPLICATION EQUIPMENT

A. In accordance with FDOT Standard Specifications.

3.04 PREPARATION

A. Prepare subgrade as specified in Project Specification 02240 and as shown in the drawings.

B. Existing Roadway:

1. Paint edges of meet line with tack coat prior to placing new pavement.

C. Thoroughly coat edges of contact surfaces (curbs, manhole frames, valve covers) with emulsified asphalt or asphalt cement prior to laying new pavement, prevent staining of adjacent surfaces.

3.05 PAVEMENT APPLICATION

A. General: Place asphalt concrete mixture on approved, prepared base in conformance with FDOT Standard Specifications.

B. Tolerances:

1. General: Conduct measurements for conformity with crown and grade immediately after initial compression. Correct variations immediately by removal or addition of materials and by continuous rolling.

2. Completed Surface or Wearing Layer Smoothness:

a. Uniform texture, smooth, and uniform to crown and grade.

b. Maximum Deviation: 3 millimeters (1/8 inch) from lower edge of a 3.6-meter (12-foot) straightedge, measured continuously parallel and at right angle to centerline.

c. If surface of completed pavement deviates by more than twice specified tolerances, remove and replace wearing surface.

3. Transverse Slope Maximum Deviation: 6 millimeters (1/4 inch) in 3.6 meters (12 feet) from rate of slope shown.

4. Finished Grade:

a. Perform field differential level survey on maximum 15-meter (50-foot) meter grid and along grade breaks.

b. Maximum Deviation: 6 millimeters (0.02 foot) from grade shown.

3.06 FIELD QUALITY CONTROL

A. General: Provide services of approved certified independent testing laboratory to conduct tests.

B. Field Density Tests:

1. Perform tests from cores or sawed samples in accordance with AASHTO T230 and AASHTO T166.

2. Measure with properly operating and calibrated nuclear density gauge in accordance with ASTM D2950.

3. Maximum Density: In accordance with ASTM D2041, using sample of mix taken prior to compaction from same location as density test sample.

C. Testing Frequency:

1. Quality Control Tests:

a. Asphalt Content, Aggregate Gradation: Once per every 400 mg (500 tons) of mix or once every 4 hours, whichever is greater.

b. Mix Design Properties, Measured Maximum (Rice's) Specific Gravity: Once every 900 mg (1,000 tons) or once every 8 hours, whichever is greater.

2. Density Tests: Once every 450 mg (500 tons) of mix or once every 4 hours, whichever is greater.

END OF SECTION

SECTION 02822

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. Furnish all labor, materials, equipment and incidentals required to prepare lawn bed and install sodding as specified.

2. Areas to receive sodded grass lawns are all areas disturbed by construction at the Water Treatment Plant. Seed and mulch not allowed.

B. Related Work Described Elsewhere

1. Shop Drawings, Working Drawings, and Samples: Section 01340.

2. Earthwork: Section 02200.

1.02 QUALITY ASSURANCE (NOT APPLICABLE)

1.03 SUBMITTALS

A. Provide technical data as required in Section 01340 regarding all materials or installation procedures required under this Section.

B. Submit representative topsoil samples for analysis by a private laboratory to determine nutrient deficiencies and outline a proper fertilization program.

PART 2 - PRODUCTS

2.01 GENERAL

A. Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division

may be used, but the Contractor shall furnish additional loam at his own expense, if required.

2.02 SOIL CONDITIONERS

A. Fertilizer:

1. Fertilizer shall be a complete fertilizer, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with State and Federal fertilizer laws.

2. Fertilizer shall be 6% nitrogen, 6% phosphorus and 6% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen.

3. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. Store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.

B. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 20 available phosphoric acid.

C. Lime shall be ground limestone.

2.03 SOD

A. Sod shall be Argentine Bahia of firm texture having a compacted growth and good root development as approved.

B. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type, and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.

C. Before being cut and lifted the sod shall have been mowed 3 times with the final mowing not more than a week before cutting into uniform dimensions.

PART 3 - EXECUTION

3.01 PREPARATION

A. Areas to be sodded shall be cleared of all rough grass, weeds, and debris, and ground brought to an even grade as approved.

B. The soil shall then be thoroughly tilled to a minimum 8 inch depth.

C. Loam shall be placed to a minimum depth of 4 inches and shall be lightly compacted. No loam shall be spread in water.

D. Lime shall be applied at a rate necessary to achieve a pH of 6 to 7.

E. Apply superphosphate at a rate of 5 pounds per 1,000 square feet and apply fertilizer at a rate of 16 pounds per 1,000 square feet.

F. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over l-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.02 INSTALLATION

A. During delivery, prior to planting, and during the planting of the lawn areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and protected so as not to be damaged by sweating or excessive heat and moisture.

B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope and with the joints offset relative to upper and lower panels. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.

C. Bring the sod edge in a neat, clean manner to the edge of all paving and shrub areas. Top dressing with approved, clean weed free sand may be required at no additional cost to the Owner if deemed necessary by the Engineer.

3.03 MAINTENANCE

A. The Contractor shall produce a dense, well established lawn. The Contractor shall be responsible for the repair and resodding of all eroded or bare spots until project acceptance and during the warranty period. Repair sodding shall be accomplished as in the original work except that fertilizing may be omitted. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Sodded areas shall receive no less than 1.5 inches of water per week.

B. Contractor shall mow sod until Final Completion.

3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATIONS

A. Lawn areas planted under this Contract and lawn areas outside the designated areas damaged by Contractor's operations shall be repaired at once by proper sod bed preparation, fertilizing and resodding, in accordance with these Specifications.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

2. Water/cement ratio (total gallons of water per cubic yard).

3. Brand, type, and quantity of cement.

4. Type and quantity of aggregates.

5. Type and quantity of admixtures.

6. Type, composition, and quantity of fly ash, slag (GGBFS), or silica fume.

7. Unit weight (wet density).

8. Composition strength based on 28-day compression test.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Engineer.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Form materials and form-release agents.

4. Steel reinforcement and accessories.

5. Fiber reinforcement.

6. Waterstops.

7. Curing compounds.

8. Floor and slab treatments.

9. Bonding agents.

10. Adhesives.

11. Vapor retarders.

12. Joint-filler strips.

13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Submit laboratory test reports for concrete mix design, aggregates (particularly deleterious materials in coarse aggregate) and fly ash, slag (GGBFS) and silica fume (if used) 4 weeks before scheduled pouring.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

1. Submit written reports to Engineer documenting testing and inspection results.

2. Submit mill test reports on reinforcement.

3. Submit materials certificates in lieu of laboratory test reports on other materials. Manufacturer and Contractor shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements. Submit certification from admixture manufacturers that chloride content complies with specification requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.07 PROJECT CONDITIONS

A. Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

   a. High-density overlay, Class 1 or better.

   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

   c. Structural 1, B-B or better; mill oiled and edge sealed.

   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

C. Deformed-Steel Wire: ASTM A 496/A 496M.

2.03 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, except use Type III where applications require high-early-strength or Type II where required by Engineer for corrosive environments.

2. Use one brand of cement throughout Project, unless otherwise acceptable to Engineer.

B. Fly Ash: ASTM C 618, Type C or Type F (corrosive environments) with loss on ignition not more than 6 percent.

C. Ground Granulated Blast-Furnace Slag: ASTM C 989.

D. Silica Fume: ASTM C 1240, amorphous silica.

E. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

F. Water: ASTM C 94/C 94M.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions.

2. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. Water Reducing, Nonchloride Accelerator Admixture: ASTM C 494, Type E.

6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.06 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches (25 to 57 mm) long.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Monofilament Micro-Fibers:

1) Axim Italcementi Group, Inc.; Fibrasol II P.
2) Euclid Chemical Company (The), an RPM company; Fiberstrand 150.
3) FORTA Corporation; FORTA Econo-Mono.
4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
5) Metalcrete Industries; Polystrand 1000.
6) Nycon, Inc.; ProConM.
7) Propex Concrete Systems Corp.; Fibermesh 150.
8) Sika Corporation; Sika Fiber PPM.

2.07 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

1. JP Specialties, Inc.

2. Sika Corporation

3. Vinylex Waterstop & Accessories

4. Westec Barrier Technologies

5. Profile: As indicated.

6. Dimensions: as indicated on the structural drawings.

2.08 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Fortifiber Building System

2. Raven Industries, Inc.

3. Stego Industries, LLC

2.09 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. BASF Construction Chemical

2. ChemMasters, Inc.

3. Dayton Superior

4. Euclid Chemical Company

5. Kaufman Products, Inc.

6. L&M Construction Chemical

7. Lambert Corporation

8. Metalcrete Industries

9. Nox-Crete Products Group

10. Sika Corporation

11. SpecChem

12. Symons by Dayton Superior

13. TK Products Unitex by Dayton Superior

14. Vexcon Chemicals Inc.

15. W.R. Meadows, Inc.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixes for each concrete class and strength by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use independent testing facilities acceptable to Engineer for preparing and reporting proposed mix designs. Testing facility shall not be identical to that used for field quality control testing.

B. Fly ash shall be used to partially supplant cement content in Class A and Class S concrete, unless noted otherwise, and is optional in other classes. Replacement quantity of cement content by weight shall be not less than 15 percent for Class A and Class S concrete or more than 25 percent for all classes except Class F.

C. For concrete Class A and Class S, concrete mix design with fly ash and silica fume shall be maximum 30 percent of cement content by weight, and shall constitute no more than 20 and 10 percent, respectively, of the total weight of cementitious materials.

D. Use of ground granulated blast furnace slag (GGBFS) shall only be approved by Engineer. Replacement quantity of cement content weight shall not be less than 35 percent or more than 50 percent.

E. Design mixes to provide normal weight concrete for following classes and properties:

1. Locations for concrete classes are as follows:

a. Class A Structural concrete (slabs, walls, columns, beams, equipment bases, and slab toppings 2 inches or greater in thickness). Note: High range water-reducing admixture shall be used for all concrete walls

2. Properties for concrete classes are as follows:

Concrete Class		**A**
28-Day* Compressive Strength (f'c), psi		4,000
Cement Content per cubic yard of concrete, sacks minimum **		6
Water/Cement Ratio by weight, maximum		0.44
Air Content, percent by volume		5±1
Slump at point of placement, inches.	WR***	2-4
	MRWR	4-6
	HRWR****	6-8
Monofilament Polypropylene, Type F1		NA

* 7-day compressive strength for high-early-strength concrete.
** For concrete with fly ash, values are total of cement plus fly ash.
*** Slump prior to the addition of mid-range or high-range water reducers.
**** High range water-reducing admixture shall be used for all concrete walls.

3. Adjustment of Concrete Mixes: Mix designs may be adjusted when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, when approved by Engineer, at no additional cost to Owner. Submit laboratory test data for revised mix design and strength results to Engineer before using in work.

4. Admixtures:

   a. Use water-reducing admixture or high range water-reducing admixture (superplasticizer) in concrete for placement and workability.

   b. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

   c. Add air-entraining admixture at manufacturer's prescribed rate to result in placed concrete having total air content specified.

   d. Use nonstructural synthetic reinforcement, monofilament polypropylene Type F1 in Class A concrete for exposed exterior surfaces without earth covering, and as specified by Engineer for

other concrete mix design. Bottom slabs of open concrete tanks do not require synthetic reinforcement. The synthetic reinforcing fibers shall be added to the concrete mix at the rate of 1.5 pounds per cubic yard and in accordance with manufacturer's recommendations.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

B. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.03 REMOVING AND REUSING FORMS

A. Vertical Forms not supporting concrete weight may be removed when concrete has sufficiently set to resist damage from removal operation.

B. Other forms shall be left in place until concrete has attained strength to support its own weight and construction live loads, unless removed in sections, and each structural section immediately reshored.

C. Time Periods: Forms remain in place as shown in table below. If form removal occurs before time shown in the table, apply curing procedures previously specified.

Minimum Time Forms are to Remain in Place:

	Average Air Temperature* During Period	
Part of Structure	40 - 50 degrees F	50 degrees F
Walls, columns and sides of beam (hours)	72	24

* Air temperature near form.

D. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

E. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.05 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Field bending of reinforcement:

1. Field bending of plain reinforcement shall be performed using an approved and appropriate sized portable hydraulic device that makes ACI-approved radius bends. No other field bending method shall be permitted.

3.06 JOINTS

A. Locate and install construction joints as shown or, if not shown, locate so as not to impair strength and appearance of structures, at intervals not to exceed 50 feet. For construction joints in water-containing structures or tanks or in water-restraining structures, use watertight joints.

B. Continue reinforcement across construction joints, unless otherwise noted. Mechanical inserts with threaded studs are not accepted as substitutes for through-dowels.

C. Locate construction joints in floor system at or near middle of span in slabs, beams, or girders unless beam intersects girders at this point. Then, where not shown on Drawings, joints in girders shall be offset distances twice the width of beams, and provisions made for shear by web reinforcement across joints.

D. Provide watertight joints to prevent water seepage. Take special care in finishing surfaces to which succeeding concrete is bonded. Provide waterstops in joints if shown. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops according to manufacturer's printed instructions.

E. Provide isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces of column pedestals, foundation walls, and grade beams.

F. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction (control) joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 3/16 inch by 1/4 slab depth or inserts 1/4-inch wide by 1/4 of slab depth unless otherwise noted.

G. If joint pattern is not shown, provide joints at 15 feet at most in either direction, with locations to conform to bay spacing wherever practical (at column centerlines, half-bays, third-bays).

H. Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool

slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

I. Cut contraction joints in unexposed floor slabs by saw cuts as soon as practical after slab finishing when it can be safely done without dislodging aggregate.

J. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into Work anchorage devices and other embedded items required for other work that are attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of attachment items.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain set elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support screed strips by use of strike-off templates or accepted compacting screeds.

C. Conduits and pipes of aluminum shall not be embedded in structural concrete unless they are effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

D. PVC Waterstops:

1. Field butt splices shall be heat fused using a Teflon-coated thermostatically controlled waterstop splicing iron at approximately 380 degrees F following manufacturer's recommendations. Lapping of waterstop or use of adhesives shall not be allowed.

2. Center the waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12 inches on center along length of waterstop and wire tie to adjacent reinforcing steel. Do not drive nails or otherwise puncture additional holes in the waterstop when forming.

3.08 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with form-coating compounds before placing reinforcement.

C. Thin form-coating compounds only with acceptable thinning agents, quantity, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete is placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with non-staining, rust-preventive form oil to protect against rusting. Rust-stained steel formwork is not acceptable.

3.09 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, reinforcing steel, waterstop installation, and other embedded or cast-in items.

1. Notify other crafts to permit installation of their work.

2. Cooperate with other trades in setting their work.

3. Moisten wood forms immediately before placing concrete where form coatings are not used.

4. Apply temporary protective covering to lower 2 feet of finished walls where adjacent floor slabs are poured to guard against spattering during slab placement.

B. Comply with ACI 304R and as specified in this Section.

C. Discharge Concrete at Site within 1-1/2 hours after cement is added to water or aggregates. When air temperature exceeds 85 degrees F, the discharge time shall be less than 45 minutes. The 45-minute requirement may be waived with the use of a water reducing, retarding admixture and approval of Engineer.

D. Provide trip ticket in duplicate for each ready-mixed concrete load delivered, stating truck number, Project name, Contractor and producer, batching time, total yards of concrete and material contained therein. Show ticket to Engineer upon request. Fill in concrete discharge time and turn over to Engineer trip ticket copies at end of each day.

E. Deposit concrete continuously or in layers so that no concrete is placed on concrete which has hardened sufficiently to cause seams or planes of weakness. If section cannot be placed continuously, provide construction joints as specified. Deposit concrete as nearly as practical to its final location to avoid segregation.

F. When depositing by chute, provide equipment of size and design to ensure continuously flowing concrete. Provide discharge end of chute with baffle plate to

prevent segregation. Position chute so that concrete need not flow more than 5 feet horizontally.

G. Do not drop concrete from chute end distances greater than 3 times the deposited layer thickness, nor more than 5 feet. Where distance from chute end to surface of concrete exceeds these distances, use spout and maintain lower end as near to deposit surface as practical. When operations are intermittent, discharge chutes into hoppers.

H. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches to avoid inclined construction joints. Where placement involves several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Fill bottom of wall space with 2 to 4 inches of cement slurry immediately before depositing concrete in walls. Use cement slurry composed of 1 part Portland cement, 2 parts fine aggregate, and sufficient water (but not to exceed 0.45 parts) for 7-inch slump mixture.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for concrete consolidation in accordance with ACI recommended practices.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible machine effectiveness. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into concrete layers that have begun to set. At each insertion, limit duration to time necessary to consolidate concrete and complete reinforcement embedment and other embedded items without causing mix segregation. Keep vibrators away from waterstops to prevent displacement.

I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operations between construction joints until panel or section placement is complete.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces before beginning finishing operations.

3. Maintain reinforcing in proper position during concrete placement operations.

4. Maintain waterstop in proper position during concrete placement operations.

5. Moisten soil when depositing concrete directly on granular soil.

J. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

K. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

L. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. Trowel Finish: Apply trowel finish to monolithic slab surfaces exposed-to-view, and slab surfaces covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

1. After floating, begin first trowel finish operation using power-driven trowels. Begin last troweling when surface produces ringing sound when trowel moves over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.

2. Check and level surface plane to tolerances of floor flatness (FF) of 20 and floor levelness (FL) of 17 in accordance with ASTM E 1155.

3. Grind smooth surface defects that would telegraph through applied floor covering system.

B. Nonslip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, ramps, and elsewhere as noted.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required finish with Engineer before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 4 inches ((100 mm)) high unless otherwise indicated; and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install anchor bolts that extend through concrete base, and anchor into structural concrete substrate.

6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.13 CONCRETE PROTECTING AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Maintain curing as follows:

1. All concrete unless otherwise noted: 7 days.

2. High-early-strength concrete: 3 days.

C. Curing Methods: Cure concrete for water-retaining structures by moist curing. Cure concrete for other structures by curing compound, moist curing, moisture-retaining cover curing, or combinations thereof.

D. Provide Moist Curing by following methods:

1. Keep concrete surface continuously wet by covering with water.

2. Continuous water-fog spray.

3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to cover concrete surfaces and edges, with 4 inches lap over adjacent absorptive covers.

E. Provide Moisture-Retaining Cover Curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practical width with sides and ends lapped 3 inches and sealed by waterproof tape or adhesive.

2. Immediately repair holes or tears during curing period using cover material and waterproof tape.

F. Provide Curing Compound as follows:

1. Apply specified curing compound to concrete slabs as soon as last finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain coating continuity and repair damage during curing period.

2. Transparent curing compound shall be used for structural concrete (Class A concrete).

3. Do not use membrane curing compounds on surfaces that are covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including beam undersides, supported slabs and other similar surfaces by moist curing with forms in place for full curing period. If form removal occurs before curing period is up, continue curing by methods specified above as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mi dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to

concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel

reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Headed bolts and studs.

4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Provide qualified personnel and employ testing laboratory, approved by Engineer, to do tests and to submit test reports.

E. Sampling Fresh Concrete: ASTM C 172, except modified for slump and air-content tests to comply with ASTM C 94.

1. Slump: ASTM C 143, one each time compression test specimens are made; additional tests when concrete consistency seems to have changed.

2. Air Content: ASTM C 231, pressure method, one each time compression test specimens made.

3. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time compression test specimens are made.

4. Compression Test Specimen: ASTM C 31, four standard cylinders for each compressive strength test set, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens.

5. Compressive Strength Tests: ASTM C 39, one set for each day's pour exceeding 5 cubic yards plus additional set for each 100 cubic yards over and above first 50 cubic yards of each concrete class placed in 1 day; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.

F. Test Results: Report test results in writing to Engineer and Contractor within 24 hours after tests. Compressive strength test reports shall contain Project identification name and number, concrete placement date, concrete testing service name, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and break type for both 7-day tests and 28-day tests.

G. Acceptance: Concrete strength shall be considered satisfactory if averages of 3 consecutive strength test results equal or exceed specified 28-day compressive strength (f'c), and no individual strength test result falls below specified compressive strength by more than 500 psi.

H. Failure to Meet Requirements:

1. Should 7-day compressive strengths shown by test specimens fall below 65 percent of required 28-day strength (f'c), Engineer will have the right to require changes in proportions for remaining Work. Furthermore, Engineer will have the right to require additional curing, as specified in this Section, on those portions or structures represented by failed test specimens.

2. Should 28-day compressive strengths (f'c) test results fail to meet required strength, core-boring tests conforming to ASTM Standard C 42 shall be made at Contractor's expense within 60 days of that concrete placement.

I. At locations where concrete quality is deemed questionable by Engineer, core-boring tests shall also be made at Contractor's expense.

J. Concrete is acceptable if average strength of 3 cores is at least 85 percent and no single core is less than 75 percent of required minimum allowable 28-day compressive strengths (f'c). If core-boring test results fail to meet strength requirements, Engineer will have right to require strengthening or replacing those portions of structures which failed to develop specified strength.

K. Provide additional curing when ordered by Engineer because of failure to meet requirements. It shall be done at Contractor's expense, and no claim for extra compensation for additional curing will be allowed. Additional curing shall extend period of protection. Additional curing is limited to 60 days.

L. Additional Tests: Testing service shall make additional in-place concrete tests when test results suggest specified concrete strengths and other characteristics have not been attained. Testing service may conduct tests to determine adequacy by cored cylinders complying with ASTM C 42, or by other approved methods. Contractor shall pay for additional tests when unacceptable concrete is verified.

END OF SECTION

SECTION 03345

CONCRETE FINISHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section describes materials and methods of concrete finishes, curing, repair of defects and surface protection.

1.02 SUBMITTALS

A. Curing Compound: Submit manufacturer's statement of compliance with these specifications and recommend coverage to meet or exceed the specified tests and manufacturer's application instructions in accordance with Section 01420: Drawings and Submittals.

PART 2 - PRODUCTS

2.01 MATERIALS

A. See Section 03300: Cast-In-Place Concrete.

B. Curing Compound:

1. Curing compound shall conform to ASTM C-309, Type 1, Class B.

2. Curing compound shall be compatible with required finishes and coatings, as specified in Division 9: Finishes.

3. Curing compound for exposed concrete not to receive special finishes, protective coatings and/or concrete toppings shall be "Super Rez-Seal", as manufactured by Euclid Chemical Co., Cleveland, Ohio or equal.

4. Curing compound for exposed concrete to receive special finishes, protective coatings and/or concrete toppings shall be "Kurez-DR", as manufactured by Euclid Chemical Co., Cleveland, Ohio or equal.

C. Mortar for Repair of Concrete: Mortar used for repair of concrete shall be made of the same materials as used for concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than one (1) part cement to

two and one-half (2-1/2) parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing.

D. Burlap Mats: Conform to AASHTO Specification M-182.

E. Sisal-Kraft Paper and Polyethylene Sheets for Curing: Conform to ASTM C-171.

PART 3 - EXECUTION

3.01 CONCRETE FINISHES

A. Complete concrete surfaces in accordance with the following schedule:

Finish Designation	Area Applied
F-1	Exterior walls below grade not exposed to water.
F-2	Exterior and interior walls exposed to water.
F-3	Walls of structures or buildings exposed to view. Underside of formed floors or slabs.
S-1	Slabs (roof and floor) not water bearing (Building).
S-2	Slabs and floors which are water bearing. Slab surfaces on which mechanical equipment moves.
S-3	Slabs and floors of structures which are exposed to view.
S-4	Slabs, beams, girders, columns, and floors of structures. Slabs and floors at slopes greater than 10 percent (10%).
E-1	Exposed edges of slabs, floors, and walls tops.
E-2	Top of walls, beams and similar uniform surfaces.

B. Concrete surface repair.

1. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2 inch, and fill tie holes.

2. Finish F-2: Repair defective concrete, remove fins, fill depressions 1/4 inch or deeper, and fill tie holes.

3. Finish F-3: In addition to Finish F-2, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one (1) part cement and one-half (1/2) parts sand by damp loose volume, over the surface of clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

4. Finish S-1: Smooth steel trowel finish

5. Finish S-2: Steel trowel finish free from trowel marks and all irregularities.

6. Finish S-3: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.

7. Finish S-4: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.

8. Finish E-l: Exposed edges of slabs, floors, and tops of walls, finish with a 1/4 inch radius edger if a chamfer is not indicated.

9. Finish E-2: Struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surfaces.

3.02 FINISHING OF FORMED SURFACES

A. Water cure surfaces until finishing and repairing are completed.

B. As soon as possible after forms are removed, remove fins and irregularities by grinding or rubbing, fill depressions deeper than specified with mortar, and fill tie holes.

C. Ream tie holes with toothed reamers until surface of hole is rough and clean. Coat surface with epoxy bonding compound and fill with mortar.

D. Finish tapered tie holes as follows:

1. Sandblast tie rod hole and blow clean prior to filling.

2. Drive rubber plug, with one end open, to the center of the hole. Plug size shall be larger in diameter than the diameter of the hole at the center of the wall.

3. Coat entire annular surface of the hole with epoxy prior to filling with mortar. Apply epoxy in accordance with manufacturer's instructions.

4. Fill each side of hole with mortar. Apply mortar to the "wet" side of the wall first. Consolidate mortar solidly into the hole.

5. Notify Engineer of tie rod filling schedule.

3.03 REPAIR OF SURFACE DEFECTS

A. Remove honeycombed and other defective concrete down to sound concrete. Edges shall be perpendicular to surface. Sandblast surfaces to receive repair.

B. Coat sandblasted surface with epoxy bonding compound.

C. Place mortar in layers having a compacted thickness of 3/8 inch. Scratch surface of each layer to promote bonding with next layer.

D. Finish repair shall match adjacent concrete and cure as specified.

E. Repair defective areas of more than 1 foot square and deeper than the reinforcing steel as above, except fill the area with pneumatically applied concrete.

3.04 REPAIR OF CRACKED CONCRETE

A. Methods of crack repair may be submitted by the Contractor for review by the Engineer.

3.05 CONCRETE SURFACES TO BE COATED.

A. Concrete surfaces exposed to view and which paints or coatings are to be applied shall be of even color, gray or gray-white. The term “exposed to view” shall mean visible to the plant operation staff in their normal daily activities. The surface shall have no pits, pockets, holes or sharp changes of surface elevation. Scrubbing with a stiff bristle fiber brush shall produce no dusting or dislodging of cement or sand.

END OF SECTION

DIVISION 4

MASONRY

SECTION 04220

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Masonry, including but not necessarily limited to, the following:

1. Standard concrete masonry units (CMU) with false joint

2. Masonry reinforcing, ties and anchors.

3. Control joints.

4. Grouting of masonry units.

5. Embedded flashing.

1.02 SUBMITTALS

A. Submit two (2) samples of each type of concrete masonry units for the project.

B. Submit catalog data for integral water repellants for CMU and mortar, metal ties and anchors, joint reinforcement, and control joint material.

C. Submit certification of compliance to OHSA Section 1926.700 A and B for construction techniques for high masonry walls.

D. Shop Drawings: Show fabrication and installation details for the following:

1. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

2. Accessories embedded in the masonry.

3. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

3. ASTM C33 - Standard Specification for Concrete Aggregates.

4. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

5. ASTM C129 - Standard Specification for Non-Load-Bearing Concrete Masonry Units.

6. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.

7. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

10. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

11. ASTM C331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

12. ASTM C426 - Standard Test Method for Drying Shrinkage of Concrete Block.

13. ASTM C476 - Standard Specification for Grout for Masonry.

14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

15. ASTM C1019 - Standard Method of Sampling and Testing Grout.

16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

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

1.04 QUALITY ASSURANCE

A. Masonry Inspection:

1. A qualified Engineer or Architect must inspect masonry during construction for compliance with the Contract Documents, including periodic wall inspection of the critical portions of masonry construction, including flashing, weep hole construction, and proper unit bedding and joint installation techniques for structural integrity and weather-tightness.

1.05 PROTECTION OF MATERIALS

A. All perishable materials for the work of this Section shall be delivered stored and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.

B. All masonry shall be shipped stacked with hay or straw protection or other suitable protective device, and shall be similarly stacked off the ground on the site. Any masonry damaged or chipped during shipment, storage or installation shall be rejected and removed from the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the Engineer.

1.06 COLD WEATHER CONSTRUCTION

A. Masonry construction in cold weather shall conform to the applicable requirements of Cold Weather Masonry Construction, Section 2.3.2.2, Specifications for Masonry Structures ACI 530.1.

1.07 HOT WEATHER CONSTRUCTION

A. Masonry construction in hot weather shall conform to the applicable requirements of hot weather construction, Section 2.3.2.3, Specifications for Masonry Structures ACI 530.1.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Masonry Units:

1. Standard weight concrete masonry units (CMU) for interior and exterior walls where indicated on the Drawings, shall conform to ASTM C90, Grade N, Type II, two cell hollow, load bearing units of 4 inch by 16 inch, 8-inch by 16-inch and 12 inch by 16 inch normal face size and bed dimension as shown on the Drawings.

a. Integral Water Repellent: Provide units made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength for exposed units.

b. Products: Subject to compliance with requirements, provide one of the following

1) ACM Chemistries; RainBloc.

2) BASF Aktiengesellschaft; Rheopel Plus.

3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

2. Units shall be obtained from one manufacturer to insure even color and texture.

3. Provide special units required by the Drawings, including solid, corner, pilaster, lintels, and jamb units.

B. Mortar:

1. Portland cement shall conform to ASTM C150 Type II requiring only sand and water for mixing.

2. Masonry cements used for integral colored CMU's shall be specifically approved for colored mortar. Colored mortar mixers shall be factory premixed with color pigments and Portland cement, requiring only sand and water for mixing. Colored mortar for the project shall be from the same factory lot and batch numbers. Color of the mortar mix shall be selected by the Engineer from the mortar manufacturer's standard color samples.

3. Lime used for masonry mortar shall be hydrated lime, conforming to ASTM C207, Type S.

4. Sand shall be clean, hard, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to ASTM C144 or C33 as required.

5. Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.

6. Mortar proportions shall conform to ASTM C270, Type S, or as otherwise approved by the Engineer. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.

7. Strength of mortars shall exceed 1,800 pounds per square inch, when tested with 2 inch cubes at the end of a 28-day aging period.

8. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

    a. Products: Subject to compliance with requirements, provide one of the following

        1. ACM Chemistries; RainBloc for Mortar.

        2. BASF Aktiengesellschaft; Rheopel Mortar Admixture.

        3. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

9. Grout for setting bearing plates, machinery, or any other equipment shall be as specified in Section 03600.

C. Grout:

1. Portland cement shall conform to ASTM C150, Type I.

2. Aggregates shall conform to ASTM C144.

3. Grout for constructing CMU lintel blocks and for grouting cores to receive embedded anchors or reinforcing shall conform to ASTM C476, fine or coarse grout. Strength shall be 2500 psi minimum at 28 days. Mix grout to have a slump of 10-in plus or minus 1-in, at time of placement.

2.02 ACCESSORIES (REINFORCING, TIES, ANCHORS AND MISCELLANEOUS)

A. Single Wythe reinforcement shall be truss type, fabricated from cold drawn steel wire complying with ASTM A82 with single pair of galvanized 9-gauge side rods and continuous 9-gauge cross-rods spaced not more than 16 inches on center, and furnished with matching corners and tee units. Units shall be galvanized after fabrication conforming to ASTM A153, Class B-2, 1.5 oz./sq. ft.

B. Galvanized dove-tailed anchor slots with anchors at 24 inches on center shall be furnished for anchorage to concrete framework or walls.

C. Approved 16-gauge corrugated nonferrous metal ties manufactured for use with the anchor slots provided shall be spaced at a maximum of 8 inches o.c. vertically and 30 inches o.c. horizontally.

D. The Contractor shall provide and install miscellaneous anchors and attachment members, required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.

E. Control joints shall be factory extruded preformed rubber gaskets, unless otherwise shown on the Drawings, conforming to ASTM D-2000 2AA-205 and shall be as manufactured by Dur-O-Wal, Hohmann and Bernard, Inc., AA Wire Products or equal. Control joints shall be installed as shown on the Drawings.

F. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

2.03 EMBEDDED FLASHING MATERIALS AND ACCESSORIES

A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

2. Copper: 10-oz./sq. ft. (3-kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.

3. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.

B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 5-oz./sq. ft. sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

E. Weep Hole/Vent: Free-draining open weave mesh; made from 100% recycled polyester; in color approved by Architect to match that of mortar. 2.25” x 3.5” x 0.5”.

F. Cavity Drainage Material: Free-draining open weave mesh; made from polyethylene, polyester, or nylon strands. Shaped to prevent blockage by mortar droppings. Thickness to match cavity size.

G. Available Products: Subject to compliance with requirements, products of manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Through-Wall Metal Flashing:

   a. Cheney Flashing Company, Inc.

   b. Keystone Flashing Co.

2. Copper-Laminated Flashing:

   a. Copper Fabric Flashing; Advanced Building Products, Inc.

   b. Copper Fabric; AFCO Products, Inc.

   c. H & B C-Fab Flashing; Hohmann & Barnard, Inc.

d. Type FCC-Fabric Covered Copper; Phoenix Building Products.

e. Copper Fabric Flashing; Polytite Manufacturing Corp.

f. Copper Fabric Flashing; Sandell Manufacturing Co., Inc.

g. York Copper Fabric Flashing; York Manufacturing, Inc.

3. Asphalt-Coated Copper Flashing:

a. Cop-R-Cote; Advanced Building Products, Inc.

b. Cop-A-Cote; AFCO Products, Inc.

c. H & B C-Coat Flashing; Hohmann & Barnard, Inc.

d. Type ACC-Asphalt Bituminous Coated; Phoenix Building Products.

e. Coated Copper Flashing; Polytite Manufacturing Corp.

f. Coated Copper Flashing; Sandell Manufacturing Co., Inc.

g. Weep Hole/Vent:Copperseal; York Manufacturing, Inc.

h. Weep Vent; Mortar Net USA, Ltd.

4. Cavity Drainage Material:

a. Mortar Maze; Advanced Building Products, Inc.

b. Mortar net; Mortar Net USA, Ltd.

2.04 MASONRY CELL INSULATION

A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.

1. Products: Subject to compliance with requirements, provide one of the following

a. Concrete Block Insulating Systems; Korfil.

b. Shelter Enterprises Inc.; Omni Core.

PART 3 - EXECUTION

3.01 MORTAR

A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than five minutes, approximately two minutes of which shall be for mixing the dry materials and not less than three minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into a putty.

B. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.

C. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.

3.02 MASONRY INSTALLATION

A. Masonry shall not be laid at temperatures below 40 degrees F, without the approval of the Engineer, and all work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50 degrees F for a period of 72 hours after placing. Any completed work found to be affected by cold weather shall be taken down and rebuilt by the Contractor at his expense.

B. All CMU's shall be laid in a full bed of mortar and fullhead, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joint for the full shell thickness. Units shall be set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test. Split faced CMU's shall be laid with the horizontal stringline control to the inside face of block.

C.. Joints of all masonry shall be tooled in accordance with the following:

1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as three hours in the shade and one hour in the sun in the summertime.

2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.

3. Both vertical and horizontal joints shall be maintained uniform in spacing.

4. Joints for CMU shall be 3/8-inch wide.

5. Joints for standard CMU shall be rubbed with a sponge to provide a flush, neat, rubbed joint.

D. Install all frames required to be set in masonry. Set masonry tightly against frames, build in all frame anchors, and fill frames with mortar.

E. Control joints shall be installed at the intersection of masonry walls with structural concrete and elsewhere as detailed on the Drawings. Joints shall be raked out to a depth of 3/4-inch for the full height of the wall suitable for caulking. The maximum length, horizontally, between vertical control joints shall be 26 feet, but joints shall be located only as directed or shown. Joints shall be equal in width to the standard mortar joint.

F. All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the points affected. No chase shall be cut into any wall constructed of hollow units after it is built, except as directed and approved by the Engineer.

G. Surfaces shall be brushed as work progresses and maintained as clean as it is practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind. Before continuing work previously laid, the previous work shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards or other means approved by the Engineer.

H. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds, and exterior electrical conduits and fixtures, and shall cooperate with other trades whose work is to be coordinated with the work under this Section.

I. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.

J. All ties and reinforcing for masonry shall be furnished and installed by the Contractor.

K. Loose lintels shall be set in a full bed of mortar and supported by solid or mortar filled hollow concrete blocks as detailed on the Drawings.

L. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

3.02 MASONRY CELL INSULATION

A. For new construction fill all non-grouted cells with sprayed-foam polyisocyanurate insulation into masonry cells.

3.03 CLEANING

A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.

B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.

C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturer's printed directions. No acid or metal scrapers shall be used on masonry.

D. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 square feet in a location approved by the Engineer. No further cleaning work may proceed until the sample area has been approved by the Engineer, after which time the same cleaning materials and method shall be used on the remaining wall area.

3.04 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal

penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At lintels and shelf angles, extend flashing to first vertical masonry joint beyond masonry opening and fold corners to turn up 1 inch (25 mm) to form an end dam; extend to wall face. At heads and sills, extend flashing at ends and turn flashing up not less than 2 inches (50 mm) to form a pan. Turn up back edge as indicated.

2. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

3. Extend sheet metal flashing 1/4 inch (6 mm) beyond face of masonry at exterior and turn flashing down to form a drip where not part of counterflashing.

4. Under copings terminate both edges beyond face of wall approximately 1/4 inch (6 mm) with drip edge.

5. Where dowels, reinforcing bars and fastening devices penetrate flashing, form penetration openings to fit tight against dowel or other item with edge turned up and seal penetration as recommended by manufacturer.

6. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.

7. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 6 inches (150 mm) on center.

8. Continue flashing around columns:

   a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.

   b. Counterflash top edge with 3-inch (75 mm) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 1 1/2-inch (38 mm).

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Use polyester mesh weep vents to form weep holes.

2. Place cavity drainage material immediately above flashing in cavities.

E. Install vents in vertical head joints at the top and bottom of each continuous cavity at 48” o/c. Use polyester mesh weep vents to form vents.

F. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.05 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

B. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

C. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

D. Placing Reinforcement: Comply with requirements ACI 530.1/ASCE 6/TMS 602.

E. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

F. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

G. Limit height of vertical grout pours to not more than **60 inches**. All lintels must be poured before installing CMU above.

3.06 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Contractor shall provide 24 hr notice min. on all grout pours. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: special inspections according to the Florida Building Code.

C. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

D. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

E. Place grout only after inspectors have verified proportions of site-prepared grout.

END OF SECTION

SECTION 04230

REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all materials, equipment and labor required to complete the reinforced unit masonry construction in accordance with the Drawings and Specifications. Coordinate all work with that of other trades.

1.02 SUBMITTALS

A. Submit shop drawings, product data, mixes, etc., in accordance with Section 01340.

B. Submit complete shop drawings, including bar lists and placement drawings.

C. Submit mill test certificate for reinforcing steel.

PART 2 - PRODUCTS

2.01 MATERIAL'S

A. General: Refer to Section 04220 for masonry materials and accessories not included in this Section.

B. Reinforcing Steel: ASTM Designation A 615, Grade 60, unless otherwise specified.

C. Construct all building exterior walls of reinforced concrete masonry as follows:

1. Concrete Masonry Units: ASTM C 90, Type II normal weight units with minimum compressive strength of 1900 psi on net area.

2. Premix Mortar: ASTM C 270, Type S.

3. Vertical Reinforcing: Provide as shown on the Drawings.

4. Concrete Grout for Filling Cells: 3/8-inch pearock mix with minimum compressive strength of 3,000 psi.

5. Horizontal Reinforcing: 9-gauge ladder type at 16" o.c. (hot-dipped galvanized)

PART 3 - EXECUTION

3.01 PLACING REINFORCEMENT

A. Clean reinforcement of loose rust, mill scale, earth or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Place reinforcement accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch, whichever is greater.

C. For columns, piers and pilasters, provide a clear distance between vertical bars as shown, but not less than 1 1/2 times the nominal bar diameter or 1 1/2-inches, whichever is greater. Provide lateral ties as shown.

D. Splice reinforcement bars only as shown. Do not splice at other points unless approved by the Engineer. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, tie splices with wire.

E. Provide not less than the minimum lap shown, or if not shown, as required by governing code.

F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8-inch on exterior face of walls and 1/2-inch at other locations.

G. Anchor reinforced masonry work to supporting structure as indicated.

3.02 INSTALLATION, GENERAL

A. Perform general installation of unit masonry in accordance with the requirements specified in Section 04220.

B. Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erection, support, bracing and maintenance of formwork is the Contractor's responsibility.

C. Construct formwork to conform to shape, line and dimensions shown and sufficiently tight to prevent leakage of mortar grout, or concrete (if any).

D. Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction. Do not remove forms and shoring supporting the weight of concrete in beams, slabs and other members until concrete has attained its specified 28 day compressive strength.

E. Coordinate cell reinforcing layout with electrical and mechanical contractors. Contact Engineer regarding conflicts.

3.03 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General:

1. Do not wet concrete masonry units (CMU).

2. Place CMU with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths as shown, or if not shown, provide 3/8-inch joints.

3. Where solid CMU units are shown, lay units with full mortar head and bed joints.

B. Walls:

1. Pattern Bond: Lay CMU wall units as specified in Section 04050. Bond and interlock each course at corners and intersections and use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide aluminum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

4. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout, in which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams will not apply.

C. Columns, Piers and Pilasters:

1. Use CMU of the size, shape and number of vertical core spaces shown. If not shown, provide units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.

2. Provide pattern bond as shown, or if not shown, provide alternate head joints in vertical alignment.

3. Where bonded pilaster construction is shown, construct wall and pilaster units together to the maximum pour height specified.

D. Grouting:

1. Use fine grout for filling spaces less than 4 inches in both horizontal directions.

2. Use course grout for filling 4 inch spaces or larger in both horizontal directions.

3. Place grout within 1.5 hours from introducing water in the mixture and prior to initial set.

4. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

5. Consolidate grout by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

E. Low-Lift Grouting:

1. Provide a minimum clear dimension of 2 inches and clear area of 8 sq. in. in vertical cores to be grouted.

2. Place vertical reinforcement prior to laying of CMU. Extend vertical reinforcement above elevation of maximum pour height as required to allow for splicing and support it in position at vertical intervals not exceeding 192 bar diameters nor 10 feet.

3. Lay CMU to maximum pour height. Limit pour height to 5 feet. If bond beam occurs below the 5 feet height stop, pour at course below bond beam.

4. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond.

5. Pour grout using container with spout or by chute and rod or vibrate during placing. Place grout continuously. Do not interrupt pouring of grout for more than one hour. Terminate grout pours 1 1/2-inches below top course of pour.

6. Bond Beams: Terminate grout in vertical cells 1 1/2-inches below bond beam course. Place horizontal reinforcement in bond beams with corners and intersections lapped as shown. Place grout in bond beam course before filling vertical cores above bond beam.

F. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3 inches and 10 sq. in., respectively.

2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

3. Construct masonry to full height of maximum grout pour specified, prior to placing grout.

4. Limit grout lifts to a maximum height of 5 feet and grout pour to a maximum height of 24 feet, for single wythe hollow concrete masonry walls, unless otherwise indicated. See Section 04050, Section 1.02.D regarding highwall construction.

5. Place vertical reinforcement before grouting. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10 feet.

6. Where reinforcement is prefabricated into cage units before placing, fabricate the units with vertical reinforcement bars and lateral ties of the size and spacing shown.

7. Place horizontal beam reinforcement as the masonry units are laid.

8. Embed lateral tie reinforcement in mortar joints where shown as masonry units are laid.

9. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gage wire ties spaced 16 inches o.c. for members with 20 inches or less side dimensions, and 8 inches o.c. for members with side dimensions exceeding 20 inches.

10. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

11. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

12. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Engineer.

13. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5 feet. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Vibrate each grout lift during pouring operation.

14. Place grout in lintels or beams over openings in one continuous pour.

15. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1 inch of vertically reinforced cavities, during construction of masonry.

16. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1 1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION

DIVISION 5

METALS

SECTION 05500

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

A. Concrete joint accessories are included in Section 03300.

B. Masonry reinforcement, ties and accessories are included in Division 4.

C. Metal doors and frames are included in Division 8.

D. Painting is included in Division 9.

E. Louvers are included in Division 10.

F. Slide gates, operators and appurtenances, including wall thimbles, are included in Division 02.

G. Pipe hangers and sleeves are included in Division 15.

H. Equipment anchor bolts are included in the respective Sections of Divisions 11, 14 and 15.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:

1. Shop drawings, showing sizes of members, method of assembly, anchorage and connection to other members.

B. Samples

1. Submit samples as requested by the Engineer during the course of construction.

C. Design Data

1. Submit calculations or test data demonstrating that the railings will resist the loads specified in the 2014 Florida Building Code at the post spacing provided.

2. Submit manufacturer's load and deflection tables for grating.

D. Test Reports

1. Certified copy of mill test reports on each aluminum proposed for use showing the physical properties and chemical analysis.

E. Certificates

1. Submit certification that the railing system is in compliance with OSHA requirements and the 2014 Florida Building Code.

2. Certify that welders have been qualified under AWS, within the previous 12 months, to perform the welds required under this Section.

1.04 REFERENCE STANDARDS

A. Aluminum Association (AA)

1. AA M31C22A41

a. M31: Mechanical Finish, Fine Satin

b. C22: Finish, Medium Matte

c. A41: Clear Anodic Coating, Class I

B. American Society for Testing and Materials (ASTM)

1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A48 - Standard Specification for Gray Iron Castings.

3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

4. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.

5. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

8. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

9. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength.

10. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

11. ASTM A366 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

14. ASTM A536 - Standard Specification for Ductile Iron Castings.

15. ASTM A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

16. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

17. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

18. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

C. American Iron and Steel Institute (AISI).

1. Specification for Structural Steel Buildings.

D. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code Steel.

2. AWS D1.2 - Structural Welding Code Aluminum.

E. Federal Specifications

1. FS-FF-B-575C - Bolts, Hexagonal and Square

F. Occupational Safety and Health Administration (OSHA)

G. 2014 Florida Building Code. (FBC)

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

1.05 QUALITY ASSURANCE

A. The work of this Section shall be completely coordinated with the work of other Sections. Verify, at the site, both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

C. All welding shall be performed by qualified welders and shall conform to the applicable AWS welding code. Welding of steel shall conform to AWS D1.1 and welding of aluminum shall conform to AWS D1.2.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

B. Repair items which have become damage or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

1.07 PROJECT/SITE REQUIREMENTS

A. Field measurements shall be taken at the site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

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. Unless otherwise noted, materials for miscellaneous metals shall conform to the following standards:

1. Structural Steel	ASTM A36
2. Structural Steel Tubing	ASTM A500, Grade C
3. Welded and Seamless Steel Pipe	ASTM A501 or ASTM A53, Type E or S, Grade B Schedule 40. Use standard malleable iron fittings, galvanized for exterior work
4. Steel Sheets	ASTM A366
5. Gray Iron Castings	ASTM A48, Class 35
6. Ductile Iron Castings	ASTM A536, Grade 65-45-12
7. Aluminum Extruded Pipe	ASTM B429, Alloy 6063 T6
8. Aluminum Extruded Shapes	ASTM B221, Alloy 6061 T6
9. Aluminum Sheet and Plate	ASTM B209, Alloy 6061 T6
10. Stainless Steel Plates, Sheets, and Structural Shapes	
a. Exterior, Submerged or Industrial Use	ASTM F593, Type 316 (Type 316L for welded)
b. Interior and Architectural Use	ASTM F593, Type 304
11. Stainless Steel Bolts, Nuts, and Washers	ASTM F593 and ASTM F594, Type 316
12. Carbon Steel Bolts and Studs	ASTM A307, Grade A (hot dip galvanized nuts and washers where noted)

13. High Strength Steel Bolts, Nuts and washers	ASTM A325 (mechanically galvanized per ASTM B695, Class 50, where noted)
a. Elevated Temperature Exposure	Type I
b. General Application	Type I or Type II
14. Galvanizing	ASTM A123, Zn w/0.5 percent minimum Ni
15. Galvanizing, hardware	ASTM A153, Zn w/0.5 percent minimum Ni

2.03 ANCHORS, BOLTS AND FASTENING DEVICES

A. Anchor bolt material shall be ASTM F593 (316) unless otherwise noted.

B. Unless otherwise noted, expansion anchors shall be ASTM F593 (316) wedge type anchors complete with nuts and washers. Type 316 stainless steel, wedge type anchors shall be used where they will be submerged or exposed to the weather or where stainless steel wedge type anchors are required. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least 1-in behind the concrete reinforcing steel.

C. Compound masonry expansion anchors shall be lead expansion sleeve type anchors complete with nuts and washers. Anchors shall be precision die-cast zinc alloy with a minimum of two lead alloy expansion sleeves. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least 1-in behind the concrete reinforcing steel. Expansion anchors shall be Star Expansion Industries, Star Slugin or equal.

D. Adhesive capsule anchors shall be a two-part stud and capsule chemical resin anchoring system. Capsules shall contain premeasured amounts of polyester or vinyl ester resin, aggregate and a hardener contained in a separate vial within the capsule. Stud assemblies shall consist of an all-thread anchor rod with nut and washer.

E. Adhesive anchors, for fastening to hollow concrete block or brick, shall be a three-part stud, screen and chemical dispenser anchoring system. Adhesive cartridges shall contain premeasured amounts of resin and hardener which are mixed and deposited in a screen tube by a dispenser. Stud assemblies shall consist of an all-thread anchor rod with nut and washer. Anchors shall be Hilti HY 70 System or approved equal.

F. Automatic end welded headed anchor studs shall be flux ended studs made from cold drawn steel, ASTM A108 Grades C-1010 through C-1020. Headed anchor studs shall be Nelson, H4L Headed Concrete Anchors or equal.

G. Machine bolts and nuts shall conform to Federal Specification FF-B-575C. Bolts and nuts shall be hexagon type. Bolts, nuts, screws, washers and related appurtenances shall be Type 316 stainless steel.

H. Toggle bolts shall be Hilti, Toggler Bolt or equal.

2.04 MISCELLANEOUS ALUMINUM

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Welding shall be on the unexposed side as much as possible in order to prevent pitting or discoloration of the aluminum exposed surface. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

C. Miscellaneous aluminum items shall include: beams, angles, closure angles, hatches, floor plates, stop plates,, and any other miscellaneous aluminum called for on the Drawings and not otherwise specified.

D. Angle frames for hatches, beams, grates, etc, shall be complete with welded strap anchors attached.

E. Aluminum diamond plate and floor plate shall have a minimum thickness of 3/8-in. Frames and supports shall be of aluminum construction. Fastening devices and hardware shall be Type 304 stainless steel. Plates shall have a mill finish.

F. Miscellaneous aluminum items shall have a cleaned and degreased mill finish.

2.05 MISCELLANEOUS STEEL

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free

from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

C. Miscellaneous steel items shall include: beams, angles, lintels, metal stairs, support brackets, base plates for other than structural steel or equipment, closure angles, bridge crane rails, monorail hoist beams, holddown straps and lugs, door frames, splice plates, subframing at roof openings and any other miscellaneous steel called for on the Drawings and not otherwise specified.

D. Structural steel angle and channel door frames shall be shop coated with primer. Frames shall be fabricated with not less than three anchors on each jamb.

E. Steel pipe pieces for sleeves, lifting attachments and other functions shall be Schedule 40 pipe unless otherwise shown on the Drawings. Wall and floor sleeves, of steel pipe, shall have welded circumferential steel waterstops at mid-length.

F. Lintels, relief angles or other steel supporting masonry or embedded in masonry shall be shop coated with primer.

G. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust and foreign matter and shall be given one shop coat of primer compatible with the finish coat after fabrication but before shipment. Paint shall be omitted within 3-in of proposed field welds. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces.

H. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Coating shall be not less than 2 oz/sq ft of surface.

2.06 MISCELLANEOUS STAINLESS STEEL

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched.

Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

C. Miscellaneous stainless steel items shall include: beams, angles, bar racks and any other miscellaneous stainless steel called for on the Drawings and not otherwise specified.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all items except those to be embedded in concrete or other masonry which shall be installed under Division 3 and Division 4 respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted.

B. Abrasions in the shop primer shall be touched up immediately after erection. Areas left unprimed for welding shall be painted with primer after welding.

C. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damage area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint conforming to the requirements of Military Specifications MIL-P-15145. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight.

D. Specialty products shall be installed in accordance with the manufacturer's recommendations.

E. Expansion bolts shall be checked for tightness a minimum of 24 hours after initial installation.

F. Install adhesive capsule anchors using manufacture's recommended drive units and adapters and in compliance with the manufacturer's recommendations.

G. Headed anchor studs shall be welded in accordance with manufacturer's recommendations.

H. All steel surfaces that come into contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

I. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.

J. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.

K. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

END OF SECTION

SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Ladders and safety devices.

2. Safety Railing System.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1.04 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Drawings showing fabrication and installation of handrails and railings, including plans, elevations, sections, details of components, and attachments to other units of Work.

2. Where installed products are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by a qualified Professional Engineer, licensed in the state of Florida, responsible for their preparation.

3. Product Data for each type of product specified.

4. Samples for verification purposes of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

    a. 6-inch-long sections of each distinctly different linear railing member including handrails, top rails, posts, balusters, and ladder rungs.

    b. Fittings and brackets.

    c. Welded connections.

B. Product Test Reports:

1. Based on tests performed by qualified independent testing laboratory evidencing compliance of railing components and systems with requirements based on comprehensive testing of current products.

C. Quality Assurance Submittals:

1. Qualification data for firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Engineers and Owners, plus other information specified.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineering Responsibility: Engineer handrails and railing systems by qualified Professional Engineer legally authorized to practice in jurisdiction where Project is located. Design shall be in accordance with ASCE 7-10 and the 2014 Florida Building Code.

1.06 STORAGE

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.07 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field

measurements before fabrication; show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying Work, warranty dimensions and proceed with fabrication of products without field measurements. Coordinate other construction to ensure that actual dimensions correspond to warranted dimensions.

1.08 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:

1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

2. Mount handrails only on gypsum board assemblies reinforced to receive anchors and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Nonshrink, Nonmetallic Grouts:

a. "Bonsal Construction Grout," W.R. Bonsal Co.
b. "Kemset," Chem-Masters Corp.
c. "Diamond-Crete Grout," Concrete Service Materials Co.
d. "Sure-Grip High-Performance Grout," Dayton Superior Corp.
e. "Crystex," L&M Construction Chemicals, Inc.
f. "Vibropruf No. 11," Lambert Corp.
g. "Masterflow 713," Master Builders.
h. "Sealtight 588 Grout," W.R. Meadows, Inc.
i. "Sonogrout," Sonneborn Building Products Division, ChemRex, Inc.
j. "Stoncrete NM1," Stonhard, Inc.
k. "Five Star Grout," U.S. Grout Corp.

2. Erosion-Resistant Anchoring Cement:

a. "Super Por-Rok," Minwax Construction Products Division.

2.02 METALS

A. Provide metal forms and types that comply with requirements of referenced standards and that are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.03 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Pre-mixed, factory packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.

B. Interior Anchoring Cement: Factory pre-packaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

C. Erosion Resistant Anchoring Cement: Factory pre-packaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.04 LADDER

A. Fabricate ladders for locations shown, with dimensions, spacings, materials, details, and anchorages as indicated on Drawings. Comply with requirements of ANSI A14.3.

1. Provide nonslip surfaces on top of each FRP rung by factory applying a permanently bonded epoxy nonslip surface.

2. Provide nonslip surfaces on top of each metal rung by coating with abrasive material metallically bonded to the rung by a proprietary process.

a. Mebac, IKG Borden.

2.05 SAFETY RAILING SYSTEM

A. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, all accessories required for a complete installation, and complying with 29 CFR 1910.23 requirements.

1. Height: 42 inches above finished roof deck.

2. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.

3. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.

4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.

5. Pipe Ends and Tops: Covered or plugged with weather-resistant material.

6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

7. Fabricate joints that will be exposed to weather in a watertight manner.

8. Close exposed ends of handrail and railing members with prefabricated end fittings.

9. Fasteners: Manufacturer's standard.

B. Basis of Design: “Bil-Guard” Hatch Railing System by The Bilco Company.

2.06 SAFETY CAGES

A. Fabricate safety cages for locations shown with dimensions, spacings, materials, details, and anchorages as indicated on Drawings.

2.07 LADDER SAFETY DEVICES

A. Ladder climbing safety devices shall be provided for ladder lengths of 20 feet or greater. Certification that the equipment meets the requirements of Federal specifications, in lieu of testing as provided in the Federal specification, shall be submitted. Material of carrier rail and ladder rung clamps shall match ladder material. Ladder safety climbing device shall be SAF-T-CLIMB as manufactured by North Safety Products or approved equal. Provide 2 ladder safety harnesses to OWNER for use with device.

B. Provide wall mounted confined space commercial grade rescuer anchor point kit at access ladder locations as detailed and indicated on drawings.

2.08 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Railings to other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.

C. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work, except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.

D. Cast-In-Place and Post-Installed Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, load imposed within a safety factor of 4 as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Cast-in-place anchors.

2. Chemical anchors.

3. Expansion anchors.

2.09 FABRICATION

A. Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated on Drawings. Comply with requirements of ANSI A14.3.

1. Provide nonslip surface on top of each rung either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

B. Pre-assemble railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Welded Connections for steel and stainless steel: Fabricate railing systems and handrails for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

G. For handrails and railing systems that are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.

H. Fabricate joints that will be exposed to weather in a manner to exclude water.

I. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

J. Toe Boards: Provide toe boards at railings around openings and at the edge of open-sided floors and platforms unless otherwise indicated. Fabricate to dimensions and details indicated for connection to, and centered between, each railing post.

K. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.10 FINISHES

A. Comply with NAAMM Metal Finishes Manual for recommendations relative to application and designations of finishes.

B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are not acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples and they are assembled or installed to minimize contrast.

D. Galvanized Finish:

1. Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

a. ASTM A 153 for galvanizing iron and steel hardware.

b. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.

2. For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

3. For interior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

4. For interior steel railings formed from steel pipe with black finish, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

5. Factory-Primed Finish: Apply air-dried primer immediately following cleaning and pre-treatment, to provide a minimum dry film thickness of 2.0 mils per applied coat, to surfaces that will be exposed after assembly and installation and to concealed, nongalvanized surfaces.

E. Steel Finishes:

1. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation

specifications and environmental exposure conditions of installed metal fabrications:

a. Exteriors (SSPC Zone 1B): SSPC-SP6, "Commercial Blast Cleaning."

b. Interiors (SSPC Zone 1A): SSPC-SP7, "Brush-Off Blast Cleaning."

2. Apply shop primer to uncoated surfaces of handrails and railing components, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1, Paint Application Specification No. 1, for shop painting.

3. Shop Primer: Manufacturer's or fabricator's standard, fast curing, lead-free universal primer, selected for resistance to normal atmospheric corrosion, compatibility with substrate and field-applied finish paint system indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
   a. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Site.

3.02 INSTALLATION

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.

3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.

3.03 ANCHORING POSTS

A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

B. Anchor posts to concrete with circular or rectangular flanges, floor or wall type, as required by conditions, connected to posts and secured to concrete with expansion anchors.

3.04 RAILING CONNECTIONS

A. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

3.05 ANCHORING RAIL ENDS

A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor rail ends to metal surfaces with oval or round flanges.

1. Connect flanges to rail ends using nonwelded connections.

2. Bolt flanges to metal surfaces.

C. Install removable railing sections where indicated in slip-fit sockets of same material surface mounted to concrete. Accurately locate sockets to match post spacing.

3.06 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 of these specifications.

C. For galvanized surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

3.07 PROTECTION

A. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Rough carpentry for the following:

1. Wood grounds, nailers, and blocking.

2. Plywood backing panels.

B. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to this Section.

1.02 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and which is generally not exposed, except as otherwise indicated.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under Section. Shop Drawing submittals shall include:

1. Product Data: Manufacturer's specifications and installation instructions for materials listed below:

2. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.

3. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and conformance with applicable standards.

4. For water-borne treatment, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to Site.

5. Fire-Retardant Treatment: Certification by treating plant that treated material complies with specified standard and other requirements.

1.04 PRODUCT HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.05 PROJECT CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other Work.

PART 2 - PRODUCTS

2.01 LUMBER

A. Lumber Standards: Manufacture lumber to comply with PS 20, American Softwood Lumber Standard, and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

1. SPIB - Southern Pine Inspection Bureau.

2. WCLIB - West Coast Lumber Inspection Bureau.

3. WWPA - Western Wood Products Association.

C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20 for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide lumber with 15 percent maximum moisture content at time of dressing and shipment for Sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.02 BOARDS

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 15 percent maximum, "MC-15."

2. Where transparent or natural finish or no finish is indicated, provide Redwood, Select Heart Grade (RIS).

3. Where painted finish is indicated, provide No. 1 Boards per SPIB rules, Select Merchantable Boards per WCLIB rules, or No. 2 Common Boards and Better per WWPA rules.

2.03 MISCELLANEOUS UNTREATED LUMBER

A. Provide wood for support or attachment of other Work including bucks, nailers, blocking, furring, grounds, stripping, cants, rooftop equipment bases and support curbs, and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

1. Moisture content: 15 percent maximum.

2. Grade: Standard grade, light framing size lumber of any species or board size lumber as required. No. 2 Common or Standard grade boards per WCLIB or WWPA rules or No. 2 boards per SPIB rules.

2.04 TREATED LUMBER

A. Rooftop Equipment Curbs, cant strips, support bases, and wood which will come in contact with water or concrete shall be No. 2, Grade dense or better, Southern Yellow Pine or Douglas Fir, moisture content of 15 percent maximum. All of the above shall be treated as specified under wood treatment for termite and decay protection.

2.05 CONSTRUCTION PANELS

A. Standards: Comply with PS 1 U.S. Product Standard for Construction and Industrial Plywood for plywood panels and, for products not manufactured under PS 1 provisions, with APA Performance Standard and Policies for Structural-Use Panels, Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire retardant treated-plywood panels with grade designation, APA C-D PLUGGED INT, with exterior glue, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch.

2.06 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

2.07 WOOD TREATMENT BY PRESSURE PROCESS

A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark requirements.

1. Pressure-treat aboveground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 15 percent. Treat indicated items and the following:

B. Fire-Retardant Treatment: Where fire-retardant-treated wood ("FRTW") is indicated, pressure impregnate lumber with fire-retardant chemicals to comply with AWPA C20 for treatment type indicated below; identify "FRTW" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection, or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Interior Type A: Use where "FRTW" wood is indicated for interior applications.

2. Exterior Type: Use where "FRTW" wood is indicated for exterior, exposed applications.

3. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power driven fasteners.

2. Published requirements of metal framing anchor manufacturer.

3. Table 2304.9.1, "Fastening Schedule," in the Michigan Building Code.

D. Countersink nail heads on exposed carpentry work and fill holes.

E. Use common wire nails except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

F. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Comply with applicable recommendations contained in Form No. E 30K, APA Design/Construction Guide - Residential and Commercial, for types of plywood products and applications indicated.

1. Comply with "Code Plus" provisions in above-referenced guide.

3.04 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered

borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06600

FRP FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. FRP structural shapes.

2. FRP gratings, decking, and frames.

1.02 DEFINITIONS

A. Definitions in ASTM E 985 for railing related terms apply to this Section.

B. Pultrusion: Process of pulling fiberglass rovings (strands), mats, and other forms of reinforcements such as woven fiberglass through baths of thermosetting liquid resin, and then through a heated forming die (made of steel) to form a completed composite fiberglass structural shape.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

Structural Performance: Design, engineer, fabricate, and install the following FRP fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each FRP fabrication.

A. Design Criteria:

1. All FRP connections shall be 316 Stainless Steel.

2. All primary and secondary supports shall be stainless steel, designed and furnished by the FRP manufacturer.

3. All perimeter edge support angles shall be FRP.

B. Structural Performance: Gratings, planking and access hatches shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Elevated Platforms and floor grating: Uniform load of 200 lb/sq. ft. or concentrated load of 300 lb.

2. Deflection shall be limited as follows:

    a. FRP structural shapes: L/240

    b. FRP grating and decking: 0.25 inches

1.04 SUBMITTALS

A. Shop Drawings: Submit in accordance with Division 1 specifications, Working Drawings, and Samples covering the items included under this Section. Shop Drawing submittals shall include:

1. Shop Drawings detailing fabrication and erection of each FRP fabrication indicated. Include plans, elevations, sections, and details of FRP fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

2. Product Data for products used in miscellaneous FRP fabrications including paint products and grout.

3. Where installed FRP fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified Professional Engineer, licensed in the state of Florida, responsible for their preparation.

4. Samples representative of materials and finished products as may be requested by ENGINEER.

B. Quality Control Submittals: Qualification data for firms and persons specified in "Quality Assurance" Paragraph to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects, Engineers and Owners, and other information specified.

1.05 QUALITY ASSURANCE:

A. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in Work.

1. Arrange for installation of FRP fabrications specified in this Section by same firm that fabricated them.

B. Engineer Qualifications: Professional Engineer licensed to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar

in material, design, and extent to that indicated for this Project shall sign and seal the shop drawings.

1.06 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which FRP fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. FRP Grating, and Frame Materials:

a. Fibergrate Composite Structures: Safe-T-Span Pultruded Industrial Series Grating T5020 Series

b. Enduro XL6 Tank Cover System

c. Seasafe Fiberglass Grating and Structural Systems

d. Strongwell SAFPLANK fiberglass plank system

e. Or alternative manufacturer approved by architect, design engineer, and owner.

2.02 FRP SURFACES

A. For FRP fabrications exposed to view upon completion of Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for FRP sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. FRP resin shall be a corrosion resistant, fire resistant, pultruded-type premium grade isophthalic polyester.

2.03 MATERIALS

A. FRP structural shapes shall be manufactured using a pultruded process utilizing either flame-retardant isophthalic polyester containing an ultraviolet (UV) inhibitor. A synthetic surface veil shall be the outermost layer of reinforcement covering the entire exterior surface. The FRP shapes shall achieve a flame spread of 25 or less in accordance with ASTM test method E 84. The exterior of the pultruded shapes shall have a 1 mil (0.025 mm) minimum polyurethane protective coating for added UV protection. Dimensional tolerances shall be in accordance with ASTM specification D 3917. FRP shapes shall comply with the following material properties:

Table 1 - Fiberglass Pultruded Material Properties

Material Properties	**ASTM Test Method**	**Psi (MPa)**
Pultruded Fiberglass Structural Shapes		
Ultimate tensile strength in longitudinal direction	D 638	30,000 (207), minimum
Ultimate compressive strength in longitudinal direction	D 695	30,000 (207), minimum
Ultimate felexural strength in longitudinal direction	D 790	30,000 (207), minimum
Ultimate shear strength in longitudinal direction	D 3846	5,500 (38), minimum
Ultimate tensile strength in transverse direction	D 638	7,000 (48), minimum
Ultimate compressive strength in transverse direction	D 695	15,000 (103), minimum
Ultimate flexural strength in transverse direction	D 790	10,000 (69), minimum
Ultimate shear strengthen transverse direction	D 3846	5,500 (38), minimum
Density (lb/in.^{3} (kg/mm^3))	D 792	0.065 (0.00180), minimum
Water absorption (24-h immersion)	D 570	0.60 max, percent by weight
Pultruded Fiberglass Sheet		
Ultimate tensile strength in longitudinal direction	D 638	20,000 (138), minimum
Ultimate compressive strength in longitudinal direction	D 638	20,000 (138), minimum
Ultimate flexural strength in longitudinal direction	D 790	30,000 (207), minimum
Ultimate shear strength in longitudinal direction	D 3846	5,500 (38), minimum
Ultimate tensile strength in transverse direction	D 638	10,000 (69), minimum
Ultimate compressive strength in transverse direction	D 695	15,000 (103), minimum
Ultimate flexural strengthen transverse direction	D 790	13,000 (90), minimum
Ultimate shear strength in transverse direction	D 3846	5,500 (38), minimum
Density (lb./in.^{3}(kg/mm^3))	D 792	0.064 (0.00177), minimum
Water absorption (24-h) immersion)	D 570	0.50 max, percent by weight

Material Properties	**ASTM Test Method**	**Psi (MPa)**
Thermal		
Thermal Coefficient of Expansion	D 696	5 x 10^{-6} (inches with degree F)***
Thermal Conductivity		4 Btu per sq. ft./hour/ degree F/in.
Specific Heat		0.028 Btu/lb. degree F
Electrical		
Electric strength, short term in oil, 1/8 inch	D 149	200 vpm*
Electric strength, short term, in oil		35 kV per inch**
Dielectric constant, 60 Hertz	D 150	5.6
Dissipation factor, 60 Hertz	D 150*	0.03
Arc resistance	D 495	120 seconds***
Flame Retardant Properties		
Flame resistance	FTMS 402-2023	75/75 Ign. burn seconds
Intermittent flame test	HLT-15	100 rating
Flammability test	D 635	****
Surface burning characteristics	E 84	25 maximum
Flammability class	UL 94	V-0
Temperature index	UL 94	130

Notes:

* Specimen tested perpendicular to laminate face.

** 1-inch long specimen tested parallel to laminate face using 2-inch diameter electrodes.

*** Indicates reported value measured in longitudinal direction.

**** Average time of burning = 0.5 second, average extent of burning = 15 minutes.

B. Fiberglass sheet or solid fiberglass bar shall be used to fabricate the internal connectors for the square tube. The internal connectors will be 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm) with length and angularity variable to meet the requirements of each connection. Angular connections shall be fabricated from fiberglass sheet bonded together using a bisphenol A/epichlorohydrin epoxy resin with an amine-curing agent to give a minimum thickness of 1-1/2 inches. The angular connections will be

fabricated to the proper dimension from the fiberglass sheets that have been bonded together.

Fiberglass sheet used for angular connections shall meet the properties specified in Table 1. Fiberglass solid bar, 1-1/2 by 1-1/2-inch, shall be used for the straight connections, and shall meet the properties specified in Table 1.

C. Rivets shall be nickel copper or nonmetallic.

D. Bolts shall be a minimum 3/8 inch (9.5 mm) diameter, 316 stainless steel. FRP bolts or fasteners are not permitted.

E. Adhesive used to bond internal connectors to fiberglass pultruded square tube shall be a bisphenol A/epichlorohydrin epoxy resin with an amine-curing agent.

2.04 FABRICATION

A. FRP Stairs and Treads: All stair components, stringers, frames, supports, and hangers, shall be of standard FRP structural shapes where specified.

1. The treads for the open riser type FRP stairs and landings shall be safety type similar to floor gratings with non-slip nosings.

2. See Standard Details on Drawings for construction details.

2.05 FRP GRATINGS, DECKING, AND FRAMES

A. Glass-fiber grating frames shall be fabricated from pultruded structural angles. No metallic fasteners shall be used.

B. Glass fiber decking shall consist of a solid flat plate bonded to square mesh type or pultruded type grating manufactured of continuous glass fibers completely wetted with polyester resin.

C. Glass fiber gratings shall be standard square mesh type or pultruded bar type manufactured of continuous glass fibers completely wetted with polyester resin.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and provide anchorages, setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be

embedded in concrete or masonry construction. Coordinate delivery of such items to Site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. All cut edges and holes shall be sealed with a compatible resin system containing an UV inhibitor.

E. All connections shall be made using a one-piece solid internal connector bonded to the interior of the square tube using an epoxy adhesive and riveted. The following types of connections are defined:

1. All bolted connections shall have a one-piece solid internal connector bonded to the interior of the square tube through which connector holes will be drilled. A minimum 1 inch (26 mm) length of the solid internal connector will be on each side of the drilled hole.

F. Additional solid internal connector pieces can be bonded with epoxy adhesive to the interior of the square tube as desired.

3.03 INSTALLATION OF FRP BAR GRATINGS AND DECKING

A. Install gratings and decking to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and/or bar sizes indicated, including installation clearances and standard anchoring details.

B. Secure removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach toe plates to gratings by bolting, at locations indicated.

D. Install removable railing sections where indicated in slip-fit sockets secured with expansion anchors into concrete. Accurately locate sockets to match post spacing.

E. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07100

WATER REPELLENT MASONRY COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This contract includes work to prevent water intrusion into the following structures where the exterior wall has been modified.

1. Process Building 75 (exterior walls of entire building).

2. Process Building 50 (exterior walls of Chemical Room 102 only).

The work includes pressure washing exterior wall surfaces (existing structures only), door and windows. Removal and replacement of existing sealants at expansion joints, doors, windows, vents, wall penetrations and grade level masonry joints. Miscellaneous hurricane protection devices shall be removed and replaced as needed to seal behind such obstructions.

Waterproofing shall be applied with two equal coats of specified product in accordance with the manufactures instruction in terms of surface, preparation, and product coverage.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1.03 SUBMITTALS

A. Submit under provisions of Section 01300- Submittals.

B. Product Specification Data: Submit manufacturer's technical literature, specifications, and application instructions for the specified clear water repellent material.

C. Samples: Obtain liquid samples of the specified clear water repellent for mock-up application. Mock-up application is covered in Section 1.04 QUALITY ASSURANCE.

D. Applicator Qualifications: Submit certification stating applicator has a minimum of three (3) years experience using the specified product. Provide a list of several most recently completed projects where the specified material was used. Include the project name, location, architect and method of application.

E. Environmental Regulations: Submit certification stating the water repellent material to be applied is in compliance with federal environmental Volatile Organic Compounds (VOC) regulations.

1.04 QUALITY ASSURANCE

A. Manufacturer: A firm with no less than (10) years experience in manufacturing the products specified in this section.

B. Applicator Qualification: A firm with no less than three (3) years experience in the application of the products specified in _this section: In addition, applicator must state the intended use of the proper application equipment and that it has been well maintained.

C. Mock-Up:

1. Apply water repellent per manufacturer's application, instructions as directed by the Architect to substrate material that matches actual job conditions. Determine the acceptability of appearance and optimum coverage rate required for application.

2. After sample treatment has cured in accordance with manufacturers recommendations, water test to verify that substrate is coated with sufficient water repellent to effectively repel liquid water from the surface.

3. Obtain Engineer and/or Project Owner approval prior to full scale application of water repellents.

D. Pre-Application Meeting: Convene a pre-application meeting prior to the start of application of the specified material attended by the Contractor, the Engineer, and the water repellent manufacturer. Each of the attendees shall be notified by the Contractor at least three (3) days prior to the meeting time.

1.05 PRODUCT DELIVERY

A. Material Delivery: Deliver materials to the job site in original sealed containers, clearly marked with manufacturer's name, brand name, and type of material. Verify the product matches that of the original sample applied on the mock-up wall.

B. Record Keeping: Contractor/applicator shall record product batch number or lot number for warranty purposes.

C. Storage & Protection: Store materials inside if possible, away from sparks and open flame. Store in a secure area to avoid tampering and contamination. Water based materials must be kept from freezing. Store and handle in accordance with manufacturers written instructions.

1.06 PROJECT CONDITIONS

A. Surface Preparation: Surface must be free of cracks, dirt, oils, paint or other contaminants which may affect the appearance or performance of the water repellent material.

B. Environmental Requirements:

1. Air and substrate temperature must be above 45°F (7°C) or below 95°F (35° C) unless otherwise specified by manufacturer.

2. Do not proceed with application if the substrate is wet or contains frozen water.

3. Do not apply material when rain is predicted within 48 hours; or earlier than five (5) days after the substrate became wet.

4. Do not apply materials in high or gusty winds.

C. Protection:

1. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.

2. Protect shrubs, metal, wood trim, glass, asphalt and other building hardware during application from over-spray.

3. Do not permit spray mist or liquid to drift onto surrounding properties.

1.07 SCHEDULING

A. Engineer shall be notified not less than 48 hours before each application of water repellent is scheduled.

1.08 WARRANTY

A. Contractor shall provide a warranty against water intrusion through above grade concrete and masonry surfaces for a period of one (1) year from the date of application. Warranty does not include deterioration failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints or cracks in excess of 1/16 inch, fire, vandalism, or abuse by maintenance equipment.

B. Complete and submit the manufacturer's "Pre-Application Warranty Form" to manufacturer a minimum of ten (10) days prior to application.

C. After completion of the water repellent application, submit manufacturer's "Warranty Application" to manufacturer for processing. Include material batch number/lot number previously recorded. Upon receiving a validated warranty, submit copies to Engineer and building owner.

D. Contractor shall replace any vegetation, in kind, that has died due to overspray during the three (3) month period following final completion of work. The definition of vegetation includes but is not limited to grass, shrubbery, and trees.

1.09 PERFORMANCE REQUIREMENTS

A. Provide water repellents with the following properties based on testing manufacturers standard products, according to test methods indicated, applied to substrates simulating Project conditions using same material and application methods to be used for Project.

1. Water Vapor Transmission: Maximum 8 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens per ASTM E-96.

2. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E-514.

3. Durability Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G-53.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable manufactures shall be as follows:

1. Chemprobe Coating Systems, L.P - Masonry Division of Tnemec Inc. 2805 lndustrial Lane, Garland TX. 75041 - PH l-800-760-6776

2. Degussa Building Systems, 889 Valley -Park Drive, Shakopee, MN 55379 PH 386-679-7597

3. Or Approved Equal.

2.02 WATER REPELLENT

A. GENERAL: All products shall be solvent based, less than 600 grams per liter VOC, and a blend of silane and siloxane.· No fillers, sterates, paraffins will be allowed. Products shall be a minimum ·of 42 percent solids.

1. PRIME A PELL PLUS – by Masonry Division of Tnemec Inc.

2. ENVIROSEAL PBT BY – by Degussa Building Systems

3. Or Approved Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify the following:

1. The required joint sealants have been installed.

2. New masonry and mortar has cured a minimum of twenty-eight (28) days.

3. Surface to be treated is clean, dry and contains no frozen water.

4. Environmental conditions are appropriate for application.

3.02 PREPARATION

A. Protection:

1. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.

2. Protect shrubs, metal, wood trim, glass, asphalt and other building hardware during application from over-spray.

3. Do not permit spray mist or liquid to drift onto surrounding properties or parking lots.

B. Other:

1. Verify lawn sprinklers are turned off where applicable, so as to avoid water contact prior to cure times required by the manufacturer.

3.03 APPLICATION

A. Apply specified water repellent in accordance with manufacturer's written application instructions at a rate of 65-85 square feet per gallon for the first pass and 75-100 sq feet per gallon for the second pass.

B. Material must be applied using solvent resistant, low-pressure application equipment designed for water repellent application.

C. Apply material as shipped by the manufacturer. Do not dilute or thin.

D. Apply saturating application of the product working from the bottom up. On porous substrates such as concrete masonry units allow a slight rundown (less than three inches). On high density materials such as pre-cast concrete panels, do not allow any run-down. On all substrates allow the product to penetrate the substrate for approximately 5-7 minutes, then apply again in the same manner. This second pass will require less material.

3.04 FIELD QUALITY CONTROL

A. The Engineer shall be contacted 48 hours prior to application so as to provide supervision as required. The architect or the architect's representative shall inspect the progress as the work proceeds. Do not apply any water repellent that is not specified by the Engineer.

B. After water repellent has cured for six (6) days at low humidity and temperature between 70°-90°F or eight (8) days at high humidity and low temperature between 50°-69° F, all surfaces shall be tested with a light water spray. Recoat any area that indicates water absorption after the water test has completely dried.

3.05 CLEANING

A. Remove protective coverings from adjacent surfaces and other protected areas.

B. Immediately clean water repellent coating from adjoining surfaces and surfaces soiled by water-repellent application as work progresses.

C. At completion, remove from the job site, all excess material, debris, and waste resulting from this work. Dispose of water repellent containers according to state and local environmental regulations.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of each form and type of joint sealer as indicated on Drawings and Schedules.

B. Section includes joint sealers for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below.

a. Control and expansion joints in unit masonry.
b. Joints between different materials.
c. Perimeter joints between materials and frames of doors and windows.
d. Other joints where indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below.

a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
b. Joints between different materials.
c. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below.

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings.
c. Perimeter joints of toilet fixtures.
d. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below.

a. Control and expansion joints in cast-in-place concrete slabs.
b. Other joints where indicated.

C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 SYSTEM PERFORMANCE

A. Provide joints sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Submittals covering items included under this Section. Shop Drawing submittals shall include:

1. Product Data from manufacturer for each joint sealer product required, including instructions for joint preparation and joint sealer application.

2. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view.

3. Samples for verification purposes of each type and color of joint sealer required. Install joint sealer samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealers.

4. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.05 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 degrees F (4.4 degrees C).

2. When joint substrates are wet due to rain, frost, condensation, or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.06 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealers to occur not less than 21 or more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Multi-Part Nonsag Urethane Sealant for Use NT:

a. "Dymeric 240," Tremco, Inc.
b. "Dynatrol II," Pecora Corp.
c. “Sikaflex 2c NS”, Sika Corp.

2. One-Part Nonsag Urethane for Use NT:

a. "Dymonic," Tremco, Inc.
b. "Dynatrol I-XL," Pecora Corp.
c. "Sikaflex-15LM," Sika Corp.

3. One-Part Nonsag Urethane Sealant for Use T:

a. "Sonolastic NP 1," BASF Building Systems.
b. “MasterSeal NP 1,” BASF Building System
c. "Sikaflex-1a,"Sika Corp.
d. "Vulkem 45 SSL," Tremco Sealant/Weatherproofing Division, RPM.

4. One-Part Pourable Urethane Sealant for Use T:

a. "Chem-Calk 950," Bostik Construction Products Division.
b. "Urexpan NR-201," Pecora Corp.
c. "Sikaflex–1CSL," Sika Corp.
d. "Vulkem 45," Tremco Sealant/Weatherproofing Division, RPM.

5. Multi-part Nonsag Immersible Polysulfide or Polyurethane Sealant:

    a. "Synthacalk GC-2+," Pecora Corp.
    b. "Sonolastic Polysulfide Sealant," Sonneborn, Degussa Building Systems.
    c. "Vulkem 116," Tremco Sealant/Weatherproofing Division, RPM (non waste water facilities)

6. Pre-formed Foam Sealant:

    a. Horizontal and Traffic Applications:
        1) "Emseal 20H," Emseal Corp.
        2) "Will-Seal EPS," Will-Seal Construction Foams Dw., Illbruck.

    b. Vertical Applications Above Grade (Control and Expansion Joints):
        1) "Emseal Greyflex," Emseal Corp.
        2) "Polytite Standard," Sandell Manufacturing Co., Inc.
        3) "Will-Seal 150," Will-Seal Construction Foams Dw., Illbruck.

    c. Below Grade Applications:
        1) "Emseal 20H," Emseal Corp.
        2) "Will-Seal 250," Will-Seal Construction Forms Dw., Illbruck.

    d. Pre-formed Hollow Neoprene Gasket:
        1) The D.S. Brown Co.
        2) Watson-Bowman and Acme Corp.
        3) Williams Products, Inc.

7. Foamed-In-Place Fire-Stopping Sealant:

    a. "Dow Corning Fire Stop Sealant," Dow Corning Corp.
    b. "Pensil 851," General Electric Co.

8. One-Part Fire-Stopping Sealant:

    a. "Dow Corning Fire Stop Sealant," Dow Corning Corp.
    b. "Fyre Putty," Standard Oil Engineered Materials Co.
    c. "Metachaulk 1100," The RectorSeal Corporation.
    d. "RTV 7403," General Electric Co.
    e. "3M Fire Barrier Caulk CP-25," Electrical Products Division/3M.

9. Joint Sealant Backing:

    a. Expand-o-Foam, 1380 Series, Williams Products, Inc.

10. Joint Fillers for Concrete:

    a. Cementone, W.R. Meadows.

b. Concrete Grey Sponge Rubber, 1300 Series, Williams Products, Inc.

2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application as demonstrated by sealant manufacturer based on testing and field experience.

2.03 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for type, grade, class, and uses.

Abbreviations

Types, Grade, Uses (Exposure)

S	Single component	Type
M	Multi-component	Type
P	Pourable	Grade
NS	Nonsag	Grade
NT	Nontraffic	Use
T	Traffic	Use
I	Immersion	Use

Uses (Joint Substrates)

A	Aluminum
O	Other
G	Glass
M	Mortar

Class

25 - Percent Movement Capability

B. Multi-Part Nonsag Urethane Sealant for Use NT: Type M, Grade NS, Class 25, and complying with the following requirements for Uses:

1. Uses NT, M, A, and, as applicable to joint substrates indicated, O.

2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

C. One-Part Nonsag Urethane Sealant for Use NT: Type S, Grade NS, Class 25, and Uses NT, M, A, and, as applicable to joint substrates indicated, O.

1. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

D. One-Part Nonsag Urethane Sealant for Use T: Type S, Grade NS, Class 25, and complying with the following requirements for Uses:

1. Uses T, NT, M, G, A, and, as applicable to joint substrates indicated, O.

2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

E. One-Part Pourable Urethane Sealant for Use T: Type S, Grade P, Class 25, and complying with the following requirements for Uses:

1. Uses T, M, A, and, as applicable to joint substrates indicated, O.

2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

F. Multi-Part Nonsag Polysulfide or Polyurethane Sealant for Uses T, NT, I: Type M, Grade NS, Class 25, and complying with the following requirements for Uses:

1. Uses T, NT, I, M, G, A, and, as applicable to joint substrates indicated, O.

2. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

2.04 COMPRESSION SEALS

A. Pre-formed Foam Sealant: Manufacturer's standard pre-formed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellant agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealers.

2. Impregnating Agent:

    a. Chemically stabilized acrylic (EMSEAL).

    b. Neoprene rubber suspended in chlorinated hydrocarbons (WILL-SEAL).

    c. Polymerized polybutylene (POLYTITE).

3. Density: 8 - 10 pounds per cubic foot.

4. Backing: None.

B. Pre-formed Hollow Neoprene Gasket: Manufacturer's standard pre-formed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile, and cross-sectional design.

2.05 JOINT SEALANT BACKING

A. Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Pre-formed, compressible, resilient, nonwaxing, nonextruding strips of flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

D. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to –26 degrees F (–15 degrees C). Provide products with low compression set and of size and shape to provide a secondary seal, control sealant depth, and otherwise contribute to optimum sealant performance.

E. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealer substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturer of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, do not leave oily residues, or otherwise have a detrimental effect on sealant adhesion or in-service performance.

C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

2.07 JOINT FILLERS FOR CONCRETE

A. Provide joint fillers of thickness and widths indicated.

Sponge Rubber Joint Filler: Pre-formed strips complying with ASTM D 1752 for Type I.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Installer Qualifications: Engage an installer who has successfully completed, within the last 3 years, at least 3 joint sealer applications similar in type and size to that of this Project.

3.02 EXAMINATION

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust, paints (except for permanent, protective

coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealers, oil, grease, waterproofing, water repellants, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.04 INSTALLATION OF JOINT SEALERS

A. Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.

b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.

d. See Standard Detail on Drawings for face brick control joint application.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

4. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

a. Note: Install all sealant in interior joints after painting of adjoining surfaces have been performed. Do not paint over sealant joints.

D. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 6A in ASTM C 962 unless otherwise indicated.

2. Provide flush joint configuration per Figure 6B in ASTM C 962 where indicated.

3. Use masking tape to protect adjacent surfaces of recessed tooled joints.

4. Provide recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.

E. Installation of Pre-formed Foam Sealants: Install each length of sealant immediately after removing protective wrappings, taking care not to pull or stretch material, and complying with sealant manufacturer's directions for installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

F. Installation of Pre-formed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections, provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gaskets together to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 to 1/4 inch.

3.05 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as Work progresses, by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original Work.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

SECTION 08220

FIBERGLASS REINFORCED PLASTIC DOORS AND ALUMINUM FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Section includes fiberglass reinforced plastic (FRP) doors and frames.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) Specifications

1. A 123 Zinc Coatings
2. C 591-01 Unfaced Preformed Rigid Cellular Polyisocyanurate.
3. C 728-97 Insulation Board, Mineral Aggregate
4. E 330-97 Structural Load Test
5. E 1996 Wind Load Test
6. E 1886 Impact Test Procedures (inclusive of Large Missile Impact)

C. Door and Frame Preparation for Hardware, American National Standard Institute Specifications (ANSI)

D. Recommended Locations for Builder's Hardware, Door and Hardware Institute (DHI)

E. Aluminum Association, Inc. (AA).

1. AA5005-H14 Sheet Architectural.
2. AA6061-T6 Heavy Duty Structures.
3. AA6063-T5 Extrusions, Pipe, Architectural.
4. AA DAF-45 Designation System for Aluminum Finishes.

F. American Architectural Manufacturers Association (AAMA)

1. AAMA 2603-98 Pigmented Organic Coatings

2. AAMA 609 Anodized Architectural Finishes Cleaning and Maintenance.

3. AAMA 611-98 Anodized Architectural Standards.

1.03 PERFORMANCE REQUIREMENTS

A. Exterior FRP doors shall be designed to meet wind-loading requirements for the KBC. Refer to Structural Drawings for wind and design pressures.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300. Include copies of manufacturer's specifications for fabrication and installation including certifications, data and test reports substantiating that products comply with requirements.

B. Submit shop drawings showing sizes and complete details of doors. Include details of core and edge construction, trim for openings and similar components. Include finishing specifications for doors to receive factory-applied shop finish.

C. Provide a schedule of doors and frames using same reference designations for details and openings as indicated on the Contract Drawings.

D. Furnish to the Owner six (6) copies of an Operating and Maintenance Data in accordance with Section 01730. The manual shall consist of maintenance instructions for doors and frames; catalog pages for each product; name, address and phone number of the local representative of each manufacturer; and copy of the approved shop drawings.

1.05 PRODUCT HANDLING

A. Doors are to be stacked flat in a dry and protected area in original cartons prior to installation. Provide blocking or staging to protect door surfaces. Do not drag doors across one another. Lift doors and carry them into position. Identify each door with individual opening designations, as indicated on the approved shop drawings, using concealed markings.

1.06 WARRANTY

A. Submit written agreement in door manufacturer's standard form signed by manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have separated, delaminated from the core, expansion of the core, or otherwise failed due to defects in material and workmanship, improper installation

or corrosion from a specified environment, for a period of not less than five (5) years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Marshall/Vega Corporation, Marshall, Arkansas.

B. Cline Aluminum Doors, Inc., Bradenton Florida.

C. Tiger Door, LLC

D. Substitutions: Manufacturers and model numbers listed are to establish a standard of quality. Similar items by other manufacturers that are equal in design, function and quality will be considered for prior approval provided required data and physical samples are submitted under provisions of Section 01300.

2.02 FIBERGLASS REINFORCED PLASTIC (FRP) DOORS

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish.

B. FRP Door Composite Components: Minimum 3-ply composite laminated construction to include:

1. Facing: 0.120-inch (3.05 mm) composite FRP panel exterior grade, UV-protected fiber reinforced polyester panel on interior and exterior faces. Ultraviolet inhibitors shall be maximum amount formulated within the resin. Exterior and interior FRP panels shall be a Class C Flame Spread: Maximum of 75, and Smoke Developed Rating of 450 or less (ASTM E 84)
2. Surface texture will be pebble embossed with a non-directional pattern.
3. All mylar transporter fabrication film must be removed from FRP face sheets prior to door fabrication.
4. FRP face panels shall be USDA accepted with minimal porosity.
5. Face sheet shall be bonded to core and backup tube from edge to edge of door.
6. FRP face sheets shall be a Class C Flame Spread: Maximum of 75 and Smoke Developed rating of 450 or less (ASTM E 84), for both interior and exterior faces of interior and exterior doors.
7. Core: Organic materials shall be used to form a marine grade honeycomb core with high compression strength of 94.8 psi (ASTM C365), and internal aluminum hardware backup tube.

8. Hardware Backup: The hardware backup tube shall be a minimum 4.25-inches (107.95 mm) in width, 1.375-inches (34.93 mm) in depth with a wall thickness of 0.125-inches (3.18 mm). Contiguous for the full perimeter of the door to allow for all specified and non-specified hardware reinforcement.
9. Hardware Prep: Basic to include mortise lock edge prep or cylindrical lock prep; and pairs prepped for flush bolts, if required.
10. Bonding Agent: Environmentally friendly adhesive with strength buildup of 350 pounds per square inch (24.6 kg/cm^2).
11. Perimeter Door Trim: Wall thickness of 0.050-inch (1.25 mm) minimum in 6063-T5 extruded aluminum alloy with special beveled edge cap design and integral weather stripping on lock stile.
12. Replaceable Door Trim: Mechanically fastened to the hardware backup tube, allowing for replacement in the field, if damaged.
13. Trim Finish: To have minimum of a Class I anodized finish.
14. Weather stripping: Replaceable wool pile with nylon fabric, polypropylene backing meeting AAMA 701standards. Applied weather stripping not acceptable.
15. Materials: Only nonferrous, non-rusting members shall be acceptable, including tie rods, screws and reinforcement plates.
16. Regulations: All components and agents to meet EPA standards.
17. Color: As indicated on plans or, if not otherwise indicated, as selected by Owner from manufacturers' full range of standard colors.

C. Door Louvers:

1. Blades and Frames: 6063 –T5 extruded aluminum alloy, 0.062 inch minimum thickness. Louver blades shall be inverted "Y" type.
2. Insect Screens: 18-16 mesh, 0.111 inch diameter aluminum set in 6063 –T5 extruded aluminum alloy frame, 0.050 in minimum thickness.
3. Louver shall have minimum of 50% free air flow.

2.03 Aluminum Frames:

A. Frame Components: Extruded channel (tubular) 6063-T5 aluminum alloy, minimum wall thickness 0.125 inches; cut corners square and joinery shall be mechanical with no exposed fasteners

B. Profile: Open back with applied stop (OBS), 1.75 inches x 6".

C. Hinge and Strike Mounting Plates: Extruded aluminum alloy bar stock, 0.187r thick mounted in concealed integral channel with no exposed fastners.

D. Door Stop: No screw on stops acceptable.

E. Frame Finish: Shall be Clear anodic coating; AA-M12C22A31 Class II mechanical finish, non-specular, with chemical medium matte etch, minimum thickness 0.4 mil.

F. Color: As indicated on plans or, if not otherwise indicated, as selected by Owner from manufacturers' full range of standard colors.

2.04 Accessories:

A. Fasteners: Aluminum, nonmagnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.

1. Do not use exposed fasteners.

B. Brackets and Reinforcements: Manufacturer's high strength aluminum units where feasible, otherwise nonferrous stainless steel.

C. Bituminous Coating: Cold applied asphaltic mastic, compounded for 30 mil thickness per coat.

2.05 OBSERVATION WINDOW FRP FRAME

A. Provide observation window FRP frames as shown on Drawings and Schedules. Frames shall be double rabbeted, 1/8-inch minimum thickness FRP, depth as shown or scheduled, with 2-inch jamb and sill widths. Head section shall be heights as shown or required. Frames shall be fabricated with mitered and bonded corners with concealed fasteners. Provide glass stops and appropriate anchors for securely holding frames in walls.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify upon delivery that all doors and frames comply with the approved shop drawings and meet the indicated requirements for type, size, location and swing. Examine each opening for conditions that would prevent the proper application of doors, frames and related items. Do not proceed until defects are corrected.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors.

B. Anchor frames to adjacent construction in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.

1. Seal metal-to-metal joints between framing members using good quality elastomeric sealant.

C. Where aluminum surfaces contact with metals other than stainless steel, zinc or small areas of white bronze, protect from direct contact by one or more of the following methods.

1. Paint dissimilar metal with one coat of heavy-bodied bituminous paint.
2. Apply good quality elastomeric sealant between aluminum and dissimilar metal.
3. Paint dissimilar metal with one coat of primer and one coat of paint recommended for aluminum surface applications.
4. Use non-absorptive tape or gasket in permanently dry locations.

D. Hang doors with required clearances as follows:

1. Hinge and Lock Stiles: 0.125 inch (3.18 mm).
2. Between Meeting Stiles: 0.250 inch (6.35 m).
3. At Top Rails: 0.125 inch (3.18 mm).
4. Between Door Bottom and Threshold: 0.125 inch (3.18 mm).

E. Adjust doors and hardware to operate properly.

F. Install hardware for doors of this section.

G. Installation of door hardware is specified in Section 08710.

3.03 CLEANING

A. Upon completion of installation thoroughly clean door and frame surface in accordance with AAMA 609.

B. Do not use abrasive, caustic or acid cleaning agents.

3.04 PROTECTION

A. Protect products of this section from damage caused by subsequent construction until substantial completion.

B. Repair damage or defect products to original specified condition in accordance with manufacturer's recommendations.

C. Replace damaged or defective products that cannot be repaired to the Architect's acceptance.

END OF SECTION

SECTION 08330

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Overhead coiling doors as indicated on Drawings and Schedules. Types of overhead coiling doors include the following:

1. Insulated overhead doors.
2. Motorized-operated doors.

B. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanism, hardware, operators, and installation accessories.

C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 PERFORMANCE REQUIREMENTS

A. Wind Loading: Design and reinforce overhead coiling doors to withstand a 45 pounds per square foot (180 mph) factored wind loading pressure unless otherwise indicated. Refer to Structural design criteria and components and cladding wind pressure schedule on Structural drawings for additional information.

B. Windborne-Debris-Impact-Resistance Performance: Provide impact-protective reinforce overhead coiling doors to pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Product Data: Submit manufacturer's product data, electric operator wiring diagram, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door.

1.04 QUALITY ASSURANCE

A. Provide each overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting, and installation components.

B. Inserts and Anchorages: Provide inserts and anchoring devices which must be set in concrete or built into masonry for installation of units. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

1. Refer to Section 04200 for installation of inserts and anchorage devices.

C. Provide Florida FL Product Approval Number on overhead door shop drawing submittal.

1.05 WARRANTY

A. Special Warranty: Submit a written warranty, executed by CONTRACTOR, Installer, and overhead door manufacturer, agreeing to repair or replace unit and components which fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to, structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation of hardware and operator system, and deterioration of paint finish, metals, metal finishes, and other materials beyond normal weathering.

1. Submit written warranty in accordance with Division 1: Warranties.

2. Warranty period is 10 years after date of Final Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Atlas Door Corp.
2. The Cookson Co.
3. Cornell Iron Works, Inc.
4. Kinnear Division, Harsco Corp.
5. Mahon Rolling Door Division, RCM Corp.
6. North American Rolling Door, Inc.

7. Overhead Door Corp. (Basis of Design)
8. Raynor Manufacturing Co.
9. Windsor Door Division, The Ceco Corp.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading, of continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gauge recommended by door manufacturer for size and type of door required, and as follows:

1. Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with zinc-rich premium coating system for caustic environments, complying with ASTM A 525, and phosphate treated before fabrication.

2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane- foam type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectfully, according to ASTM E 84. Enclose insulation completely metal slat faces.

3. Inside Curtain Face: To match material of outside metal curtain face.

B. Endlocks: Galvanized metal castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Unless otherwise recommended by door manufacturer, provide windlocks on doors exceeding 16 feet wide. Space windlocks approximately 24 inches o.c. on both edges of curtain.

D. Bottom Bar: Consisting of two angles, each not less than 1-inch by 1-inch by 1/8-inch-thick, galvanized or stainless steel or aluminum extrusions to suit type of curtain slats.

1. Provide a replaceable gasket of flexible vinyl or neoprene between angles as a weather seal and cushion bumper for manually operated doors unless shown as an overlapping joint.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build-up units with minimum 3/16-inch-thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.

F. Secure continuous wall angle to wall framing by 3/8-inch minimum bolts at not more than 30 inches o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise indicated. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain and continuous bar for holding windlocks.

G. Weather Seals: Provide neoprene weather stripping for exterior exposed doors, except where otherwise indicated. At door heads, use 1/8-inch thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8-inch thick continuous strip secured to exterior side of jamb guide.

2.03 COUNTERBALANCING MECHANISM

A. Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and mounted in a spring barrel and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03 inch per foot of span under full load.

1. Provide spring balance of one or more oil tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

2. Fabricate torsion rod for counterbalance shaft of case-hardened steel, of required size to hold fixed spring ends and carry torsional load.

C. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.

D. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and any portion of between-jamb-mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

1. Fabricate hoods for doors of not less than 24 gauge galvanized steel.

2.04 PAINTING

A. Shop clean and prime ferrous metal and galvanized surfaces, exposed and unexposed, except faying and lubricated surfaces, with door manufacturer's standard rust-inhibitive primer. Finish coating of door shall be factory applied manufacturer's premium finish (fusion bonded epoxy coating) for enhanced durability in caustic environments. Color as selected by Owner from manufacturers' full range of standard available colors.

2.05 ELECTRIC DOOR OPERATORS

A. Provide electric door operator assembly of size and capacity recommended, and provided by door manufacturer complete with electric motor and factory pre-wired motor controls, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.

B. Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so that motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.

D. Door Operator Type: Provide wall- or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for emergency manual operation. Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.

E. Electric Motors: Provide high-starting torque, reversible constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction from any position at not less than 2/3 foot or more than 1 foot per second.

1. Coordinate voltage, wiring requirements, and current characteristics of motors with building electrical system. (See electrical Drawings for NEMA type area classifications.).

2. Provide open drip-proof type motor and controller with NEMA Type 4X enclosure.

F. Automatic Closing: Provide automatic closing device and governor, operating when activated by temperature rise and melting of 160 degrees F (71 degrees C) fusible link. Construct governor unit to be inoperative during normal door operations. Design release mechanism for easy resetting.

1. Provide manufacturer's standard UL labeled smoke detectors and electromechanical door holder release devices where indicated.

a. Fabricate unit to permit manual lifting of curtain for emergency exit after automatic closing with curtain returning to closed position when released.

G. Remote Control Station: Provide momentary contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Provide interior units, full-guarded, surface-mounted heavy-duty NEMA Type 4X enclosure.

H. Automatic Reversing Control: Provide each motorized door with automatic safety sensor extending full width of door opening. Activation with sensor will immediately stop downward travel and reverse direction to fully opened position.

1. Pressure Sensor Edge: Provide each motorized door with an automatic safety sensor edge located within astragal or weather stripping mounted to bottom door rail. Contact with switch will immediately reverse downward door travel. Furnish manufacturer's standard take-up reel or self-coiling cable.

a. Provide electrically actuated automatic bottom bar.

2. Photoelectric Sensor: Manufacturer’s standard system designed to detect an obstruction in door opening without contact between door and obstruction.

I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance

with final Shop Drawings, manufacturer's instructions, and as specified in this Section.

B. Upon completion of installation, including Work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Finish or door hardware required for swing, sliding, and folding doors, except special types of unique hardware specified in the same Section as the door and door frames on which they are installed. Finish and door hardware includes:

1. Hinges.
2. Pivots.
3. Spring hinges.
4. Key control system.
5. Lock cylinders and keys.
6. Lock and latch sets.
7. Bolts.
8. Exit devices.
9. Closers.
10. Overhead holders.
11. Miscellaneous door control devices.
12. Door trim units.
13. Protection plates.
14. Weather stripping for exterior doors.
15. Astragals or meeting seals on pairs of doors.
16. Thresholds.
17. Security products.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340 – Shop Drawings, Working Drawings, and Samples covering the items included under this Section. Shop Drawing submittals shall include:

1. Product data, including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

2. Final Door Hardware Schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
3. Final Door Hardware Schedule Content: Based on door hardware indicated, organize schedule into hardware sets, indicating complete designations of every item required for each door or opening. Include the following information:

    a. Type, style, function, size, and finish of each hardware item.
    b. Name and manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of each hardware set cross-referenced to indications on Drawings, both on floor plans and on Door and Frame Schedule.
    e. Explanation of all abbreviations, symbols, and codes contained on Schedule.
    f. Mounting locations for hardware.
    g. Door and frame sizes and materials.
    h. Keying information.

B. Submittal Sequence: Submit initial draft of final Schedule along with essential product data to facilitate the fabrication of other work that is critical in the Project Construction Schedule. Submit final Schedule after samples, product data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

C. Keying Schedule: Submit separate detailed Schedule indicating clearly how OWNER's final instructions on keying of locks has been fulfilled.

D. Templates for doors, frames, and other Work specified to be factory prepared for the installation of door hardware. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of door hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier Qualifications: A recognized architectural door hardware supplier with warehousing facilities in Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project, and employs an experienced architectural hardware consultant (AHC) who is available to OWNER, ENGINEER, and CONTRACTOR, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with OWNER to finalize keying requirements and to obtain final instructions in writing.

1.04 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final Door Hardware Schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by door hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate door hardware set number to match set numbers of approved Door Hardware Schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of the door hardware supplier and the door hardware installer until each is satisfied that the count is correct.

D. Deliver individually packaged door hardware items at the proper times to the proper locations (shop or Site) for installation.

E. Provide secure lock-up for door hardware delivered to Site but not yet installed. Control handling and installation of door hardware items which are not immediately replaceable so completion of Work will not be delayed by door hardware losses, both before and after installation.

1.05 MAINTENANCE

A. Maintenance Tools and Instructions: Provide a complete set of specialized tools and maintenance instructions as needed for OWNER's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS (USE CORBIN RUSSWIN LOCKSETS)

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Butts and Continuous Hinges:

a. Bommer Industries, Inc.
b. Hager Hinge Co.
c. McKinney Products Co.
d. PBB, Inc.

e. Stanley Hardware, Division Stanley Works.

f. Ives

2. Cylinders and Locks:

a. Corbin and Russwin Architectural Hardware, Division Black and Decker Corp.

3. Bolts:

a. Corbin/Russwin.

4. Exit/Panic Devices:

a. Corbin and Russwin Architectural Hardware.

5. Overhead Closers:

a. Corbin and Russwin Architectural Hardware.

6. Door Control Devices:

a. Corbin and Russwin Architectural Hardware.

7. Door Trim Units:

a. Hager Hinge Co.

8. Kick, Mop, and Armor Plates:

a. Brookline Industries, Division Yale Security, Inc.
b. Rockwood.
c. Trimco.
d. Ives

9. Thresholds:

a. Kawneer (for aluminum entry).
b. National Guard Products, Inc.
c. Reese Enterprises, Inc.
d. Zero International, Inc.

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated on Legend of Hardware Types and Schedule of Door Hardware Sets at the end of this Section. Products are identified by using hardware designation numbers of the following.

1. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required in the Legend of Hardware Types for purposes of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which complies with requirements, including those specified elsewhere in this Section and supply comparative and cross-referenced product data.

2.03 MATERIALS AND FABRICATION

A. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Provide each item of hardware for proper installation and operation of door movement as shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to ENGINEER.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish optional materials or forming methods for those indicated, except as otherwise specified.

D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws except as specifically indicated.

1. Provide screws for installation with each hardware item. Provide Phillips flat-head screws, except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other Work, to match finish of such other Work as closely as possible, including prepared-for-paint surfaces to receive painted finish.

2. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use through-bolts for installation where bolt head or nut on the opposite face is exposed in other Work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each through-bolt or use sex screw fasteners.

E. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for OWNER's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.04 HINGES, BUTTS, AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Provide Phillips flat-head or machine screws complying with the following requirements:

1. For metal doors and frames, install machine screws into drilled and tapped holes.
2. For wood doors and frames, install wood screws.
3. For fire-rated wood doors, install No. 12 by 1-1/4-inch, threaded-to-the-head steel wood screws.
4. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Steel Hinges: Steel pins.
2. Nonferrous Hinges: Stainless steel pins.
3. Exterior Doors: Nonremovable pins.

D. Hinges: Except as otherwise indicated, provide continuous hinges as follows:

1. Continuous Hinges: Hager 790 Series, Heavy Duty 304 Stainless Steel hinge, satin finish (US32D), per ANSI/BHMA Grade 1 requirement for support doors weighing up to 600 lbs.
2. Fabricate to full height of door and frame with full-length alignment guides on door and frame.

2.05 LOCK CYLINDERS, AND KEYING

A. Supplier shall meet with OWNER to finalize keying requirements and obtain final instructions in writing.

B. Review the keying system with OWNER, and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with OWNER's existing system.

C. Equip Locks with:

1. Manufacturer's standard 6-pin tumbler cylinders.
2. Manufacturer's special 6-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal.

D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.

E. Comply with OWNER's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation: "DO NOT DUPLICATE."

F. Key Material: Provide keys of nickel silver only.

G. Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.

1. Deliver keys to key control system manufacturer.
2. Deliver keys to OWNER's Representative.

2.06 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt\ with curved lip extended to protect frame, finished to match hardware set.

1. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
2. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
3. Provide flat lip strikes for locks with 3-piece, antifriction latch bolts as recommended by manufacturer.
4. Provide extra-long strike lips for locks used on frames with applied wood casing trim.
5. Provide recess type top strikes for bolts locking into head frames unless otherwise indicated.

B. Lock Throw: Provide 5/8-inch minimum throw of latch and deadbeat used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 1/2-inch minimum throw of latch for other bored and pre-assembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

2.07 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
2. Provide parallel arms for all overhead closers except as otherwise indicated.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

1. Provide integral smoke detector device in combination door closers and holders complying with UL 228.

C. Provide black resilient parts for exposed bumpers. Color selection by Owner.

2.08 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops, and similar units); either machine screws of self-tapping screw.

B. Fabricate edge trim of stainless steel not more than 1/2 inch or less than 1/16 inch smaller in length than door dimension.

C. Fabricate protection plates (armor, kick, or mop) not more than 1-1/2-inch less than door width.

1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gauge).

2.09 WEATHER STRIPPING AND SEALS

A. Except as otherwise indicated, provide continuous weather stripping at each edge of every exterior door leaf. Provide type, sizes, and profiles shown on Drawings or Schedules. Provide noncorrosive fasteners as recommended by manufacturer for application indicated. Provide smoke, light, or sound seals on interior doors where indicated or Scheduled.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weather Stripping at Jambs and Heads:

1. Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semi-mortised, of following metal, finish, and resilient bumper material:

D. Weather Stripping at Door Bottoms:

1. Provide threshold consisting of contact type resilient insert and metal housing of design and size shown on Drawings or Schedules, of following metal, finish, and resilient seal strip:
2. Solid neoprene wiper or sweep seal complying with MIL R 6055, Class II, Grade 40.

2.10 THRESHOLDS

A. Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown on Drawings or Schedules.

2.11 HARDWARE FINISHES

A. Provide matching finishes for hardware units at each door or opening to the greatest extent possible and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch or lock sets) for color and texture.

B. Provide finishes which match those established by BHMA, or if none established, match ENGINEER's sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards,

but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate no lacquer.

E. The designations used on Schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18, Materials and Finishes Standard, by BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. Rust-Resistant Finish: For iron and steel base metal required for exterior work and in areas shown as high-humidity areas (and also when designed with the suffix -RR), provide 0.2 mil thick copper coating on base metal before applying brass, bronze, nickel, or chromium-plated finishes.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by ENGINEER.

B. Install each hardware item in compliance with manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage, and re-installation or application of surface protections with finishing work specified in Division 9. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than 1 month prior to acceptance or occupancy of a space or area, return to Work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct OWNER's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately 6 months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct OWNER's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials, or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

SCHEDULE OF DOOR HARDWARE SETS – EXTERIOR

Double Doors (Exterior)

SET HD-1

3 Pair	Butts	Type A
1 Only	Lock	Type A
1 Only	Closer	Type A (Active leaf)
2 Only	Bolts	Type A
1 Set	Weatherseal	Type A
1 Only	Weatherseal	Type B
1 Set	Weatherseal	Type E
1 Only	Threshold	Type A
2 Only	Stops	See Door and Frame Schedule
1 Only	Lock Guard	

Double Doors (180 Min. Fire Rated - Interior)

SET HD-2

3 Pair	Butts	Type A
1 Only	Lock	Type A
1 Only	Closer	Type A (Active leaf)
2 Only	Bolts	Type A
2 Sets	Smokeseal	Type A
1 Only	Threshold	Type A
2 Only	Stops	See Door and Frame Schedule

END OF SCHEDULE OF DOOR HARDWARE

LEGEND OF HARDWARE TYPES
Sheet 1 of 3

Butts

Type A - Full Mortised (US32D finish)

1	Stanley	FBB191 NRP*	4-1/2	x	4-1/2
2	McKinney	TB2314 NRP*	4-1/2	x	4-1/2
3	Hager	BB1191 NRP*	4-1/2	x	4-1/2
4	Bommer	BB5002 NRP*	4-1/2	x	4-1/2
5	PBB	BB51 NRP*	4-1/2	x	4-1/2
6	Ives	5BB1 NRP*	4-1/2	x	4-1/2

Substitute steel butts for UL labeled doors.

Electric Monitor Hinges

1	Hager	EMN	Suffix to Type A
2	PBB	EM	Suffix to Type A
3			

Type B - Half Mortised (US32D finish)

1	Stanley	FBB108 NRP*	4-1/2	x	4-1/2
2	McKinney	TB3374 NRP*	4-1/2	x	4-1/2
3	Hager	BB1108 NRP*	4-1/2	x	4-1/2
4	Bommer	BB510 NRP*	4-1/2	x	4-1/2
5	Ives	5BB2 NRP*	4-1/2	x	4-1/2

Type C - Pivots for Aluminum Entry

1	Kawneer	Top offset pivot Intermediate offset pivot Bottom offset pivot

Type D - Continuous Hinges

1 Hager 790 Series, Heavy Duty 304 Stainless Steel hinge, satin finish (US32D) Fabricate to full height of door and frame with full-length alignment guides on door and frame.

Lock

Type A - Single Panic (US26D finish)
(Pushbar Rim Device with ANSI Function 08 front door standard outside lever mortise lock trim

1		
2		
3	Corbin/Russwin	ED 5200 x R1
4		
5		

Type B - Classroom (US26D finish)

2	Corbin/Russwin	ML 2055 RWA

Type C - For Aluminum Entry

1	Kawneer	MS w/cylinders (Key and thumb operated)	Lock

Type D - Privacy Lock (US26D finish)

1	Sargent	8225 x LNW
2	Corbin/Russwin	ML 2030 RWA
3	Yale	8702 PRR
4	Best	45H-LF
5	Falcon	M301-SG

Type E - Passage Latch (US26D finish)

1	Sargent	8215 x LNW
2	Corbin/Russwin	ML 2010 RWA
3	Yale	8201 PRR
4	Best	45H-N
5	Falcon	M101-SG

Type F - Panic 2-Point (Entrance) US26D (Crossbar Mortise Device for narrow stile w/ext. Cylinder) and with electronic access control.

2	Dor-o-matic	1992
1	Trilogy Lock	PDL3000 (Electronic Access Controls)

Type G - Deadlock (Entrance) US26D

1	Sargent	8203
2	Corbin/Russwin	ML 2013
3	Yale	8715
4	Falcon	M911

NOTE: All hardware in hazardous areas (i.e., Boiler, Chlorine Rooms) shall have knurled finish.

Closer

Type A - Type. Parallel Arm w/H.O. (Alum) (For out-swinging doors)

1	LCN	4111H Cush Series
2	Corbin/Russwin	DC 6210 A5
3	Stanley	D-4550H EDA
3	Sargent	281 CPHS

Type B - Int. Pull Side W/H.O. (Alum) (For in-swinging doors)

1	LCN	4011 H Series
2	Corbin/Russwin	DC 6200 A1
3	Sargent	281 H10
3	Stanley	D-4550H REG

Type C - For Aluminum Entry

1	Kawneer	Sam-11 Concealed overhead closer
2	LCN	2030 or 5030 series
3	Rixson	70 series

LEGEND OF HARDWARE TYPES
Sheet 2 of 3

NOTE: Delete H.O. on all closers for label doors.

Type C - For Aluminum Entry

1	Kawneer	Sam-11 Concealed overhead closer
2	LCN	2030 or 5030 series
3	Rixson	70 series

Type D - For Entrance (not alum) Concealed Overhead.

1	LCN	2030 Series
2	Rixson	70 Series

Type E - Int. Push Side, Double Lever Arm.

1	LCN	4824

Plates

Type A - Push (US32D finish)

1	Baldwin	2124
2	Rockwood	70 - 4 x 16
3	Trimco	1001-1

4	Ives	8200 4 x 16

Type B - Pull (US32D finish)

1	Baldwin	2367
2	Rockwood	107 x 70C
3	Trimco	1017-3B
4	Ives	8302

Type C - Kick (clear plastic)

1	Rockwood	K4125 1/8" x 8" x 1 1/2" LDW**
2	Burns	1/8" x 8" x 1 1/2" LDW**
3	Ives	1/8" x 8" x 1 1/2" LDW**

Type D - For Aluminum Entry (US32D)

1	Brookline	1 - 050 B.B. 8-inch
1	Kawneer	1 - CO-9 B.B. 9-inch
1	Trimco	1 - 1191-1
1	Rockwood	1 - 150

Type E - Kick (US32D)

1	Rockwood	0.050 x 8" x 1 1/2" LDW
2	Trimco	KOO50 0.050 x 8" x 1 1/2" LDW
3	Ives	0.050 x 8" x 1 1/2" LDW

Threshold

Type A - Bronze

1	Zero	654B x continuous cast-in anchor
2	National Guard	424 BR x 720
3	Reese	S204B x 270

Type B - for Aluminum Entry

1	Kawneer	Offset pivot for over-head closer

Coordinator

Type A - (USP)

1	Rockwood	1672
	Glynn-Johnson	COR-2

*NRP = Nonremovable Pin
**LDW = Less door width

Bolts

Type A - Extension Concealed Flush (US26D finish)

1	Trimco	W3917-12
2	Glynn-Johnson	FB6
3	Rockwood	555 x 12" Min.

Type B - Surface (US26D finish)

1	Stanley	CD4060 x 8"
2	Glynn-Johnson	GR1642 8"

Type C - Two Point Concealed Automatic Flush (US26D finish)

1	Corbin/Russwin	ED 6800
2	Sargent	3710

Type D - Surface Spring Action with Chain (US26D)

1	Stanley	SP1055 x 6" Bolt

LEGEND OF HARDWARE TYPES
Sheet 3 of 3

Weatherseal

Type A - Head and Jamb (Aluminum finish; color to be selected)

1	Zero	139
2	National Guard	130
3	Reese	DS78

Type B - Door Bottom (Neoprene w/ Alum. finish; color to be selected) for doors opening out

1	Zero	39
2	National Guard	200
3	Reese	323

Type B - Door Bottom (Neoprene w/ Alum.finish; color to be selected) for doors opening in

1	Zero	153
2	National Guard	113
3	Reese	DB593

Type C - Applied Stop at Head and Jamb (Neoprene w/ Alum. Finish; color to be selected)

1	Zero	170
2	National Guard	103
3	Reese	599

Type D - Monorail Weatherseal (Neoprene w/ Alum. Finish; color to be selected)

1	Zero	316*
2	National Guard	203*
3	Reese	DS78*

Type E - Astragals

Vertical and Horizontal

1	Zero	44A + 188
2	National Guard	139SP + 5050
3	Reese	183SP + 737B

Horizontal

1	Zero	87m x drip
2	National Guard	123 x 124
3	Reese	202 x 203

Smokeseal

Type A - (Required on all Labeled Fire-Rated Doors)

1	Zero	188
2	National Guard	5050
3	Reese	797

Lock Guard

1	Precision	1625 NL (US32D)
2	Glynn-Johnson	LP12

Stop Type (Fed. Spec. 1161A)

Type A - Overhead (US26D)

1	Glynn-Johnson	GJ90MS Series
2	Corbin/Russwin	DH 5400
3	Sargent	590S Series

Type B - Wall (US26D finish)

1	Glynn-Johnson	GJWB60C
2	Trimco	1270CVSV
3	Rockwood	404

Type C - Base w/Holder (US26D finish)

1	Glynn-Johnson	GJW20
2	Trimco	1207
3	Rockwood	476

Type D - Floor (US26D finish)

1	Glynn-Johnson	GJFB14
2	Trimco	1211
3	Rockwood	442

Type E - Wall w/Hold Open (US26D finish)

1	Glynn-Johnson	GJW-45A
2	Rockwood	494
3	Trimco	1254

Type F - Floor w/ Hold Open (US26D finish)

1 Glynn-Johnson F20X
2 Rockwood 485

* Provide closed cell sponge neoprene per Government Specification MIL R 61 30A, Type II per Standard Detail appended.

END OF LEGEND OF HARDWARE TYPES

END OF SECTION

DIVISION 9

FINISHES

SECTION 09671

RESINOUS FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Decorative resinous flooring systems.

2. Industrial resinous flooring systems.

3. High-performance resinous flooring systems.

B. Related Sections:

1. Division 7 Section"Joint Sealanta" for sealants installed at joints in resinous flooring systems.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Material Certificates: For each resinous flooring component, from manufacturer.

F. Material Test Reports: For each resinous flooring system.

G. Maintenance Data: For resinous flooring to include in maintenance manuals.

H. Warranty: Refer to Section 01740: Warranties and Bonds. All paint and coatings work performed under these specifications shall be guaranteed by the coatings applicator for 100 percent of the total coated area for both materials and labor against failures during the warranty period.

I. Failure under this warranty shall include flaking, peeling, or delaminating of the coating due to aging, chemical attacked, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. Applicator to have at a minimum of 5 years' experience installation of flooring systems of this type.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.

a. Include 48-inch (1200-mm) length of integral cove base with inside corner.

2. Simulate finished lighting conditions for Architect's review of mockups.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Atlas Minerals & Chemicals, Inc.; Polymer Flooring Division; (ChemPruf 121).

2. Benjamin Moore & Co.; (Epoxy Novolac M79/M80)

3. Dudick, Inc.; (Protecto-Coat 100XT)

4. Epoxy Systems, Inc.; (#633)

5. PolySpec; (NovoRez 350)

6. Tamms Industries, Inc.; a division of The Euclid Chemical Company (Dural Tex 1807)

7. Tnemec Company, Inc.; (Tneme-Glaze 282)

2.02 HIGH-PERFORMANCE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance-aggregate- filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

1. Color and Pattern: As selected by Owner from manufacturer's full range.

2. Wearing Surface: Textured for slip resistance.

3. Overall System Thickness: 1/16 inch (1.6 mm.

C. Body Coats:

1. Resin: Epoxy novolac.

2. Formulation Description: Water based.

3. Application Method: Self-leveling slurry.

a. Thickness of Coats: 1/16 inch (1.6 mm).
b. Number of Coats: One.

4. Aggregates: Manufacturer's standard.

D. Topcoat: Sealing or finish coats.

1. Resin: Epoxy novolac.

2. Formulation Description: Water based.

3. Type: Clear.

4. Finish: Gloss.

5. Number of Coats: One.

E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: per ASTM C 579.

2. Tensile Strength: per ASTM C 307.

3. Flexural Modulus of Elasticity: per ASTM C 580.

4. Water Absorption: per ASTM C 413.

5. Coefficient of Thermal Expansion: per ASTM C 531.

6. Indentation: percent maximum per MIL-D-3134.

7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.

8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.

9. Abrasion Resistance: maximum weight loss per ASTM D 4060.

10. Flammability: Self-extinguishing per ASTM D 635.

11. Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.

12. Hardness: Shore D per ASTM D 2240.

13. Bond Strength: 100 percent concrete failure per ACI 503R.

F. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to STM D 1308 for 50 percent immersion in the following reagents for no fewer than seven days:

2.03 ACCESSORIES

A. Primer: Type recommended by manufacturer for substrate and body coats indicated.

1. Formulation Description: Water based.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.

b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.

c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks

from reflecting through resinous flooring according to manufacturer's written instructions.

3.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

1. Integral Cove Base: 4 inches (100 mm) high.

D. Apply self-leveling slurry body coats in thickness indicated for flooring system.

E. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.

F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.03 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of

construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09900

PAINTING

PART I - GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall furnish all materials, labor, equipment, and incidentals required to provide a protective coating system for the surfaces listed herein and not otherwise excluded. All surfaces described, whether new or existing, shall be included within the scope of this Section.

B. The work includes painting and finishing of interior and exterior exposed items and surfaces such as ceilings, walls, floors, miscellaneous metal, doors, frames, transoms, roof fans, construction signs, guardrails, posts, pipes, fittings, valves, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the Drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specifications as stated herein. The following major items of the Project shall be coated:

1. Interior of cast-in-place concrete and concrete block walls and concrete ceilings and exterior concrete block and stucco walls. This shall include the interior and exterior of Process Building 75 and the interior of Process Building 50 sodium hypochlorite room. Coatings are covered in the architectural drawings and in Specification Sections 09671, and herein. Water repellant masonry coating for decorative CMU is specified in Section 07100.

2. Interior of concrete water retaining structures, where applicable.

3. Exterior of concrete structures, where applicable.

4. Submerged surfaces and surfaces exposed to potable water of any ferrous metal and aluminum components of equipment, piping, fittings and valves (except stainless steel).

5. Exposed ferrous surfaces of equipment, pumps, motors, tanks and ferrous or galvanized metal fittings and accessories.

6. Exposed surfaces of PVC components of piping, fittings, valves, electrical conduit and equipment.

7. Exposed exterior surfaces of all metallic piping, conduit, fittings and valves, and galvanized metals located on the interior and exterior of buildings and structures. This shall include new piping, conduit, fittings and valves for the Project. Paint all exposed conduits in buildings to match background color.

8. Embedded aluminum or aluminum in contact with dissimilar metals or in contact with corrosive atmospheres.

9. All surfaces disturbed during construction shall be recoated to match existing.

C. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, epoxies, sealers and fillers, and other applied materials whether used as a prime, intermediate or finish coats.

D. The following items will not be painted unless otherwise noted:

1. Any code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.

3. Aluminum or fiberglass handrails, walkways, toeboards, windows, louvers, grating, checker plate, hatches, and stairways.

4. Stainless steel angles, tube, pipe, etc.

5. Products with polished chrome, aluminum, nickel or stainless steel finish.

6. Stainless steel, brass, bronze, chromium plate, anodized aluminum, and aluminum other than exposed utility tubing.

7. Flexible couplings, lubricated bearing surfaces, insulation and plastic pipe or duct interiors.

8. Plastic switch plates and receptacle plates.

9. Signs and nameplates.

10. Finish hardware.

11. Packing glands and other adjustable parts, unless otherwise indicated.

12. Prefinished items including architectural woodwork and casework, toilet enclosures, metal lockers, elevator equipment, light fixtures, and distribution cabinets.

13. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in, or in contact with, concrete shall be coated to prevent electrolysis.

1.02 RELATED WORK

A. Paint piping and equipment for identification purposes in accordance to Section 09905: Piping and Equipment Identification System.

B. Section 07100: Water Repellant Masonry Coating

C. Section 09671: Resinous Flooring.

1.03 QUALITY ASSURANCE

A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Provide undercoat paint produced by the same manufacturer as the finish coats. Undercoat and finish coat paints shall be compatible. Use only thinners approved by the paint manufacturer, and use only within recommended limits.

C. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this project. Work shall be done in a safe and workmanlike manner. Training shall be provided by the manufacturer prior to the coating application.

Contractor shall fill out daily painting reports. See Form G-1 in this specification.

D. Standards:

1. ASTM.

2. OSHA.

3. NFPA.

4. SSPC.

5. NACE.

6. NSF.

7. AWWA.

E. Acceptable Manufacturers:

1. Tnemec Company, Inc.

2. Carboline Company.

3. Keeler & Long, Inc.

4. Porter International.

5. Crawford Laboratories, Inc. (Florock).

1.04 SUBMITTALS

A. Materials and Shop Drawings: Submit to the Engineer as provided in the General Conditions and Section 01340: Shop Drawings, Working Drawings and Samples, shop drawings, manufacturer's specifications and data on the proposed paint systems and detailed surface preparation, application procedures and dry film thickness (DFT).

B. Schedule:

1. The Contractor shall submit for approval a complete typewritten Schedule of Painting Operations within 90 days after the Notice to Proceed. This Schedule is imperative so that the various fabricators or suppliers may be notified of the proper ship prime coat to apply. It shall be the Contractor's responsibility to properly notify and coordinate the fabricators' or suppliers' surface preparation and painting operations with these specifications. This Schedule shall include for each surface to be painted, the brand name, generic type, solids by volume, application method, the coverage and the number of coats in order to achieve the specified dry film thickness, and color charts. When the Schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film

gauges may be utilized by the Owner or Engineer to verify the proper application while work is in progress.

2. It is the intent of this Section that as much as possible all structures, equipment and piping utilize coating systems specified herein supplied by a single manufacturer. All exceptions must be noted on the Schedule. For each coating system, only one (1) manufacturer's product shall be used.

3. Requests for substitutions shall be made within ten (10) days of Bid and shall include all of the information required in the Schedule plus a signed and notarized statement from the Chief (Manufacturing) Chemist that the products listed are equal to the specified products, test results, and a list of ten (10) municipal water plant projects where each product has been used and provided satisfactory service for at least ten years. No request for substitution shall be considered that would change the generic type of coating, decrease DFT, or decrease number of coats.

   Test result submittals shall be certified by a qualified testing laboratory. A quality of paint that is measured by analytical written ASTM/Federal test procedures will provide assurances that quality products are utilized.

   The results from the following testing procedures shall be submitted for determining quality:

   a. Abrasion: Federal Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 gram load.

   b. Adhesion: Elcometer Adhesion Tester (0 to 1000 psi).

   c. Exterior Exposure: Exposed at 45 degrees facing ocean (South Florida Marine Exposures).

   d. Hardness: ASTM D-3363, latest revision.

   e. Humidity: ASTM D-2247, latest revision.

   f. Salt Spray (Fog): ASTM B-117, latest revision.

C. Color Samples: Manufacturer's standard color charts for color selection by Owner.

D. Samples- Painting:

1. Paint colors will be selected by Owner. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Samples of each finish and color shall be submitted to the Owner or Engineer for approval before any work is started.

3. Samples shall be prepared so that an area of each sample indicates the appearance of the various coats. For example, where three (3) coat work is specified, the sample shall be divided into three (3) areas:

   a. One (1) showing the application of one (1) coat only.

   b. One (1) showing the application of two (2) coats.

   c. One (1) showing the application of all three (3) coats.

4. Such samples when approved in writing shall constitute a standard, as to color and finish only, for acceptance or rejection of the finish work.

5. For piping, valves, equipment and miscellaneous metal work, provide sample chips or color charts of all paint selected showing color, finish and general characteristics.

6. Rejected samples shall be resubmitted until approved.

1.05 DELIVERY, HANDLING AND STORAGE

A. Deliver all materials to the job site in original, unopened packages and containers bearing manufacturer's name and label in accordance with Section 01600: Materials and Equipment.

1. Provide labels on each container with the following information:

   a. Name or title of material.

   b. Fed. Spec. number if applicable.

   c. Manufacturer's stock number, date of manufacture and expiration date (shelf life).

   d. Manufacturer's formula or specification number.

   e. Manufacturer's batch number.

   f. Manufacturer's name.

   g. Generic type.

h. Contents by volume, for major pigment and vehicle constituents.

i. Application instructions: thinning, ambient conditions, etc.

j. Color name and number.

2. Containers shall be clearly marked to indicate any hazards connected with the use of the paint and steps which should be taken to prevent injury to those handling the product. Material Safety Data Sheets shall be kept on-site and made readily available for all personnel.

B. All containers shall be handled and stored in such a manner as to prevent damage or loss of labels or containers. Containers shall be kept sealed and ready for use.

C. All materials shall be stored in a cool, dry area out of the direct sunlight and away from any ignition source. The contractor shall refer to the manufacturer's literature and material safety data sheets for additional storage requirements.

D. The Owner shall designate areas for storage and mixing of all painting materials. Store only acceptable product materials on project site. Restrict storage to paint materials and related equipment. Storage of paint materials and related equipment shall comply with the requirements or pertinent codes and fire regulations. In addition, all safety precautions noted on the manufacturer's Material Safety Data Sheets and other literature shall be strictly followed. Proper containers outside of buildings shall be provided by the Contractor and used for painting wastes. No plumbing fixtures shall be used for this purpose.

E. Used rags shall be removed from the buildings every night and every precaution taken against spontaneous combustion.

1.06 WARRANTY AND GUARANTEES

A. Refer to Section 01740: Warranties and Bonds.

B. All paint and coatings work performed under these specifications shall be guaranteed by the coatings applicator for 100 percent of the total coated area for both materials and labor against failures during the warranty period.

C. Failure under this warranty shall include flaking, peeling, or delaminating of the coating due to aging, chemical attack, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All paint shall be manufactured by one of the suppliers listed in Paragraph 1.03E., herein, and shall be their highest grade of paint.

B. The following coating systems list a product by name to establish a standard of quality; other products of the same generic types may be submitted to the Engineer for approval as described in Paragraph 1.04., herein. When other than the specified coating system is proposed, the Contractor shall submit on a typewritten list giving the proposed coatings, brand, trade name, generic type and catalog number of the proposed system for the Engineer's approval.

C. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Shop paint shall be of the same type and manufacture as used for field painting by the Contractor.

D. Emulsion and alkyd paints shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements, including Federal Specification TT-P- 19.

E. Finish coats containing lead shall not be allowed. Oil shall be pure boiled linseed oil.

F. Rags shall be clean painter's rags, completely sterilized.

2.02 COATING SYSTEMS

A. Class 1 Exposures – Interior Concrete and Masonry, Non-Immersion Excluding Floors.

1. Examples of this classification include the following surfaces:

a. Interior masonry and plaster.

b. Concrete block walls.

c. Concrete walls, columns and supports.

d. Concrete ceilings and beams.

2. Surface Preparation: As specified in Paragraph 3.02, herein, including filling cracks, voids and other surface imperfections, removing mortar droppings, cleaning and air-blasting.

3. Class 1 Coating System:

a. Prime Coat: Epoxy Polyamide Filler for Concrete Block

(1) Tnemec Series 54-660 Masonry Filler at 75 to 100 sq.ft./gal. Actual coverage may be less than the minimum stated depending on the porosity of the substrate to be coated.

b. Finish coats: Epoxy Polyamide or Aine-Cure (Glossy):

(1) Tnemec Series 69 Hi-build Epoxoline II: Two (2) coats at 6 to 8 mils DFT each coat for a minimum total finish thickness of 14 mils DFT.

NOTE: MAXIMUM ELAPSE TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

B. Class 2 Exposures - Exposed Concrete, Immersion, Potable (Not Used)

C. Class 3 Exposures - Buried Exterior Concrete Surfaces

1. Class 3 exposures consist of all exterior below grade surfaces for precast concrete structures and all exterior below grade concrete or masonry surfaces for building stemwalls.

a. Exterior below grade surfaces of precast and/or cast-in-place concrete wet wells, sanitary manholes, and vaults.

b. Exterior below grade surfaces of building stemwalls.

2. Surface Preparation: Same as required for Class 2 exposure surface preparation specified in Paragraph 2.02.B.2 above.

3. Class 3 Coating System

a. Prime Coat: Polyamide cured coal tar epoxy thinned 33 percent by volume.
Kop Coat Bitumastic No. 300-M: One (1) coat, 4 mils DFT.

b. Finish Coats: Polyamide cured coal tar epoxy.

Kop Coat Bitumastic No. 300-M: Two (2) coats, 10 mils DFT per coat.

c. Total minimum system finish coating thickness shall be 24 mils DFT.

D. Class 4 Exposures - Concrete and Masonry, Exterior, Non-Immersion

1. Class 4 exposures consist of exposed exterior concrete and masonry surfaces of new buildings and structures subjected to normal exterior elements and not subjected to water immersion. Class 4 exposures shall include the following:

a. Exterior, aboveground concrete surfaces of new or modified structures other than decorative CMU.

b. Exterior decpratove CMU surfaces of new or modified buildings are covered in Specification Section 07100.

2. Surface Preparation: As specified in Paragraph 3.02 herein and in addition the following:

a. New masonry surfaces shall be prepared by filling cracks, voids and other surface imperfections, removing mortar droppings, cleaning and high pressure water blasting.

b. New concrete surfaces shall be prepared as required for Class 2 exposure surface preparation specified in Paragraph 2.02.B.2 above.

c. Existing concrete surfaces shall be prepared by high pressure water blasting or abrasive blast cleaning to remove existing deteriorated or disbonded coatings as required for adhesion of the new coating system.

3. Class 4 Coating System

a. Prime Coat for New Concrete Structures: Cement base waterproofing.
Thoro Systems Thoroseal: One (1) coat, 2 lbs per square yard.

b. Prime Coat for New Masonry Structures: Single-component cementitious acrylic masonry block filler.
Tnemec Series 130-6602 Envirofill at 80-100 sf/gal.

c. Prime Coat for Previously Coated Structures: Two component waterborne epoxy primer.
Tnemec Series 151 Elasto-grip at 300 sf/gal.

d. Finish Coats: High quality elastometric coating.
Tnemec Series 156 Envirofill; two coats at 5.0 mils DFT per coat.

e. Total minimum system finish coating thickness shall be 10.0 mils DFT over the primer or sealer.

E. Class 5 Exposures – Exposed Concrete, Chemical Resistant

1. Class 5 exposures consist of exposed concrete surfaces that are subject to splashing, spillage and fumes of chemicals. The following would be included:

a. Surfaces in the chemical rooms modified during the sodium hypochlorite conversion including:
(1) All floors inside the Process Building 75 and Process Building 50 (sodium hypochlorite room).
(2) Walls for chemical containment areas.
(3) Bottom half of walls inside the chemical feed room in Process Building 75 and inside the sodium hypochlorite room in Process Building 50.
(4) Interior surfaces of chemical injection vaults and chemical trenches disturbed during construction.

2. Surface Preparation: As specified in Paragraph 3.02, herein, and in addition the following:

a. New masonry surfaces shall be prepared by filling cracks, voids and other surface imperfections, removing mortar droppings, cleaning and high pressure water blasting.

b. New concrete surfaces shall be prepared as required for Class 2 exposure surface preparation specified in Paragraph 2.02.B.2 above.

c. Existing concrete surfaces shall be prepared by high pressure water blasting or abrasive blast cleaning to remove existing deteriorated or disbonded coatings as required for adhesion of the new coating system.

3. Class 5 Coating System:

a. Prime Coat: Epoxy Filler for Concrete Block

(1) Tnemec Series 218 Epoxy Modified Cementitious Mortar: One (1) Coat as required fill voids and bugholes to provide a continuous substrate.

b. Prime Coat: Epoxy Polyamide Surfacing Epoxy for Concete Surfaces

(1) Tnemec Series 215 Surfacing Epoxy: One (1) coat as required to fill voids and bugholes to provide a continuous substrate.

c. Finish coats: Epoxy Novolac:

(1) Tnemec Series 282 Tneme-Glaze: Two (2) coats at 6 to 8 mils DFT each coat for a minimum total finish thickness of 14 mils DFT.

NOTE: MAXIMUM ELAPSE TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

F. Class 6 Exposures - Metals, Immersion (Interior and Exterior) and Non-Immersion (Interior)

1. Class 6 exposures consist of interior and exterior metal surfaces (immersion) and interior metal surfaces that do not come in direct contact with water or corrosive atmospheres and shall include the following:

a. Pumps, motors, equipment and appurtenances.

b. Aboveground piping, fittings, valves and metal electrical conduit.

c. Miscellaneous steel plates, shapes, hardware, etc.

d. Galvanized steel surfaces.

e. Other surfaces obviously requiring field coating or as specified to be field coated in Division 11 or in Section 09905: Piping and Equipment Identification Systems.

2. Surface Preparation: As specified in Paragraph 3.02 herein and, in addition, the following:

a. Non-immersion metals shall be abrasive blast cleaned to SSPC-SP6. Immersion metals shall be abrasive blast cleaned to SSPC-SP10.

b. All bare metals or areas that were shop primed that have been damaged shall be abrasive blast cleaned to the appropriate, commercial blast cleaning standards.

c. Shop primed items, stored on site for a prolonged period prior to coating, shall be prepared for coating following the coating manufacturer's recommendations prior to applying touch-up and subsequent coats. Surface preparation may include brush-off abrasive blasting or spot blasting to the appropriate, commercial blast cleaning standards, for areas where the primer has been damaged and bare metal is showing.

d. Non-ferrous metals shall be degreased and cleaned by washing with a water based dispersant. Rinse thoroughly with clean water after cleaning.

3. Class 6 Coating System (Immersion)

a. Prime Coat for Ferrous and Non-Ferrous Metals: NSF Part 61 approved, two-part epoxy polyamide primer.
Tnemec Series 140-1255 (Beige) Pota-Pox Plus at 4.0 mils DFT.

b. Finish Coat for Non-Ferrous Metals: NSF Part 61 approved epoxy coating.
Tnemec Series 140-WH02 (Tank White) Pota-Pox Plus at 4.0 mils DFT.

c. Finish Coats for Ferrous Metal: NSF Part 61 approved, two component, cross linked epoxy.
Tnemec Series 140 Pota-Pox Plus: Two coats at 5.0 mils DFT per coat.

d. Total minimum system finish coating thickness shall be 14.0 mils DFT for ferrous metals and 8.0 mils DFT for non-ferrous metals.

4. Class 6 Coating System (Non-Immersion)

a. Prime Coat for Ferrous and Non-Ferrous Metals: Two component, cross-linked epoxy primer.
Tnemec Series 69 Hi-Build Epoxoline II at 4 mils DFT.

b. Finish Coat for Non-Ferrous Metals: Two-part epoxy.
Tnemec Series 69 Hi-Build Epoxoline II at 3.0 mils DFT.

c. Finish Coat for Ferrous Metal: Two component, cross-linked epoxy.
Tnemec Series 69 Hi-Build Epoxoline II at 5.0 mils DFT.

d. Total minimum system finish coating thickness shall be 9 mils DFT for ferrous metals and 7 mils DFT for non-ferrous metals.

NOTE: MAXIMUM ELAPSED TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

G. Class 7 Exposures - Plastic Piping, Valves, Fittings and Conduit, Interior and Exterior

1. Class 7 exposures consist of PVC or fiberglass piping and structural shapes or electrical systems requiring color coding, and for protection of exposed, exterior plastic components from the elements, and shall include the following:

a. PVC and fiberglass piping, fittings, valves and electrical conduits requiring color coding in accordance with Section 09905: Piping and Equipment Identification System.

b. Exposed exterior plastic piping, valve and fitting components subject to UV degradation and weathering by the elements.

2. Surface Preparation: As specified in Paragraph 3.02 herein, including cleaning and washing with detergent to remove all dirt and foreign material, and light surface abrasion using medium grade sandpaper. Remove dust, dirt and debris with clean rags prior to coating.

3. Class 7 Coating System:

a. Prime Coat: Two component epoxy.
Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.

b. Finish Coats for exterior surfaces: Tnemec Series 73 Endurashield at 3.0 mils DFT.

c. Finish coat for interior exposure: Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.

d. Total minimum system finish coating thickness shall be 6 mils DFT.

H. Class 8 Exposures - Aluminum

1. Class 8 exposures consist of aluminum surfaces embedded or in contact with concrete, mortar or plaster, or aluminum in contact with dissimilar metals which may cause corrosion due to electrolysis, and shall include the following:

a. Aluminum surfaces in contact with concrete, mortar or plaster, such as hatch cover frames, stair stringers, portions of grating and frames, floor plate and frames, etc.

b. Aluminum surfaces in contact with dissimilar metals which may cause corrosion due to electrolysis.

2. Surface Preparation: As specified in Paragraph 3.02 herein, including solvent cleaning in accordance with SSPC-SP1 standards for solvent cleaning and scarification.

3. Class 8 Coating System:

a. Prime Coat: Two component polyamide epoxy. Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.

b. Finish Coats for Aluminum Exposed to View: Two-component, high build, acrylic urethane.
Tnemec Series 73 Endurashield at 3.0 mils DFT.

c. Finish Coat for Aluminum Not Exposed to View: Polyamide cured coal tar epoxy.
Tnemec Series 46H-413 Hi-Build Tneme-Tar applied at 16.0 mils DFT.

d. Total minimum system finish coating thickness shall be 19.0 mils DFT for areas not exposed to view or 6.0 mils for areas exposed.

I. Class 9 Exposures - Metals Exterior Exposed

1. Class 9 exposures consist of exterior metal surfaces exposed to the weather and environment.

a. Pumps, motors, equipment, and appurtenances

b. Above ground piping, fittings, valves, and metal conduit

c. Miscellaneous metal surfaces

d. Ladders, stairways, structural steel

e. Roof mounted equipment, hatches, fans, etc.

f. Galvanized and non-ferrous metal surfaces

g. Other surfaces obviously requiring field painting

2. Surface Preparation: As specified in paragraph 3.02 herein and, in addition, the following:

a. All bare metals or areas that were shop primed that have been damaged shall be abrasive blast cleaned to SSPC-SP6, commercial blast cleaning standards.

b. Shop primed items, stored on site for a prolonged period prior to coating, shall be prepared for coating following the coating manufacturer's recommendations prior to applying touch-up and subsequent coats. Surface preparation may include brush-off abrasive blasting or spot blasting to SSPC-SP6, commercial blast cleaning standards, for areas where the primer has been damaged and bare metal is showing.

c. Non-ferrous metals shall be degreased and cleaned by washing with a water based dispersant such as Carboline Surface Cleaner #3. Rinse thoroughly with clean water after cleaning.

3. Class 9 Coating System

a. Prime coat for ferrous and non-ferrous metal: Two part epoxy primer.
Tnemec Series 69 Hi-Build Epoxoline II at 4.0 mils DFT.

b. Intermediate coat for ferrous metal: Two part epoxy.
Tnemec Series 69 Hi-Build Epoxoline at 3.0 mils DFT.

c. Finish coat for ferrous and non-ferrous metal: High Build Acrylic Polyurethane.
Tnemec Series 73 Endura-Shield at 3.0 mils DFT.

d. Total minimum system finish shall be 7.0 mils for non-ferrous metal and 10.0 mils for ferrous metal surfaces.

J. Class 10 Exposures - Interior Floors (Painted) (Not Used)

K. Class 11 Exposures - Exposed Concrete Floors

1. Class 11 exposures consist of exterior concrete surfaces that are exposed to the weather elements and occasional immersion of water and receive light foot traffic, including the interior of the existing piping vaults.

2. Surface Preparation: As specified in Section 3.02F in addition to the following:

a. Abrasive blast clean to remove laitance and roughen the surface equivalent to the surface of No. 80 grit.

3. Class 11 Coating System.

a. Primer: Tnemec Series 69 Hi-Build Epoxoline II. Two coats at 3-5 mils DFT.

b. Topcoat: Tnemec Series 291 Enhanced Aliphatic Polyester Polyurethane.
One coat at 2-3 mils DFT.

c. Minimum DFT for the three coats is 10.0 mils.

L. Class 12 Exposures - Interior Floors (Epxoy)

1. Class 12 exposures consist of interior concrete floors called out to have epoxy flooring in the Drawings. Coatings for the interior floors of the maintenance building where specified to have epoxy cloors is covered in Section 09671.

PART 3 - EXECUTION

3.01 SHOP PAINTING

A. Surface Preparation - All ferrous metal to be primed in the shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting or pickling in accordance with SSPC-SP5 or SP8, respectively. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Under no circumstances will cleaned metal be allowed to sit overnight before priming, or

pretreatment and priming. All nonferrous metals shall be solvent cleaned prior to the application of primer. In addition, galvanized surfaces which are to be topcoated shall first be degreased then primed. All non-ferrous metal surfaces shall also be scarified prior to topcoating.

B. Materials Preparation:

1. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.

2. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all clean-up. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

C. Applications:

1. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship. Coating systems shall be as specified herein.

2. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.

3. All paint and coatings materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.

4. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.

5. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness.

6. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.

7. Equipment manufacturer or supplier shall provide touch-up paint for items with shop applied finish coats.

8. Where specified in the individual sections, primer coat(s) shall be applied in the shop by the equipment manufacturer. The shop coats shall be as specified and shall be compatible with the field coat or coats.

D. Certification: The Contractor shall obtain from the equipment manufacturer or supplier, prior to shipment of equipment, a written certification that surface preparation, coating brand, material, DFT and application method complied with this Section.

3.02 SURFACE PREPARATION

A. All dirt, rust, scale, splinters, loose particles, disintegrated paint, grease oil and other deleterious substances shall be removed from all surfaces which are to be coated.

B. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items and surfaces not to be painted which are in contact with or nearby surfaces to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Refer to Paragraph 3.09B.

C. Before commencing work, the painter must make certain that surfaces to be covered are in perfect condition and must obtain Engineer's approval to proceed. Should the painter find such surfaces impossible of acceptance, he shall report such fact to the Engineer. The application of paint shall be held as an acceptance of the surfaces and working conditions and the painter will be held responsible for the results reasonably expected from the materials and processes specified.

D. Program the cleaning and painting so contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

E. Ferrous Metal Surfaces:

1. Remove any oil or grease from surfaces to be coated with clean rags soaked in toluol or other solvent recommended by coating manufacturer in accordance with SSPC specifications. Any chemical contamination shall be eliminated by means of neutralization or flushing or both prior to additional surface preparation. Clean rags shall be changed each 100 square feet.

2. For immersion service, all sharp edges and welds shall be ground smooth to a rounder contour, all weld splatter shall be removed, and all pits and

dents shall be filled, and all imperfections shall be corrected prior to sandblasting.

3. For non-immersion service, all sharp edges and welds shall be ground, all weld splatter shall be removed, all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.

4. For immersion service, all surfaces to be coated shall be sandblasted to white metal in accordance with Steel Structures Painting Council Specification SP-5 of National Association of Corrosion Engineers Specification NACE-2. A white metal blast is defined as removing all rust, scale, paint, etc., to a clean white metal which has a uniform gray-white appearance. No streaks or stains or rust or any other contaminants are allowed. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed application instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating.

5. For non-immersion service, or wherever specified in the coating manufacturer's most recent printed application instructions for other services, all surfaces to be coated shall be sandblasted to near white metal in accordance with Steel Structures Painting Council Specification SP-10 or National Association of Corrosion Engineers Specification NACE-2. A near white metal blast is defined as removing all rust, scale, paint, etc., except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coatings that may remain. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating. (This is 95 percent of any given surface area blasted to white metal).

6. For non-immersion service surfaces to be coated shall be sandblasted where specified to a commercial sandblast in accordance with Steel Structures Painting Council Specification SP-6 or National Association of Corrosion Engineers Specification NACE 3. A commercial sandblast is defined as removing all rust, scale, paint, etc., except for slight shadows,

streaks or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues or paint or rust, may be found in the bottom of pits. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon a possible after the blasting preparation is finished and always before the surface starts to rust. no sandblasted surface shall stand overnight before coating. (This is 2/3 of any given surface area blasted to white metal).

7. Ferrous metal surfaces previously exposed to sulfides shall be sandblasted, flame cleaned, and sandblasted again in accordance with the recommended surface preparation for the particular service in question.

8. Where blast cleaning is done in the field, only "virgin" sand, grit, or abrasive will be used.

9. Inaccessible areas, such as, behind tank rafters or skip-welded lap joints, or in between back-to-back angle iron bracing, shall be coated before assembly to prevent corrosive action from taking place in these inaccessible areas. All surface voids shall be sealed-welded and back-to-back bracing and tank rafters either coated before assembly or eliminated from the design and construction. Sharp corners and edges shall be ground to a smooth contour and welds prepared as described above.

F. Concrete Surfaces:

1. All efflorescence, laitance, chalk, dust, dirt, oils, grease, concrete curing agents, form release agents, sealers, old coatings and other chemical contaminants shall be removed either by steam cleaning with detergent, by scrubbing with a hot trisodium phosphate solution consisting of 2 pounds of trisodium phosphate to each gallon of hot water (160°F), or by high pressure water blasting (3,000 psi or higher). Multiple cleaning operations may be required to remove all contaminants. Repeat the cleaning operation until the contamination is removed and flush the area with clean water to remove residual cleaning solution. Allow to dry thoroughly before coating.

2. All concrete surfaces to be coated shall be clean and dry. "Dry" is defined for new concrete as free of moisture and fully cured which is a minimum of 30 days at 75°F and 50 percent Relative Humidity or some equivalent cure time at other conditions (7 days minimum for stucco). Moisture

content of concrete shall be determined by using both of the following methods.

a. The presence of moisture shall be checked by taping a one-foot square piece of 20 mil thick minimum plastic film on the surface. Pieces of test plastic film should be placed at various locations that are likely to be slow drying out, such as below grade, low spots in floors, inside corners and lower wall areas. The plastic film should be carefully sealed with tape to prevent the escape of any moisture or vapor that would be trapped behind the film. The film should be left in place over night or longer to allow sufficient time for moisture migration. After 16 hours minimum remove and examine the backside for moisture condensation and inspect the concrete surface for darkened areas. The source of the moisture, if present, shall be located, and the cause corrected prior to coating.

b. The presence of moisture shall also be determined with a moisture detection device such as a Delmhorst Model DLM2E. Moisture determined by this method shall be less than 14 percent moisture content before coating operations shall be allowed to proceed.

3. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. The surface shall be flushed with fresh water and dried.

4. Do not use form oils incompatible with coating, concrete curing agents or concrete hardeners on concrete surfaces to be coated.

5. Concrete and/or cinder block walls to receive a coating shall be air-blasted with 100 psi clean, dry, oil-free air to remove dust, etc., and wire brushed to remove all loose and/or weak mortar. See requirements for sumps, tanks and other water-bearing structures below.

6. Concrete floors shall be thoroughly swept clean and then acid etched. Acid etching consists of first dampening the entire surface with clean water - avoid and excess of water that will for puddles. Acid etch the damp floor with a 10 to 15 percent solution of hydrochloric (muriatic) or phosphoric acid. Allow the acid to stand on the floor until the bubbling stops. For best results, while the acid is bubbling scrub the floor with a stiff bristled brushes. Do not allow the "spent" acid to dry on the floor. Rinse the surface thoroughly with fresh water. If the surface does not appear as rough as medium grit sandpaper, repeat the above steps. Neutralize the surface with a 5 percent solution of soda ash, tri-sodium

phosphate, or ammonium hydroxide in clean water. Let the solution stand for 10 minutes on the surface. Rinse thoroughly with water. The surface must be slightly alkaline (pH of 9.0) prior to coating.

7. The floors or concrete sumps, tanks or other water-bearing structures should be acid etched as described above or they may be sandblasted. The walls of concrete sumps and tanks must be sandblasted. Roughen the surface to a texture equivalent to that of medium grit sandpaper. Use compressed air blast nozzle with oil-free air. The abrasive used should be dry silica sand with the maximum particle size that will pass through a 16 mesh screen and minimum particle size retained on a 30 mesh screen. After blast cleaning is completed, sand, dust and loose particles should be removed from the surface by vacuuming or blowing off with high pressure oil-free air. Examine the surface for texture and uniformity, as well as the removal of dust, efflorescence and laitance. Patch voids and cracks that will cause discontinuities in the coating or unsightly appearance using a patching compound compatible with the coating system.

G. Wood Surfaces: Wood should be clean and dry. Remove surface deposits of sap or pitch by scraping and wiping clean with rags dampened with mineral spirits or VM & P Naphtha. Seal knots and pitch pockets with shellac reduced with equal parts of shellac thinner (denatured alcohol) before sandpaper and finishing with fine grit and remove sanding dust. After the prime coat is dry, fill cracks and holes with putty or spackling compound. When filler is hard, sand flush with the surface using fine grit sandpaper. Sand lightly between coats with fine grit, open-coated sandpaper

H. Galvanized Steel, and Non-Ferrous Metal:

1. Galvanized steel and aluminum will only be coated when so specified.

2. Surfaces shall be clean and dry. Remove dust and dirt by blowing off the surface with high pressure air or wiping clean with dry rags. Oil, grease and protective mill coatings should be removed by solvent cleaning in accordance with SSPC-SPl.

3. White rust should be removed from galvanized steel or aluminum by hand or power brushing. Care should be taken not to damage or remove the galvanizing. Rust should be removed from old galvanized steel by Hand or Power Tool Cleaning in accordance with SSPC-SP2 or SP3.

4. All surfaces shall be scarified by brush blasting for immersion service or hand sanding for non-immersion service.

5. Other surface preparation as outlined in the coating manufacturer's latest written Application Instructions shall be observed for more demanding exposures.

I. Stainless Steel:

1. Stainless steel will only be coated when so specified, or when it is adjacent to areas to be coated such as piping supports, anchor bolts or flange bolts.

2. Stainless steel requires only solvent cleaning prior to coating using any one of the methods in SSPC-SP1. Only solvents and cleaning solutions containing less than 200 ppm of halogens should be used to prevent stress corrosion cracking.

3. Stainless steel may be whip-blasted to provide a surface profile to increase the mechanical bond of the coating system. The height of the profile and the texture required should be defined for the operator and as a standard for the acceptance of the work. Pictorial standards for the surface cleanliness of carbon steel are not applicable to stainless steel, since there are no corrosion products or mill scale to remove from the surface.

4. Abrasive blast cleaning procedures outlined by Steel Structures Painting Council for carbon steel may also be used for stainless steel. Only very hard silica sand or other abrasive media should be used for a fast cutting action and to obtain a sharp angular profile.

J. Previously-Painted Surfaces (except ferrous metal, non-immersion)

1. Careful examination of the old coating is necessary in order to determine the condition of the coating prior to recommending the degree of surface preparation that will be needed. The old coating should be shaved with a knife to ascertain its present adhesion to the substrate, as well as the flexibility of the film. If the old coating has a tendency to powder of shatter easily under the knife, or disbonds freely from the substrate or underfilms, it would indicate total removal is necessary.

a. When up to 10 percent of the total area has failed, spot blasting back to at least one-inch into sound film, feathering of edges and spot priming is required.

b. When the coating system has deteriorated to approximately 25 percent of the total area, or if the coating is brittle, eroded or underfilm rusting is present, completely remove original coating system by sandblasting as specified.

2. Tank linings, immersion-service coatings, and some other types of high performance coatings generally require total removal before recoating. Consult manufacturer's recommendations for which of the other types of high performance coatings require total removal.

3. In instances where the film has been eroded due to weathering or worn thin due to abrasion or impingement with no rusting, the surface contaminants may be removed through high pressure water blasting (approximately 2,000 to 3,000 psi, over 4 gallons per minute) with emulsifying agents or cleaners, rinsed and dried. Roughening of the surface shall be used to improve the adhesion of subsequent coats. Recoat with the recommended finish coat(s).

K. PVC or Other Plastic Piping or Structural Shapes or Ductwork:

1. Solvent clean.

2. Lightly abrade surface with medium grade sandpaper. Remove dust by wiping with clean rags.

3.03 APPLICATION

A. Paint all exposed surfaces in rooms scheduled for painting whether or not colors are designated in schedules, except where the natural finish of material is obviously intended and specifically noted as a surface not be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color of finish is not designated, the Engineer will select these from standard colors available for the materials systems as specified.

B. Color Selection

1. Colors for Multi-coat Systems: Each coat shall be applied in a different color or shade from the preceding coat to aid in determining the uniformity and coverage of the coating. The finish coat color shall be selected by the Owner or Engineer. When a white finish coat is specified, the last two (2) coats shall be white.

2. Color Coding Piping: All exposed piping shall be identified as specified in Section 09905: Piping and Equipment Identification System. Pipe identification system shall include color coding or banding, legends and arrows.

3. Color Coding Conduit: All exposed electrical conduit with conductors over 120 volts shall be color banded as specified in Division 16: Electrical

and Section 09905: Piping and Equipment Identification System (color code, if provided, takes precedence).

C. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.

D. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied. All equipment shall be maintained in good working order and shall be comparable to that described in the coating manufacturer's most recent Application Instructions. It shall be thoroughly cleaned and inspected daily. Worn spray nozzles, tips, etc., shall be replaced regularly. Effective oil and water separators shall be used and serviced on all air lines.

E. All paints and coating materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.

F. Apply additional coats when undercoats, stains or other conditions show through the final coat or paint, until the paint film is of uniform finish, color and appearance.

G. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. Allow each coat to dry thoroughly before applying the next coat; follow manufacturer's recommendations taking into account temperature and relative humidity.

H. All interior surfaces of structures shall be finish coated prior to installation of equipment, conduit and other exposed items by Mechanical, Electrical or Instrumentation.

I. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.

J. Finish exterior doors on tops, bottoms, and side edges the same as the exterior faces, unless otherwise indicated.

K. Sand lightly between each succeeding enamel or varnish coat.

L. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise specified.

M. Retouching Existing Painted Surfaces: Existing painted surfaces damaged by the

modification work or other operations of the Contractor shall be retouched to conform to the above coating systems and blend in with the new and existing work. Damaged surfaces shall be repainted with not less that two (2) coats, and other existing surfaces that are listed shall be repainted with the coating system specified.

N. The prime and intermediate coats as specified for the various coating systems may be applied in the shop by the manufacturer. The shop coats shall be of the type specified and shall be compatible with the field coat or coats. Such items as pumps, motors, equipment, electrical panels, etc. shall be given at least one touch-up coat with the intermediate coat material and one complete finish coat in the field.

3.04 APPLICATION RESTRICTIONS

A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied. Contractor shall verify the following with supplied test equipment in presence of RPR and supply daily records in writing to RPR.

a. The conditions below shall be adhered to even if manufacturer's recommendations are less stringent. If manufacturer's recommendations are more stringent, they shall apply.

b. No coatings shall be applied when the air, surface, and material temperature is below 55°F or above 95°F for 24 hours prior to and 24 hours after coating application. Surface temperature shall be at least 5°F above the dew point for 24 hours prior to and 24 hours after coating application. The dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Weather Bureau psychometric tables. Do not apply coatings when the relative humidity exceeds 85 percent or to damp or wet surfaces, unless otherwise permitted by the coating manufacturer's printed instructions. No painting shall be done when the surfaces may become damaged by rain, fog or condensation or when it is anticipated that these conditions will prevail during the drying period, unless suitable enclosures to protect the surface are used. Where heat is necessary, it shall be supplied by the painting applicator and shall be of such type that it will maintain an air and coated surface temperature of 55°F minimum prior to and after the coating application as described above, and 90°F minimum during the cure stage if hot air forced curing is recommended by the

coating manufacturer for special coatings. Further, this heater shall be of such type as not to contaminate the surface area to be or being coated with combustion products. The Contractor shall supply utilities to run electric or gas heaters. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Owner or Engineer.

2. Do not apply finish in areas where dust is being or will be generated during application through full cure.

3. All exterior painting shall be done only in dry whether.

4. Spray application shall occur only when wind velocities, including gusts, are less that 10 miles per hour. All materials, equipment, etc. in the vicinity of spray application shall be protected from overspray.

B. Application of materials shall be done only on properly prepared surfaces as herein specified. Between any two coats of material, unless specifically cover in the coating manufacturer's most recent printed application instructions, if more than one (1) week passes between subsequent coats, the coating manufacturer will be contacted for his recommended preparation of the surface prior to application of the next coat. This preparation might include brush-off blasting, steam cleaning, or solvent wiping (with an indicated solvent) and shall be specified in writing by the material supplier and followed by the applicator. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Owner or Engineer.

C. In no case shall paint be applied to surfaces which show a moisture content greater that 14 percent. The presence of moisture shall be determined prior to coating by testing with a moisture detection device such as a Delmhorst Model DLM2E.

3.05 MINIMUM COATING THICKNESS

A. Coating thickness shall meet or exceed the specified minimum dry film thickness (DFT) in all areas. The average coating thickness as determined by multiple representative DFT measurements shall meet or exceed the mid-point of DFT range. If below this DFT value, the surface shall be recoated with at least the minimum DFT until the total DFT meets or exceeds the mid-point DFT.

B. Coverage rates are theoretical as calculated by the coating manufacturer and are, therefore, the maximum allowable.

C. Apply a prime coat to material which is required to be painted or finished, and which has not been prime coated by others.

D. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, is shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

E. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3.06 FINISHES

A. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

B. Complete Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specific requirements.

3.07 FIELD QUALITY CONTROL

A. The Contractor shall request acceptance of each coat by the Owner's representative before applying the next coat; and the Contractor shall provide the necessary properly calibrated gauges. All nonferrous surfaces shall be checked for number of coats and thickness by use of a Tooke gauge. All ferrous surfaces shall be checked for film thickness by use of an Elcometer or Micro-Test magnetic dry film gauge properly calibrated. In addition, submerged tank linings and metals shall be tested for freedom from holidays and pinholes by use of a Tinker-Rasor or K-D Bird Dog Holiday Detector. All defects shall be corrected to the satisfaction of the Owner.

B. All training from manufacturer shall be provided prior to the coating application.

C. Contractor to fill out daily reports.

3.08 PROTECTION

A. All other surfaces shall be protected while painting.

B. Protection of furniture and other movable objects, equipment, fittings, and accessories shall be provided throughout the painting operation. Remove all electric plates, surface hardware, etc., before painting; protect and replace when

completed. Mask all machinery nameplates and all machined parts not to receive paint. Lay drop cloths in all area where painting is being done to adequately protect flooring and other work from all damage.

3.09 CLEANING

A. The Contractor shall perform the work under this Section while keeping the premises free from accumulation of dust, debris and rubbish and shall remove all scaffolding, paint cloths, paint, empty paint containers, and brushes from buildings and the project site when completed.

B. Cleaning: All paint brushed, splattered, spilled or splashed on any surface not specified to be painted shall be removed.

C. The Contractor shall insure that all glass throughout that portion of the facility in which he worked is cleaned of dirt and paint before he leaves the job site. Further, the Contractor shall insure that all glass in this area is thoroughly washed and polished.

D. Upon completion of the project, the job site shall be left neat and clean.

3.10 EXTRA STOCK

A. Paint To Be Supplied To Owner: Upon completion of painting work, the Owner shall be furnished at no additional cost, unopened containers providing a minimum of one (1) gallon of each type and color of finish paint for touching up. Multi-component coatings shall have each component supplied in separate containers boxed together. Paint container labels shall be complete with manufacturer's name, generic type, number, color and location where used.

END OF SECTION

FORM G-1
DAILY INSPECTION REPORT

Date:	Spec#	Page__ of ___	Contract #:

Work Performed and Locations _____

_____

_____

_____

Ambient conditions

Time				
Dry Bulb Temp	°	°	°	
Wet Bulb Temp	°	°	°	
Dew Point	°	°	°	
Relative Humidity	%	%	%	
Surf. Temp Min/Max	°	°	°	
Outside wind speed/dir.				
weather conditions				

Surface Preparation: Start_____ Finish_____ Est. sq/ft_____
Method of paint removal _____ Specification requirement
Compressor air check (blotter test)_____Compressor pressure____
AB-2 Testing _____
Dust collector _____RPM Dust collector magnehelic gage reading____
Anchor profile required_____ Anchor profile achieved_____
Other testing performed (i.e. scat testing)_____

Coating Application: Start_____ Finish_____ Est. sq/ft _____
Prime _____ Mid_____ Top _____ Stripe_____ Other___
Manufacturer _____ Product name: _____
Color _____ Kit size _____Shelf life_____Pot life _4hr_Sweat-in time
Batch number(s) of coatings _____

Date manufactured _____
Reducer _____ Batch number_____
Mix method_____ Quantity mixed_____Application method: _____
Tip size_____ Temperature of coating being mixed_____
WFT Required_____ WFT Achieved_____

Hold point inspections: Pre-paint removal_____ Paint removal_____ Mixing of coatings _____
Coating application_____ Post cure/DFT_____ Corrective actions____

Equipment used: Blast unit____ Compressor____ Dust Collector____ Decon____ Sprayer_____
Office trailer____ Box truck____ heater_____ Other____

QC Inspectors Signature:_____

SECTION 09905

PIPING, VALVE, AND EQUIPMENT IDENTIFICATION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of providing an identification system for piping systems and related equipment.

B. Related Work Described Elsewhere:

1. Shop Drawings, Working Drawings, and Samples: Section 01340.

2. Painting: Section 09900

3. Equipment: Division 11

4. Mechanical: Division 15.

5. Electrical: Division 16.

1.02 QUALITY ASSURANCE

A. Standards: ANSI Standard A13.1, Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. Submit manufacturer's descriptive literature, illustrations, specifications, and other pertinent data in accordance with Section 01340.

B. Schedules:

1. Provide a typewritten list of all tagged valves giving tag color, shape, letter code and number, the valve size, type, use, and general location.

2. Provide a complete list of materials to be furnished and surfaces on which they will be used.

C. Samples:

1. Provide a sample of each type valve of tag supplied.

2. Provide a sample of each type of identification tape supplied.

3. Provide manufacturer's color charts for color selection by Engineer.

1.04 PRODUCTS DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Except for locally mixed custom colors, deliver sealed containers with labels legible and intact.

B. Storage Of Materials:

1. Store only acceptable project materials on project site.

2. Store in suitable location.

3. Restrict storage to paint materials and related equipment.

4. Comply with health and fire regulations.

1.05 JOB CONDITIONS

A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.

2. Do not apply finish in areas where dust is being generated.

B. Protection: Cover or otherwise protect finished work of other trades and surfaces not to be painted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for painting shall conform to the requirements of Section 09900: Painting.

B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer.

C. Aboveground piping shall be identified by self-adhesive pipe markers equal to those manufactured by W. H. Brady Company.

1. Markers shall be of wording and color as shown in Table 09905.

2. Lettering shall be:

a) 2 1/4-inches high for pipes 3 inches diameter and larger.

b) 1 1/8-inches high for pipes less than 3 inches diameter.

3. Flow arrows shall be:

a) 2 1/4-inches by 6 inches for pipes 3 inches diameter and larger.

b) 1 1/8-inches by 3 inches for pipes less than 3 inches diameter.

D. Buried piping shall be identified by identification tape installed over the centerline of the pipelines.

1. Identification Tape for Steel or Iron Pipe: Identification tape shall be manufactured of inert polyethylene film so as to be highly resistant to alkalies, acids, or other destructive agents found in soil, and shall have a minimum thickness of 4 mils. Tape width shall be 6 inches and shall have background color specified below, imprinted with black letters. Imprint shall be as specified below and shall repeat itself a minimum of once every 2 feet for entire length of tape. Tape shall be Terra Tape Standard 250, or approved equal.

2. Identification Tape for Plastic or Non-Magnetic Pipe: Identification tape shall be manufactured of reinforced polyethylene film with a minimum overall thickness of 4 mils and shall have a 0.35 mil thick magnetic metallic foil core. The tape shall be highly resistant to alkalies, acids, and other destructive agents found in soil. Tape width shall be 3 inches and shall have background color specified below, imprinted with black letters. Imprint shall be as specified below and shall repeat itself a minimum of once every 2 feet for entire length of tape. Tape shall be TerraTape Sentry Line 1350, or approved equal.

3. Tape background colors and imprints shall be as follows:

Imprint	Background Color
"Caution Sewer Line Buried Below"	Green
"Caution Electrical Line Buried Below:	Red
"Caution Water Line Buried Below"	Blue
"Caution Telephone Line Buried Below"	Orange
"Caution Reuse Line Buried Below"	Purple
"Caution Compressed Air Line Buried Below"	Dark Green
"Caution Chemical Line Buried Below"	Yellow

4. Identification tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, TX; Allen Systems, Inc., Wheaton, IL; or approved equal.

E. Aboveground Valve Identifications: A coded and numbered tag attached with brass chain and/or brass "S" hooks shall be provided on all valves.

1. Tag Types: Tags for valves on pipe shall be brass or anodized aluminum. Colors for aluminum tags shall, where possible, match the color code of the pipe line on which it is installed. Square tags shall be used to indicate normally closed valves and round tags shall indicate normally open valves.

2. Coding: In addition to the color coding, each tag shall be stamped or engraved with wording or abbreviations to indicate the valve service and number. All color and letter coding shall be approved by the Engineer. Valve service shall either be as listed in Table 09905, or by equipment abbreviation if associated with a particular piece of equipment. Valve numbering, if required, shall be as approved by the Engineer and/or Owner.

F. Buried valves shall have valve boxes protected by a concrete pad. The concrete pad for the valve box cover shall have a 3-inch diameter, bronze disc embedded in the surface as shown on the Drawings. The bronze disc shall have the following information neatly stamped on it:

1. Size of valve, inches.
2. Type of valve:
   a) GV – Gate Valve
   b) BFV – Butterfly Valve
   c) PV – Plug Valve
3. Valve Services – See Table 09905 for abbreviations.
4. Direction to open and number of turns to fully open.

PART 3 - EXECUTION

3.01 COLOR CODING FOR PIPES AND EQUIPMENT

A. Piping color codes, and code labels for pipe identification shall conform to Table 09905.

B. General Notes and Guidelines:

1. Pipelines, equipment, or other items which are not listed here shall be assigned a color by the Owner and shall be treated as an integral part of the Contract.

2. Color coding shall consist of color code painting and identification of all exposed conduits, through lines and pipelines for the transport of gases, liquids, or semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and any operating accessories which are integral to a whole functional mechanical pipe and electrical conduit system.

3. All moving parts, drive assemblies, and covers for moving parts which are potential hazards shall be Safety Orange.

4. All safety equipment shall be painted in accordance with OSHA Standards.

5. All inline equipment and appurtenances not assigned another color shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to, but not including, the flanges attached to pumps and mechanical equipment assigned another color.

6. All pipe hangers and pipe supports shall be painted, unless specified otherwise due to material of construction.

C. All pipe hangers, pipe supports, and accessories shall be painted to match their piping. The system shall be painted up to, but not including, the face of flanges or the flexible conduit connected to electrical equipment. Structural members used solely for pipe hangers or supports shall be painted to match their piping. Where the contact of dissimilar metals may cause electrolysis and where aluminum will contact concrete, mortar or plaster, the contact surface of the metals shall be coated in accordance with Section 09900.

D. All systems which are an integral part of the equipment, that is originating from the equipment and returning to the same piece of equipment, shall be painted

between and up to, but not including, the face of flanges or connections on the equipment.

E. All insulated surfaces, unless otherwise specified, shall be given one (1) coat of sizing, one (1) prime coat, and one (1) finish coat.

F. System code lettering and arrows shall conform to the requirements of ANSI A 13.1 marked on piping as follows:

1. Legends shall be of the following color for the respective pipe color:

Key to Classification of Predominant Colors For Piping		Color of Letters, if not Otherwise Specified
(F) Fire Protection:	Red	White
(D) Dangerous:	Yellow	Black
	Orange	Black
(S) Safe:	Green	Black
	White	Black
	Black	White
	Light Grey	Black
	Dark Grey	White
	Aluminum	Black
(P) Protective:	Blue	White

2. All piping containing or transporting corrosive or hazardous chemicals shall be identified with labels every 10 feet and with at least two (2) labels in each room. Otherwise, markers shall be placed no more than 20 feet apart with at least one (1) marker on every straight run and additional markers at turns and where pipes pass through walls.

3. An arrow indicating direction of flow shall be placed adjacent to each marker.

4. On pipes entering and leaving building, the destination shall be included in I.D.

5. See Table 09905 for color codes and abbreviations of proposed piping.

3.02 FABRICATED EQUIPMENT

A. Unless otherwise indicated or specifically approved, all fabricated equipment shall be shop primed and finished. See Section 09900 - Painting.

B. The Contractor shall be responsible for and take whatever steps are necessary to properly protect the shop prime and finish coats against damage.

C. Where specified in other Sections of these Specifications for mechanical equipment, the Contractor shall apply field coats of paint in accordance with Section 09900. If the shop finish coating is unsatisfactory due to poor adhesion or other problems with primer or finish coats, coatings shall be removed and replaced by sandblasting, priming and finishing in accordance with Section 09900 and this Section.

D. Wherever fabricated equipment is required to be sandblasted, the Contractor shall protect all motors, drives, bearings, gears, etc., from the entry of grit. Any equipment found to contain grit shall be promptly and thoroughly cleaned. Equipment contaminated by grit in critical areas, such as bearings, gears, seals, etc., shall be replaced at no cost to the Owner.

3.03 INSTALLATION OF IDENTIFICATION TAPE

A. Identification tape shall be installed for all buried pipelines and conduits in accordance with the manufacturer's installation instructions and as specified herein.

B. Identification tape for piping shall be installed at two (2) locations:

1. One (1) foot below finished grade along centerline of pipe, and;

2. Directly on top of the pipe.

TABLE 09905
COLOR CODES AND ABBREVIATIONS

Service	Mark	Conduit, Pipe, and Valve Color Code	Letter and Flow Arrow Color
Aerated Water	AW, AW1, AW2	Aqua	Black
Drain	DR	Brown	Black
Finished Water	FW, FW1	Dark Blue	Black
Hydrofluosilicic Acid	HFSA	Light Blue with Red Bands	Black
Sodium Hypochlorite	NaOCL	Yellow	Black
Sodium Hydroxide	NaOH	Yellow with Green Band	Black
Potable Water	PW	Dark Blue	Black
Raw Water	RW, RW1	Olive Green	Black
Softened Water	SOF	Aqua	Black
Sample Line	SA	Gray	Black

Note: All color coding shall be in accordance with the recommendation of Ten State Standards. Owner shall provide color selection to match existing.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10140

SIGNAGE SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of specialty signs as shown on Drawings, and as specified herein. The Contractor shall furnish all labor, materials, equipment, and incidentals required to install signage.

1. The Contractor shall furnish all labor, materials, equipment, and incidentals required to install signage as specified herein.

B. Forms of specialty signs required include the following:

1. Panel signs.
2. Metal letters and numbers.

C. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 REFERENCES

A. Federal Specifications

1. QQ-A-200/8D: 6063 Aluminum alloy bar, rod, shapes, tube, and wire.
2. QQ-A-250/2D: 3003 Aluminum alloy plate and sheet.

B. Local Specifications

1. Florida Building Code

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Drawings for fabrication and erection of specialty signs. Include the following:

a. Plans, elevations, and large-scale details of sign wording and lettering layout.
b. Anchorages and accessory items indicated.
c. Location template Drawings for items supported or anchored to permanent construction.
d. Sign Schedule.

1.04 QUALITY ASSURANCE

A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

B. Coordinate all interior and exterior graphic sign descriptions with Owner and provide schedule prior to fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Panel Signs, Handicapped Symbol Signs, and Exterior Freestanding Signs:

a. ABC Signing Division of Nelson-Harkins Industries.
b. Andco Industries Corp.
c. APCO Graphics, Inc.
d. Architectural Graphics, Inc.
e. ASI Sign Systems, Inc.
f. Charleston Industries, Inc.
g. DGS Corp.
h. Diskey Sign Corporation.
i. Mohawk Sign Systems.
j. Spanjer Brothers, Inc.
k. The Supersine Company.
l. Vomar Products, Inc.

2. Metal Letters:

a. A.C. Davenport and Son.
b. Andco Industries, Inc.
c. A.R.K. Ramos Manufacturing Company, Inc.
d. ASI Sign Systems, Inc.
e. Matthews.

f. Metal Arts, Division of L&H Manufacturing Co.
g. Metallic Arts.
h. Spanjer Brothers, Inc.
i. The Southwell Company.
j. The Supersign Company.

B. Room Identification Signs

1. Signs shall consist of a removable plaque inserted in square cornered extruded aluminum frames with a grey 1/16-inch perimeter reveal separating plaque insert and frames.

2. Plaques shall be 3/16-inch thick engraved stock with a sub-layer of contrasting color. Lettering on the plaque shall be 1-inch high, Helvetica Medium font, in all caps.

3. Extruded frame shall have a minimum thickness of 1/16-inch and overall frame thickness of 3/8-inch. Frame finish shall be a dark duranodic.

4. Mounting:

a. Room Signs with numbers mounted on all exterior doors.
b. Door mounted signs shall me mechanically fastened with stainless steel counter sunk screws. Signs shall be mounted in the center of the door, 5 feet – 0 inches above finished floor on the exterior side of the door.
c. Wall mounted signs shall be affixed to a shim plate with vinyl foam tape or silastic adhesive. Shim plate shall be 0.125-inch thick aluminum with pre-drilled counter sunk holes. Plate shall be mounted to the wall with stainless steel screws. Plate shall be 5 foot-6 inches above finished floor, unless otherwise noted.
d. Signage shall be manufactured by Andco Industries Corporation, Vomar Products, or approved equal.

C. Safety and Restrictive Signs

1. Fixed plaque signs shall consist of 1/16-inch thick, clear matte acrylic that is sub-surface printed with the sign message prior to being laminated to a 1/8-inch thick base plate of red opaque acrylic. Plaque shall have 1 inch radius rounded corners and shall be suitable for outdoor use.

2. Plaque lettering shall be 2 inch high, Helvetica Medium font, in all caps. Letters and symbols shall be of die-cut pressure sensitive vinyl.

3. Plaques shall be wall mounted and shall be affixed to a shim plate with vinyl foam tape or silastic adhesive. Shim plate shall be 0.125-inch thick aluminum with pre-drilled counter sunk holes. Plate shall be mounted to the wall with stainless steel screws.

4. Plaques shall be manufactured by Andco Industries Corporation, Vomar Products, Cooper Architectural Signs, or approved equal.

2.02 MATERIALS

A. Fiberglass (Exterior Door Plant Signs): Provide molded seamless thermosetting glass-fiber-reinforced polyester panels in sizes and thicknesses indicated, with a minimum tensile strength of 15,000 psi when tested in accordance with ASTM D 638, and a minimum flexural strength of 30,000 psi when tested in accordance with ASTM D 790.

B. Cast Acrylic Sheet (Interior Panel Signs): Provide cast (not extruded or continuous cast) methacrylate plastic sheet, in sizes and thicknesses indicated; with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 degrees F (80 degrees C).

C. Fasteners: Unless otherwise indicated, used concealed fasteners fabricated from metals that are noncorrosive to either the sign material or the mounting surface.

D. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION

A. Graphic Image Process:

1. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, content, positions, finishes and colors of letters, numbers, symbols, and other graphic devices. Handicap access bathrooms shall have 1-1/4-inch-high lettering.

2. Interior Panel Signs: Fabricate panel signs to comply with the requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

a. Raised Sign Panels: Signs shall be 1/8-inch-thick acrylic plastic with 1/32-inch raised letters and Grade 2 Braille complying with

Americans with Disabilities Act (ADA) of 1990. Letters shall be of a contrasting color with their background. Braille shall be of an integral color and material with their background. Braille tags shall not be used.

3. Metal Letters and Numbers: Provide metals letters and numbers to comply with requirements indicated for the manufacturing process, materials, finish, style, size, and message content.

    a. Aluminum Sheet: Not less than 0.090-inch thick. Fabricate by the heliarc welding process.

2.04 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures, or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by ENGINEER from manufacturer's standards.

B. Metal Finishes: Comply with National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual" for finish designations and application recommendations.

C. Aluminum Finishes:

1. Class II Clear Anodized Fine Satin Finish: Provide AA-M31C21A31 (fine satin mechanical finish with chemical etch, fine matte finish, 0.4 mil thick minimum anodic coating).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate sign units and accessories where shown or Scheduled, using mounting methods of type described and in compliance with the manufacturer's instructions, unless otherwise indicated. If location is not shown, it shall be as directed by ENGINEER.

1. Install sign units level, plumb, and at the height indicated with sign surfaces free from distortion or other defects of appearance.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

Vinyl Tape Mounting: Use double-sided foam tape, of the thickness indicated, to mount signs to smooth non-porous surfaces. Do not use this method for vinyl-covered or rough surfaces.

C. Metal Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by manufacturer for the letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Projected Mounting: Mount letters at the projection distance from wall surface indicated.

3.02 CLEANING AND PROTECTION

A. At completion of installation, clean soiled sign surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by OWNER.

END OF SECTION

DIVISION 11

EQUIPMENT

SECTION 11241

CHEMICAL FEED SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

Furnish all labor, materials, equipment and incidentals required and install complete, ready for operation, and field test the chemical feed systems as shown on the Drawings and as specified herein.

B. Related Work Described Elsewhere

1. Section 11245: Chemical Metering Pumps

2. Section 11400: Temporary Chemical Feed System

3. Process instrumentation and controls are included under Division 13.

4. Mechanical piping, valves, pipe hangers, accessories and appurtenances are included under Division 15.

5. Electrical work is included under Division 16.

C. General Design

1. General:

a. The chemical feed systems specified herein are intended to support the operation of the treatment facility. The design capacity of the treatment facility after the Sodium Hypochlorite Conversion is 62.5 MGD.

b. The proposed chemical feed systems specified herein are intended to allow for expansion of the water treatment plant to a maximum day design capacity of 62.5 MGD. The existing sodium hypochlorite metering pumps will be removed and replaced with new pumps to support the change to a bulk sodium hypochlorite system. The new pre disifinection and cleaning metering pumps will remaind in Process Building 75, while the new post

disinfection metering pumps will be located in Process Building 50 as shown on the Drawings.

The existing FRP storage tanks in Process Building 75 will be replaced and new FRP storage tanks will be added to Process Building 50.

New sodium hypochlorite chemical feed injection piping will provided from the metering pumps to the injection locations to accommodate the change in flow rate resulting from the increase in solution strength.

2. Sodium Hypochlorite Feed System (Process 75 and Process 50)

a. System Operations

Sodium Hypochlorite is added to the aerated water prior to and immediately following the ground storage tanks (pre and post disinfection) to provide disinfection. Currently, sodium hypochlorite, 0.8% solution is generated at the plant site and stored in three (3) Fiberglass Reinforced Plastic (FRP) bulk storage tanks. The sodium hypochlorite generator equipment shall be removed and the storage tanks shall be replaced and used for 12.5% solution to be delivered to the site in truck loads. Additionally, new storage tanks for post disinfection shall be added to Process Building 50. The sodium hypochlorite will be fed by metering pumps (supplied directly from the bulk storage tanks) which are automatically adjusted in proportion to the water flow rate. The chemical feed system shall be capable of feeding a maximum design dose of 13 mg/L as Cl_2 to the pre disinfection injection point and a maximum design dose of 2.0 mg/L as Cl_2 to the post disinfection injection point. Sodium hypochlorite will also be delivered periodically to the forced draft aerators for cleaning. New metering pumps for pre disinfection and for cleaning of the forced draft aerators will be provided in the existing sodium hypochlorite building (Process Building 75) and new metering pumps for post disinfection will be provided in Process Builidng 50.

b. Pre, Post, and FDA cleaning system sodium hypochlorite meter pumps shall remain in operation at all times, either existing pumps, new pumps or temporary feed system pumps. Sodium hypochlorite service shall not be disrupted during construction. A minimum of four (4) primary, three (3) post, and one (1) FDA cleaning system chlorination feed pumps shall be on-line at all times.

1.02 QUALITY ASSURANCE

A. The chemical feed systems specified herein shall be supplied by equipment manufacturers having experience in the design and manufacture of equipment of similar size and capacity and shall present proof of successful operations involving each piece of equipment operating under similar conditions.

1.03 SUBMITTALS

A. Materials and Shop Drawings:

1. Submit to the Engineer for approval, as provided in the Section 01340: Shop Drawings, Working Drawings and Samples, operating and maintenance manuals, systems piping and wiring diagrams, and other descriptive material for all equipment to be furnished under this Section. In addition to the information above, the submittals shall include at least the following items to demonstrate conformance of materials:

a. Letter of Certification from the National Sanitation Foundation International (NSF) stating compliance with Standard 61.

b. Letter from the Manufacturer verifying chemical compatibility of all products to be used in chemical feed systems.

B. Additional Information

1. In the event that it is impossible to conform with certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

1.04 OPERATIONS AND MAINTENANCE DATA

A. Operating and Maintenance Instructions

1. Operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc., that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The number and special requirements shall be as specified in Section 01730: Operating and Maintenance Data.

2. A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided to instruct representatives of the Owner and the Engineer on

proper operation and maintenance. With the Owner's permission, this work may be conducted in conjunction with the inspection of the installation and test run as provided under PART 3-EXECUTION. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

Delivery, storage and handling of products shall be as specified in Section 01600: Materials and Equipment.

1.06 WARRANTY AND GUARANTEES

Provide equipment (system) warranty per Section 01740: Warranties and Bonds.

PART 2 - PRODUCTS

2.01 GENERAL

A. These Specifications are intended to give a general description of what is required, but do not cover details of construction which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to include the furnishing, shop testing, delivery, installation, supervision, and field testing of all materials, equipment and appurtenances for the chemical feed equipment as herein specified, whether specifically mentioned in these Specifications or not. Also included in these Specifications is the instruction of the regular operating personnel in the care, operation and maintenance of all equipment.

B. All necessary accessory equipment and auxiliaries required for the proper functioning of the chemical feed system installation incorporating the highest degree of standards for the specified type of service shall be furnished by the system supplier whether or not specifically mentioned in these Specifications or shown on the Drawings.

2.02 MATERIAL AND EQUIPMENT

A. Sodium Hypochlorite Feed System (Process 75 / Process 50)

1. Chemical Storage Tanks (75-T-1B, 75-T-2B, 75-T-3B / 50-T-1, 50-T-2):

a. The Contractor shall replace the three (3) existing horizontal FRP

storage tanks in Process Building 75 with three (3) new horiztonal FRP storage tanks. The new storage tanks shall be installed as shown on the Drawings and specified in accordance with Section 13216: Fiberglass Reinforced Plastic Tanks.

b. The Contractor shall install two (2) new vertical FRP storage tanks in Process Building 50 as shown on the Drawings and specified in accordance with Section 13216: Fiberglass Reinforced Plastic Tanks.

2. Chemical Metering Pumps (75-MP-1, 2, 3, 4, 5 / 50-MP-1, 2, 3):

a. The Contractor shall install four (4) new metering pumps for the pre-GST disinfection system and one (1) new metering pump for the FDA cleaning system in Process Building 75, replacing the existing feed pumps. The metering pumps shall be installed as shown on the drawings in accordance with Section 11245: Chemical Metering Pumps.

b. The Contractor shall install three (3) new metering pumps for the post-GST disinfection system in Process Builidng 50, replacing the exsiting feed pumps currently located in Process Building 75. The metering pumps shall be installed as shown on the drawings in accordance with Section 11245: Chemical Metering Pumps.

2.03 ACCESSORIES

A. Emergency Shower and Eyewash

1. Emergency shower and eyewash station for indoor use shall be pedestal mounted with a stanchion, a floor flange, a deluge shower, an aerated eye/face wash, a flow switch with alarm, an eye/face wash dust cover, stay-open ball valves, interconnecting piping, and a universal emergency sign. The shower shall be stainless steel with a stainless steel pull rod actuator. The eye/face wash receptor shall be stainless steel with pushplate and foot pedal actuator.

2. Emergency shower and eyewash station for outdoor use shall be pedestal mounted with a stanchion, a floor flange, a deluge shower, an aerated eye/face wash, a flow switch with alarm, scald protection stay-open valves, interconnecting piping, and a universal emergency sign. The shower and eye/face wash shall be stainless steel with a stainless steel actuator. The eye/face wash receptor shall be stainless steel with a push plate and foot pedal aerators.

3. Emergency shower and eyewash shall be provided with dust caps and spare dust caps for each unit.

4. Emergency shower and eyewash shall be Haws or approved equal.

5. The emergency eyewash shower shall be painted in accordance with Section 09900 and 09905.

2.04 SPARE PARTS

A. Special tools required for normal operation and maintenance shall be supplied for each piece of equipment furnished.

B. Each piece of equipment shall be furnished with the manufacturer's recommended spare parts for the first two (2) years of operation.

C. All tools and spare parts shall be furnished in containers clearly identified with indelible markings as to their contents and referenced to the chemical feed system. Each container shall be packed with its contents protected for storage. All tools shall be furnished in steel tool boxes.

PART 3 - EXECUTION

3.01 PREPARATION (NOT APPLICABLE)

3.02 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings. Installation shall include furnishing the required lubricants for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.

3.03 INSPECTION AND TESTING

A. Furnish the services of a factory representative who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise test runs of the equipment.

B. Upon completion of installation, the manufacturer, in the presence of the Engineer, shall perform a preliminary test (no chemicals) over the full range of each system to insure the functioning of all component parts to the satisfaction of the Engineer. The test shall be over the full range of capacity. The manufacturer shall furnish all labor and equipment. Power shall be supplied by the Contractor. Approval of the preliminary test by the Engineer shall not constitute final acceptance of the equipment furnished.

C. After the plant is in operation, a full operating test shall be performed in the presence of the Engineer and a qualified manufacturer's representative on the system. The manufacturer shall furnish all labor, materials and equipment required for such tests and shall correct any deficiencies noted by repairing or replacing the defective component and retesting as required until the equipment meets the Specifications and the satisfaction of the Engineer. The manufacturer shall have 30 days to make the changes necessary to meet the Specifications. If after said 30 day period all deficiencies have not been satisfactorily corrected, the Owner may order the manufacturer to remove the equipment from the installation and refund to the Owner all payments made to him. Chemicals for the full operating test will be furnished by the Contractor. After completion and acceptance of testing, all bulk chemical tanks shall be completely filled.

END OF SECTION

SECTION 11245

CHEMICAL METERING PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. This section covers the furnishing of all labor, materials, equipment, accessories, and incidentals required and installation, placing in operation, and field testing of the chemical metering pumps, motors, controls, and accessories as specified under Section 11241: Chemical Feed Systems as further specified herein and as shown on the Drawings.

2. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the specific equipment application. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation of all materials, equipment and appurtenances for the complete pumping units, controls, and accessories as specified herein, whether specifically mentioned in these Specifications or not.

3. For all units there shall be furnished and installed all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these Specifications or not, as required for an installation incorporating the highest standards for this type of service.

4. Contractor shall furnish variable frequency drives (VFD's) for each metering pump and local control panels as shown on Drawings and as specified in this Specification for a complete system in place.

B. Related Work Described Elsewhere

1. Section 01340: Shop Drawings, Working Drawings, and Samples.

2. Section 01730: Operating and Maintenance Data.

3. Section 11241: Chemical Feed Systems.

4. Section 13300: Instrumentation and Controls.

5. Section 15130: Pressure Gauges.

6. Mechanical piping, valves, pipe hangers, and supports are included in their respective Section of Division 15.

7. Electrical work, except as hereinafter specified, is included in Division 16.

C. General Design

1. A complete description of the major components and summary of the operation of each of the chemical feed systems is included in Section 11241: Chemical Feed Systems.

2. All of the equipment specified herein shall be in complete conformity with Section 11241: Chemical Feed Systems and these Specifications. All of the equipment specified herein is intended to be new standard equipment for use in the liquid chemical feed systems and shall include, but not be limited to, the following items of material and equipment:

   a. Mechanically or hydraulically actuated metering pumps.

   b. Calibration chambers.

   c. Pressure relief valves.

   d. Pulsation dampeners with integral pressure gauge.

   e. Backpressure valves.

   f. Pump drives and controls.

3. All working parts of identical pumps and motors, such as bearings, check valves, shafts, sleeves, motors, etc., shall be of standard dimension built to limit gauges or formed to templates such that parts will be interchangeable between like units and such that the Owner may at any time in the future obtain replacement and repair parts for those furnished in the original machines. All parts shall be properly stamped for identification and location in the machines as shown on the Operation and Maintenance Manuals furnished.

4. All system components that come into contact with drinking water shall be NSF International Standard 61 certified.

1.02 QUALITY ASSURANCE

A. To assure unity of responsibility, the motors, controls, and accessories shall be furnished and coordinated by the pump manufacturer or supplier. The supplier shall assume complete responsibility for the satisfactory installation and proper operation of the entire pumping system including pumps, motors, controls, and accessories.

B. Manufacturers: The mechanically or hydraulically actuated metering pumps shall be as manufactured by ProMinent, Milton Roy or Pulsafeeder. No substitutions are permitted.

C. The pumps covered by these Specifications shall be new and unused and shall be standard pumping equipment of proven ability as manufactured by a reputable, qualified manufacturer having a successful record of manufacturing and servicing the equipment and systems specified herein a minimum of five (5) years. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.

1.03 SUBMITTALS

A. Materials and Shop Drawings

Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with the provisions of the General Conditions and Section 01340: Shop Drawings, Working Drawings and Samples of these Specifications. Submittals shall include at least the following:

1. Certified shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.

2. Descriptive literature, bulletins, and/or catalogs of the equipment.

3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, linearity, and horsepower. Curves shall be submitted on 8-1/2 inch by 11 inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at zero stroke speed to pump capacity at specified total head.

4. Data including principle dimensions, materials and construction, space required, clearances, piping and electrical connections and requirements, controls, type of finish, installation instructions and other pertinent information.

5. A complete total bill of materials of all equipment including the weights of equipment furnished.

6. A list of the manufacturer's recommended spare parts. Include gaskets, packing, diaphragms, etc. on the list. List bearings by the bearing manufacturer's numbers only.

7. Complete motor data.

8. Copies of all factory test results, if specified in PART 2 - PRODUCTS of this Section of the Specifications.

9. The recommended summer and winter grades of lubricants along with alternative references to equal products of other manufacturers.

10. Complete wiring diagrams and schematics of each control panel, controllers, control devices and operator's station furnished under this Section.

11. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels, etc., including connections to work of other Sections.

12. Quality Control Submittals:

    a. Manufacturer’s Certification of Compliance demonstrating that all materials of construction that come into direct or indirect contact with the chemicals being pumped are fully compatible for the specified service.

    b. Manufacturer's Certification of Compliance that the factory finish system is identical to the requirements specified herein.

    c. Special shipping, storage and protection, and handling instructions.

    d. Manufacturer's printed installation instructions.

    e. Manufacturer's Certificate of Proper Installation.

    f. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

    g. Field Performance Test Certificate.

B. Additional Information

1. In the event that it is impossible to conform with certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

2. Upon receipt and review of submitted material, provide the required number of certified prints and one reproducible tracing of all Drawings as specified in Section 01340: Shop Drawings, Working Drawings and Samples.

1.04 OPERATIONS AND MAINTENANCE DATA

A. Operating and Maintenance Instructions

1. Operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The number and special requirements shall be as specified in Section 01730: Operating and Maintenance Manuals.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged storage period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

D. Finished iron or steel surfaces not shop painted shall be properly protected to prevent rust and corrosion.

E. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

F. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.06 WARRANTY AND GUARANTEES

A. Provide full equipment service/parts warranty as specified in Section 01740: Warranties and Bonds.

PART 2 - PRODUCTS

2.01 GENERAL

A. The pumping units required under this section shall be complete including proper alignment and balancing of the individual units. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.

B. All equipment and piping shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed. All bolts, nuts, and washers shall be of Hastelloy C for the Sodium Hypochlorite pumps and equipment.

C. Stamped stainless steel nameplates giving the name of the manufacturer, model number, rated capacity, speed, and any other pertinent data shall be permanently attached to each item of equipment. The lettering shall be stamped on using 1/4 inch high or larger letters.

D. A separate stainless steel nameplate with the equipment identification number as specified herein and as shown on the Drawings shall be attached to each item of equipment in an easily visible location. The lettering shall be stamped on using 1/4 inch high or larger letters.

E. Stainless steel nameplates giving the name of the manufacturer, serial number, model number, horsepower, speed, voltage, amperes, and other pertinent data shall be attached to each motor.

F. Engraved laminated nameplates giving the name and function of all selector switches, pushbuttons, alarm lights and control devices shall be securely attached to each panel furnished.

G. All electrical materials and equipment shall be Underwriters Laboratories, Inc. listed and shall otherwise be equal to those specified under Division 16: Electrical.

2.02 MATERIALS AND EQUIPMENT

A. Metering Pumps - Hydraulically or Mechanically Actuated

1. The chemical metering pumps shall be of the single diaphragm design with the diaphragm actuated and balanced hydraulically or mechanically. The pump, motor, gear reducer, and stroke controller, where required, shall be mounted on a common baseplate.

2. Hydraulically actuated pumps shall be provided with adjustable hydraulic relief valve which shall bypass the hydraulic fluid through an integral passage to provide full protection of the pump drive mechanism from excessive discharge pressure. The hydraulic reservoir and gear lubrication system shall be vented. The pump shall be designed to run safely to the relief valve setting. The pump mechanism shall have flooded lubrication using a common oil with the hydraulic system and shall be sealed from direct contact with the outside atmosphere and suitable for the specified operating conditions with or without the use of heating or cooling systems. The drive worm gear shall be supported on each end by tapered roller bearings. All drive components shall be completely immersed in oil.

3. Mechanically actuated pumps shall include integral motor, oil-lubricated gear reducers. All drive components shall be oil lubricated. The liquid end shall be physically separated from the drive unit by a separate chamber ehind the diaphragm creating an air gap.

4. Pump shall be provided with precise seating, suction, and discharge ball check valves. The check valves shall be removable from the liquid end for servicing or replacement. The suction and discharge check valve cartridges or seats and element shall be easily field replaceable. Check valves shall be single or double ball, in line (straight-through) type check valves. No spring-loaded check valves will be acceptable. All check valve components shall be compatible with the materials to be pumped as listed in Table 11245-A.

5. The diaphragm shall be supported on each side by contour plates. The diaphragm materials shall be compatible with the materials to be pumped as listed in Table 11245-A.

6. The pumps shall have a steady state flow accuracy of within ±1 percent over a turndown ratio of 10:1. Flow repeatability shall be within ±3 percent over the turndown ratio. Deviation from linearity shall not exceed ±3 percent over the turndown ratio. The pumps shall be capable of accepting manual or electric control, either factory mounted or by field conversion. Pumps shall be provided with manual 0-100 percent stroke

adjustment via a unit mounted micrometer unless an automatic stroke adjustment mechanism is specified in Table 11245-A. The manual stroke adjustment shall be capable of being performed while the pump is operating or idle.

7. Materials of construction for the pumping units shall be compatible with the fluids to be pumped and as listed in Table 11245-A.

8. All pump components that come into contact with drinking water shall be NSF International Standard 61 certified.

B. Motor and Control

1. Each mechanically actuated pump shall be driven by an integrally mounted AC motor. The drive motor shall operate off of 480 volt, 60 Hz, three phase AC power.

2. Motors shall be standard totally enclosed fan cooled (TEFC) AC units and of the frame size selected by the manufacturer to prevent overheating when continuously operated at 10 percent speed and constant torque loaded. Drives shall be suitable for continuous operation over a 20 to 1 speed range within plus or minus 2 percent of selected operating speed. Each pump and drive including coupling and guard shall be factory mounted on a common base and tested. Motor shall be invertor duty rated for variable frequency drive application.

3. A thermal switch shall be furnished in each drive motor and wired under Division 16: Electrical to stop motor on high winding temperature.

4. The metering pump motor speed shall be controlled by a variable frequency drive (VFD). Furnish VFD for metering pump as specified herein. Refer to Instrumentation and electrical drawings for the control requirements of the VFD's and the local control panels.

5. The pump controller shall accept an analog signal such that stroke frequency is proportional to a 4-20 mA signal. The pump controller shall be capable of control through the remote signal or manually at the controller.

6. Variable Frequency Drive

a. The variable frequency drive shall be a space vector Pulse-Width Modulated (PWM) design. Modulation methods which incorporate "gear-changing" techniques are not acceptable. The final responsibility of distributor or packager modifications to a third-

party standard product will reside with the VFD manufacturer. The VFD manufacturer shall have overall responsibility for the drives. All drives shall be supplied by one manufacturer.

b. The entire VFD system shall be factory assembled and system tested by the VFD manufacturer to assure a properly coordinated system.

c. Any modifications to a standard product required to meet this specification shall be performed by the VFD manufacturer only. Distributor or system integrator changes to the VFD manufacturer's product are specifically disallowed.

d. All components listed including power factor correction / harmonic filter shall be integral to the VFD lineup, factory wired and tested as a complete system. The entire VFD system shall meet the requirements of NEC article 409 and IEEE 508A for fault current withstand ratings as indicated on the project electrical drawings.

e. VFD system shall maintain a 0.95 minimum true power factor throughout the entire speed range.

f. The drive system shall be 96% efficient at full load and full speed and 95.5% efficient at 51% load and 80% speed. Losses to be utilized in drive system efficiency calculation shall include input transformer, harmonic filter and power factor correction if applicable, VFD converter and output filter if applicable. Auxiliary controls, such as internal VFD control boards, cooling fans or pumps, shall be included in all loss calculations.

g. Ratings

1. Rated Input Power: 460 Volts 60 Hz, +10%, -5% at rated load, 3-phase.
2. Voltage Dip Ride-Through: VFD shall be capable of sustaining continued operation with a 40% dip in nominal line voltage. Output speed may decline only if current limit rating of VFD is exceeded.
3. Power Loss Ride-through: VFD shall be capable of a minimum 3 cycle power loss ride-through without fault activation.
4. Output Power: As required by motors supplied.
5. Ambient Temperature Range: 0 to 40°C.

6. Elevation: Up to 3300 feet (1000 meters) above MSL without derating.
7. Atmosphere: Non-condensing relative humidity to 95%.
8. AC Line Frequency Variation: +/- 3 Hertz.

h. Power Unit Rating Basis: 110% rated current continuous, 150% rated current for one minute, at rated temperature. If the power unit rating of the VFD does not meet the above requirements, provide VFD with one standard size larger than the nameplate motor horsepower.

i. The controller shall produce an adjustable AC voltage/frequency output. It shall have an output voltage regulator to maintain correct output V/Hz ratio despite incoming voltage variations.

j. The controller shall have a continuous output current rating of 100% of motor nameplate current.

k. The inverter output shall be generated by IGBTs. Pulse Width Modulation strategy will be of the space vector type implemented to generate a sine-coded output voltage. The VFD shall not induce excessive power losses in the motor. The worst case RMS motor line current measured at rated speed, torque and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine wave operation. The inverters shall be able to sustain 1600 volt surges.

l. The controller(s) shall be suitable for use with any standard NEMA-B squirrel-cage induction motor(s) having a 1.15 Service Factor or with existing standard NEMA-B squirrel-cage induction motor(s) with nameplate data as shown on the plans. At any time in the future, it shall be possible to substitute any standard motor (equivalent horsepower, voltage and RPM) in the field.

m. The control logic section shall be fully digital and not require analog adjustment pots or fixed selector resistors. A power failure will not necessitate a reload of any drive parameter or configuration.

n. Minimum Starting Speed: When called to operate, the VFD shall amp to a minimum speed. The minimum speed shall be adjustable but initially set at 60% of maximum speed. The 4-20 mA speed signal from the PLC and potentiometer on the front of the drive shall modulate the signal between the minimum speed setpoint and the maximum output speed of the drive; i.e., at the 4 mA signal,

the VFD shall run at the minimum speed. At the 20 mA signal, the VFD shall run at full speed. The potentiometer shall also adjust speed between the minimum speed setpoint and the maximum running speed. Below the minimum speed setpoint, the potentiometer shall have no effect.

o. Refer to the P&IDs in the drawings for remote signals and alarms.

p. Protective Features and Circuits: The controller shall include the following alarms and protective features:

1. Instantaneous overcurrent and overvoltage trip.
2. Undervoltage and power loss protection.
3. Power unit overtemperature alarm and protection. Upon sensing an overtemperature condition, the VFD is to automatically trip.
4. Electronic motor inverse time overload protection.
5. Responsive action to motor winding temperature detectors or thermostatic switches. A dry contact (NC) input to the VFD is required.
6. When power is restored after a complete power outage, the VFD shall be capable of catching the motor while it is still spinning and restoring it to proper operating speed without the use of an encoder.
7. The VFD shall be protected from damage due to the following, without requiring an output contactor:
    a) Three-phase short circuit on VFD output terminals.
    b) Loss of input power due to opening of VFD input disconnecting device or utility power failure during VFD operation.
    c) Loss of one (1) phase of input power.
8. The VFD shall continue to operate at a reduced capacity under a single-phase fault condition.
9. The VFD shall be able to withstand the following fault conditions without damage to the power circuit components:
    a) Failure to connect a motor to the VFD output.
    b) VFD output open circuit that may occur during operation.

c) VFD output short circuit that may occur during operation.

10. Three phase lightning and surge protection across the line input at each VFD.

7. Electronic Stroke Control

a. Each chemical feed pump shall be equipped with an electronic stroke controller if scheduled herein under Table 11245-A. The electronic stroke controller shall automatically adjust the stroke length of the pump in response to a 4 to 20 mA analog signal as specified under Instrumentation (Division 13). The control system shall be constructed to completely isolate the control signal from the AC power supply.

b. The stroke controller including AC synchronous drive motor and control circuitry shall be enclosed in a NEMA 4 watertight enclosure suitable for mounting on the chemical feed pump. The drive motor shall operate off of 480 volt, 60 Hz, three phase AC power. The design shall allow the system to operate under continuous stall or without signal without damage to the drive motor or control circuitry. The response time for 0 to 100% change shall be 15 seconds or less. The system shall provide a 1 to 10% dead band adjustment. The actuator shall consist of a fully enclosed cog belt coupled to a high-quality, vernier-type adjustment with lock to permit manual mechanical override and readout in the event of signal equipment malfunction.

c. The stroke controller shall provide for over-signal protection and programmable signal loss protection. An integral dip switch shall allow the operator to program the controller to either freeze the stroke length at the last position or drive to zero in the event of a control signal loss.

d. The electronic stroke controller shall be provided with controls for panel mounting inside the operator control panel described under 2.02B.7. The operator controls shall allow the operator to manually adjust the stroke length of each pump from the local operator control panel using the electronic stroke controller. The panel mounted controls shall include an auto-manual selector switch and 0 to 100% ratio control switch for each chemical metering pump. All panel mounted control components to be NEMA 4X.

8. Metering Pump Local Control Panels

a. Wall mounted local control panels shall be provided for the proposed sodium hydroxide chemical feed system. The control panel shall accept external 480VAC, 3-phase power supply and shall have a main breaker with external handle for disconnect mean. The control panel shall be a stainless steel NEMA Type 4X enclosure and shall have UL label. Each local control panel shall be provided with indication lights, pushbuttons, displays, etc. as describes in this specification and as shown in the drawings for a complete and working system.

b. Control and status indications for metering pumps shall be resided in the local control panels and shall have a running indication LED light, fault indication LED light, in remote indication LED light, start/stop pushbutton, speed indication/display, speed control (potential meter), and stroke control, etc. for each pump. "Start/stop pushbutton" and speed control potential meter shall only be active when "Hand-Off-Auto" selector switch at the VFD is selected in "Hand" at each VFD. Coordinate with Electrical Contractor for conduits and cables required before bidding.

d. The electronic stroke length controller, when required, shall be provided with a local-remote switch. When "remote" is selected, the stroke length control shall be by the 4-20 mA input signal either from the local control panel or from the PLC control panel and when "local" is selected, stroke length control shall be adjusted manually.

e. Each control panel shall have two additional local displays for chlorine residual and process water flow, as shown on the instrumentation drawings. The display shall be LCD type digital display and shall accept 4-20 mA input.

9. The metering pumps shall be provided with all the additional signals as shown on the Instrumentation Drawings.

2.03 ACCESSORIES

A. Calibration Columns

1. Provide transparent calibration column to be mounted on the suction piping of each metering pump as shown on the Drawings. The calibration column shall be piped such that one (1) metering pump can be calibrated while the other pumps are fully operational. The calibration columns shall

be supplied with NPT taps for connection of piping. The calibration column volume and graduations are listed in Table 11245-A.

B. Pressure Relief Valves

1. Pressure relief valves shall be provided on the discharge piping of each metering pump as shown on the Drawings. Pressure relief valves shall use a diaphragm design and be externally adjustable by means of a screwdriver. All materials of construction shall be compatible with and fully resistant to corrosion by the liquids being pumped. The size of the pressure relief valve shall match the associated metering pump capacity.

C. Backpressure (Pressure Sustaining) Valves

1. Backpressure valves shall be provided on the discharge piping of the metering pumps as shown on the Drawings. Backpressure valves shall use a diaphragm design and be externally adjustable by means of a screwdriver. All materials of construction shall be compatible with and fully resistant to corrosion by the liquids being pumped. The size shall match the associated metering pump's capacity.

D. Pulsation Dampeners

1. Pulsation dampeners shall provide for a volumetric residual fluctuation of ±4 percent or less based upon a single feed pump in operation. The pulsation dampeners shall be equipped with a pressure gauge and charging valve mounted on top of the gas chamber. All materials of construction shall be compatible with and fully resistant to corrosion by the liquids being pumped. Pulsation dampeners shall be supplied by the pump manufacturer.

E. Spray Shield

1. The sodium hypochlorite metering pumps shall be equipped with clear plexiglass spray shields.

2. Spray shields shall extend on all sides of the metering pumps as shown in the Drawings.

3. Spray shields located on the front of the metering pumps shall be hinged with latches.

4. Spray shields shall include cut-outs for piping.

5. Design of the spray shields shall be such that the shield can be removed without removal of bolts.

6. Spray shields shall be supported by FRP structures that meet the requirements of Section 06600 – Fiberglass Reinforced Plastic Fabrications.

2.04 SPARE PARTS

A. All special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment by the manufacturer.

B. The following spare parts shall be furnished for each hydraulically or mechanically actuated metering pump:

1. Two (2) extra sets of all gaskets, seals, diaphragms, packing, etc. of each different type.

2. One (1) container of each type of lubricating or hydraulic oil required.

3. Check valve assemblies.

4. One (1) box of fuses of each size furnished.

C. Contractor shall supply one (1) spare metering pump for each pump specified.

D. The following spare parts shall be furnished for VFDs:

1. Three of each type of fuse rated 460V or less.
2. Two of each type of converter power semiconductor.
3. Two of each type of inverter power semiconductor.
4. One of each type of type control printed circuit board and gate firing boards.
5. One keypad assembly.

D. All tools and spare parts shall be furnished in containers clearly identified with indelible markings as to their contents. Each container shall be packed with its contents protected for storage. All tools shall be furnished in steel tool boxes.

PART 3 - EXECUTION

3.01 PREPARATION (NOT APPLICABLE)

3.02 INSTALLATION

A. Installation of the pumps, drivers, and accessories shall be in strict accordance with the manufacturer's instructions and recommendations in the location shown on the Drawings. Installation shall include furnishing the required lubricants for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Installation shall include any pipe and fittings necessary to connect the metering pumps to the suction and discharge piping.

3.03 INSPECTION AND TESTING

A. Furnish the services of a factory representative who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise test runs of the equipment.

B. Upon completion of installation, the manufacturer, in the presence of the Engineer and Owner, shall perform a preliminary test of the complete chemical feed system as specified under Section 11241: Chemical Feed Systems.

3.04 START-UP AND INSTRUCTION

A. Submit to the Engineer and Owner completed checkout forms and certification of completed demonstration and training forms per Section 01650: Start-up and Demonstration.

B. Contractor shall furnish at his expense the services of a factory-trained service engineer for system start-up, calibration and instruction briefings for operating personnel.

C. Manufacturer's Representative: Present at site or classroom at the WSF site as designated by Owner, for minimum person-days listed below, travel time excluded with additional time furnished if required to correct problems or deficiencies:

1. 1 person-day for installation assistance and inspection

2. 3 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.

3. 1/2 person-day for prestartup classroom or site training.

4. 1/2 person-day for facility startup.

TABLE 11245-A
FEED PUMP DESIGN REQUIREMENTS

Item	Sodium Hypochlorite Pre-Disinfection (Process 75)	Sodium Hypochlorite Post- Disinfection (Process 50)	Sodium Hypochlorite FDA Cleaning (Process 75)
Equipment Numbers	75-MP-1, 75-MP-2, 75-MP-3, 75-MP-4	50-MP-1, 50-MP-2, 50-MP-3	75-MP-5
Type	Hydraulically or Mechanically Actuated Diaphragm	Hydraulically or Mechanically Actuated Diaphragm	Hydraulically or Mechanically Actuated Diaphragm
Number of units	4	3	1
Pump Design Capacity (each)	94 gph	38.5 gph	200 gph
Minimum Feed Rate (each)	9 gph	0.65 gph	NA
Minimum Pump operating pressure	75 psi	75 psi	50 psi
Power Requirements	1 hp	1/2 hp	1 hp
Approved Pump Models	Milton Roy-MacRoy G, ProMinent-Sigma/3, or Pulsafeeder-PulsaPro 880	Milton Roy-MacRoy D, ProMinent-Sigma/2, or Pulsafeeder-PulsaPro 680	Milton Roy-MacRoy G, ProMinent-Sigma/3, or Pulsafeeder-PulsaPro 7120
Enclosure	TEFC	TEFC	TEFC
Controls	Automatic	Automatic	Manual
Stroke length control	4-20 mA Signal from Chlorine Analyzer	4-20 mA Signal from Chlorine Analyzer	--
Stroke speed control	Flow Proportional, 4-20mA Signal From TP Flow Meter	Flow Proportional, 4-20mA Signal From HSP Flow Meter	Manual
Stroke adjustment	100%	100%	100%
Stroke length adjustment	Automatic	Automatic	Manual
Solution Strength	12.5%	12.5%	12.5%
Materials:			
liquid end body	PVDF	PVDF	PVDF
diaphragm	Teflon	Teflon	Teflon
check valve balls	Ceramic	Ceramic	Ceramic
seat & O-rings	Teflon	Teflon	Teflon
hardware	Hastelloy C	Hastelloy C	Hastelloy C

TABLE 11245-A (CONTINUED)

Item	Sodium Hypochlorite Pre-Disinfection (Process 75)	Sodium Hypochlorite Post- Disinfection (Process 50)	Sodium Hypochlorite FDA Cleaning (Process 75)
Ancillary equip. location:			
pressure relief valves	Discharge Piping	Discharge Piping	Discharge Piping
back pressure valves	Discharge Piping	Discharge Piping	Discharge Piping
pulsation dampeners	Discharge Piping	Discharge Piping	Discharge Piping
calibration column	Suction Piping	Suction Piping	Suction Piping
Ancillary equip. settings:			
pressure relief valve setting	75 psi	75 psi	50 psi
back pressure valve setting	30	30	15
calibration column size	3,000 mL with 30 mL gradiations	2,000 mL with 20 mL gradiations	4,000 mL with 40 mL gradiations

END OF SECTION

SECTION 11304

CHEMICAL RESISTANT NEUTRALIZATION SYSTEM PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install, test, complete and ready for operation one (1) suspended column chemical resistant pump as specified herein and shown on the Drawings.

B. Related Work Described Elsewhere:

1. Concrete work is included in Division 3.

2. Painting, except as specified herein, is included in Division 9.

3. Mechanical piping, valves, pipe hangers, and supports are included in their respective Sections of Division 15.

4. Electrical work and motors, except as hereinafter specified, is included in Division 16.

C. General Design:

1. One (1) suspended column chemical resistant pumping units are required for this contract. The pumps shall be located and arranged as shown on the Drawings.

2. General design information is provided in Table 11304-A.

3. All working parts of identical pumps and motors, such as bearings, wearing rings, shaft, sleeves, motors, etc., shall be of standard dimension built to limit gauges or formed to templates such that parts will be interchangeable between like units and such that the Owner may at any time in the future obtain replacement and repair parts for those furnished in original machines. All parts shall be properly stamped for identification and location in the machines as shown on the Operation and Maintenance manuals furnished.

1.02 QUALITY ASSURANCE

A. To assure unit of responsibility, the motors shall be furnished and coordinated by the pump manufacturer. The Contractor shall assume full responsibility for the satisfactory installation and operation of the entire pumping system including pumps, and motors.

B. The pumps covered by these Specifications are intended to be standard pumping equipment of proven ability as manufactured by a reputable manufacturer having long experience in the production of such pumps. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactory when installed. Pump shall be manufactured in accordance with the Hydraulic Institute Standards.

C. All equipment furnished under this Specification shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing and serving the equipment and systems specified herein a minimum of five (5) years.

1.03 SUBMITTALS:

A. Materials and Shop Drawings

Copies of all material required to establish compliance with the Specifications shall be submitted in accordance with the provisions of the General Conditions and Section 01340: Shop Drawings, Working Drawings, and Samples. Submittals shall include at least the following:

1. Certified shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.

2. Manufacturer's literature and illustrations, bulletins, and/or catalogs of the equipment.

3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, on which the specified operating points are marked to show that they meet the specified requirements for head, capacity, efficiency, NPSHR, required submergence and horsepower. Curves shall be submitted on 8-1/2-inch by 11-inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to pump capacity at minimum specified total head.

4. Data including principle dimensions materials of construction, space required, clearances, piping and electrical connections and requirements, controls, type of finish, installation instructions and other pertinent information.

5. A complete total bill of materials of all equipment including the weights of equipment furnished.

6. A list of manufacturer's recommended spare parts in addition to those specified in Paragraph 2.07, with the manufacturer's current price for each item. Include gaskets, packing, etc., on the list. List bearings by the bearing manufacturer's numbers only.

7. Electrical and control schematic diagrams.

8. Complete motor data, including motor temperature switch information and wire termination diagrams. The following data shall be provided on the drive motors: rpm at full load, frequency, voltage, full load current, code and design, letter, efficiency, horsepower, number of phases, time rating, temperature rise, service factor, service duty, and bearing life rating. The submittal shall include motor manufacturer's recommended lubrication requirements.

9. Copies of all factory test results.

B. Additional Information

1. In the event that it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

2. Upon receipt and review of submitted material, provide the required number of certified prints and on reproducible tracing of all Drawings as specified in Section 01340: Shop Drawings, Working Drawings, and Samples.

C. Operating and Maintenance Instructions

1. Operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The number of copies and special requirements shall be as specified in Section 01730: Operating and Maintenance Data.

2. A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the Owner's permission, this work may be conducted in conjunction with the inspection of the installation and test run as provided under PART 3 – EXECUTION. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

D. Certifications: Execution Requirements. Furnish the Engineer with a written certification signed by the manufacturers' representative that the installed equipment:

1. Has been properly installed per the manufacturer's requirements.
2. Has been lubricated per the manufacturer's instructions.
3. Has been accurately aligned and proper running clearances set.
4. Is free from undue stress imposed by piping or mounting bolts.
5. Is ready to be operated on a continuous basis, and is free from any known defects.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.

G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.05 WARRANTY AND GUARANTEES:

A. Provide one (1) year equipment warranty.

PART 2 - PRODUCTS

2.01 EQUIPMENT GENERAL REQUIREMENTS

A. Pump curves shall be continuously rising and shall be free of dips and valleys from the design point to the shut-off head.

B. Material Service Requirements: Pumps and all related equipment shall be constructed of materials suitable for the intended applications.

C. All parts shall be so designed and proportioned as to have liberal strength and stiffness, and to be especially adapted from the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.

D. Data Plates:

1. All data plates shall be of stainless steel suitably attached to the pump with stainless steel screws. Pump data plates shall contain the manufacturer's name, pump size and type, serial number, speed, impeller diameter, design capacity and head, , and any other pertinent data.

2. Motor data plates shall contain the manufacturer's name and model number, serial number, horsepower, speed, frequency, voltage, phase, efficiency, service factor, and all other pertinent data attached to each motor.

E. Parts Numbering: Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Identical parts for separate units shall have the same number.

F. The nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its pump is operating at any point on its characteristic curve at maximum speed.

G. All pumps shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain. All pumps shall be designed for outdoor service.

H. Miscellaneous Parts: The equipment shall be furnished with shims, stainless steel anchor bolts, couplings, motor flanges, and any other miscellaneous materials necessary to properly mount and install pump and motor.

I. Painting: All external parts of the pump, motor, drive unit, base, and accessories shall be primed and finish painted (1 coat) at the factory prior to shipping. Surface preparation, priming and finish coating shall be in accordance with Section 09900: Painting. All coatings used for shop painting shall be the products of the same manufacturer as the coating to be used for field painting to assure coating compatibility. Coordinate color of finish coat with owner.

J. The pumps shall be standard dimensions such that parts will be interchangeable between like units and all units shall be supplied by the same manufacturer.

2.02 PUMP DESIGN

1. Equipment for the pumps, including motors and alternators shall be provided as a complete unit by the pump manufacturer.

2. Impellers shall be dynamically balanced.

2.03. MATERIALS OF CONSTRUCTION

1. Pumps shall have the following materials of construction:

Component	Material	Specification
Casing, column, impeller, suction piece, discharge pipe	Polypropylene or PVC as described under the subsection Service Conditions	---
Motor mounting bracket	Cast iron, epoxy coated	ASTM A 48
Motor connecting belts	Stainless Steel	AISI Type 316
Shaft, hardware, impeller key, bolting below baseplate	Stainless Steel shaft shall be fully encapsulated with polypropylene	AISI Type 18-8 or 316 Stainless Steel
Mounting plate	Polypropylene	---

2. Physical properties of the FRP or polypropylene shall be as follows:

a. Tensile Strength: 15,000 psi minimum

b. Flexural Strength: 30,000 psi minimum

2.04. SUSPENDED COLUMN PUMPS (CHEMICAL SERVICE)

Pumps shall be vertically mounted, single stage, bottom suction, with closed impeller. Provide upper ball thrust bearing, grease oil lubricated. Mounting plate shall be at least 1-1/2 inch thick. Maximum pump speed shall be 3,450 rpm. Discharge pipe shall terminate above the baseplate in a Class 150, ANSI B16.5, flat-faced flange. The pump shaft shall pass through the mounting plate via Viton lip seals to provide a vapor-tight barrier.

2.05 SEAL WATER FLUSH

All pumps shall be equipped with a seal water flush connection. The water supply shall be automatically controlled when the pumps are in operation.

2.06 PUMP MOTORS

A. The pump manufacturer shall be responsible for supplying the motor and shall ensure proper coordination for mounting of the motor on the pump. He shall properly select and size the drive unit for the pump inclusive of thrust bearing capacity for all conditions as start-up, runout, and shutoff.

B. The pump motor shall be a standard C face vertical motor. The motor shall be designed for continuous operation with a 460 volt; 3-phase, 60 Hertz power service; with a maximum speed shown in Table 11304-A.

C. The motors shall not be overloaded at any point on the driven pump's performance curve. The motor shall be NEMA Design B, and shall be designed constructed and tested in accordance with applicable IEEE, NEMA, AFBMA and ANSI standards as manufactured by U.S. Electrical Motors, or an equal approved by the Engineer. Motors shall be given a short commercial test in accordance with IEEE standards and furnished with the following construction features before shipping to the pump manufacturer testing facility:

1. Construction: All cast iron construction for frame, end brackets, conduit box and fan shroud. Motors shall be supplied with lifting lugs or "O" type bolts on the top of the motor.

2. Enclosure: Total Enclosed Fan Cooled (TEFC), severe duty, design with forced air circulation by integral fan.

3. Horsepower: Motor horsepower shall meet the requirements as specified in Table 11304-A.

4. Efficiency: Premium, 95 (minimum) percent at full load capacity.

5. Insulation: Class F

6. Temperature Rise: Class B based upon 40 degrees C ambient.

7. Service Factor: 1.15

8. Epoxy coated rotor and stator windings.

9. Motor windings shall be moisture sealed and shall be capable of passing the tests listed in MG1-12.62. Motors with form would coils shall have vacuum-pressure impregnated windings. Critical mechanical parts of the motor shall be plated or treated with a paint primer to provide additional protection in corrosive atmospheres.

10. Motor windings for stator and rotor motor leads shall be manufactured using solid copper wire.

11. Shielded, regreasable, vacuum degassed steel ball bearings. Motor thrust bearings shall have ample capacity to carry the weight of all rotating parts plus the hydraulic thrust of the pump impellers with an ample safety factor. Minimum AFBMA B-10 bearing life of 100,000 hours.

12. Corrosion resistant hardware and grease plugs.

13. Gasket between motor frame and conduit box.

14. Gasketed cast iron conduit box.

15. Stainless steel nameplate fastened with stainless steel pins.

16. Accessories: Each motor shall be provided with a heat overload protection device to protect the motor from overheating during operation. Head overload protection shall be accomplished through RTDs embedded in the motor windings that shall immediately stop the drive motor in the event of excessive heat buildup. Motor shall be provided with a 120-volt single phase strip heater to maintain a motor temperature of at least 40 degrees C, or 10 degrees C above ambient, whichever is greater.

17. Vibration and Sound limits: Vibration shall not exceed Hydraulic Institute Standards and sound pressure level shall not exceed 80 dbA at 5 feet under full load conditions in accordance with IEEE standard 85.

18. A grounding lug shall be provided in the conduit box.

2.07 ACCESSORIES

A. Lubricants: Pump and drive units shall be delivered with the equipment fully lubricated insofar as possible. If any point cannot be serviced, it shall be clearly marked to the effect that it is not lubricated and requires serving prior to operation. An adequate supply of proper lubricant, with instructions for its application, shall be supplied with the equipment for each point not lubricated prior to shipment.

B. Spare Parts: Furnish the recommended spare parts, properly boxed and labeled for each size and type of pump provided for the Project, as a minimum, the following:

1. One (1) flexible coupling.

2. Additional spare parts shall be provided for 2 full years of operation in accordance with manufacturer’s recommendation.

C. All special tools required for normal operation and maintenance shall be furnished with the equipment.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the respective manufacturer's instructions and recommendations in the locations shown on the Drawings. Equipment shall be installed by experienced and mechanically skilled workmen with previous experience in similar installations. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.

B. All necessary piping, fittings, valves, air relief valves, vents, concrete foundation, mounting brackets, anchor bolts, grouting, etc. shall be provided to ensure a complete and satisfactory installation of the pumping equipment including pump, electric motor, electrical connections, and piping connections.

C. Install piping, fittings, valves and other appurtenances to the pump installation in accordance with the manufacturer’s installation instructions, the requirements of

referenced sections included with these specifications and as shown on the Drawings. Equipment shall be installed in a workmanlike manner so that individual equipment will function properly and freely and no individual parts shall be strained.

D. Pump bases shall be rigidly and accurately anchored into position, precisely leveled and aligned, so that the completed installation is free from stress or distortion. All necessary foundation bolts, plates, nuts, and washers shall be furnished and installed by the Contractor and shall conform to the recommendations and instructions of the equipment manufacturer. Anchor bolts shall be set by the Contractor in accordance with the manufacturer's recommendations. Grouting under bases after the equipment is set is included as work under this section. Pumps and pump bases shall have adequate provisions to collect drainage and conduct it away to the nearest drain.

E. Noise and Vibrations: all equipment containing moving parts shall be installed level and plumb, unless otherwise indicated in the Drawings or in the specifications; and shall be anchored securely in order that noise be suppressed to a minimum and that vibrations do not cause damage while in operation.

3.02 COATINGS

A. All exposed portions of the pumps and motors shall be shop primed, with primer compatible with field painting as specified in Division 9.

B. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.

C. Field painting is specified under Section 09900: Painting. The primer and paint used in the shop shall be products of the same manufacturer as the field paint to assure compatibility.

D. All nameplates shall be properly protected during painting.

3.03 FACTORY SERVICE REPRESENTATIVE

A. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment for a period of not less than two 8-hour days in two separate visits to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. The first visit will be for checking and inspecting the equipment after it is installed. The second visit will be to

operate and supervise the initial field test. At least four (4) hours of the second day shall be allocated solely to the instruction of plant personnel in operation and maintenance of the equipment. This instruction period shall be scheduled at least ten days in advance with the Owner and shall take place prior to acceptance by the Owner. The final copies of the Operation and Maintenance manuals must have been delivered to the Engineer prior to scheduling the instruction period with the Owner.

3.04 INSPECTION AND TESTING

A. After pump has been completely installed, the Contractor shall conduct, in the presence of the Engineer, testing of all mechanical equipment and piping as in operation to demonstrate capacity, correct alignment, smooth operation, proper adjustment, and freedom from noise, vibration, over-heating and leaking, and to ensure satisfactory compliance with the Specifications. All defects shall be corrected. The Contractor shall supply all oil, grease, electric power, water, and all other material necessary to complete the field tests.

B. If the pump performance does not meet the Specifications, corrective measures shall be taken by the Contractor, or pump shall be removed and replaced with a pump which satisfies the conditions specified.

C. Motor Field Testing: Motor shall be disconnected from the pump and run for four (4) hours. Following the run-in test, reconnect the motor to the pumping equipment and reinstall all coupling guards.

D. Pump Field Testing:

1. Upon completion of all the mechanical work, the Contractor shall conduct testing as specified herein to demonstrate that the equipment performs in accordance with all Specifications.

2. The Contractor shall perform initial testing of the equipment to ensure himself that the tests listed in the Demonstration Test paragraph below can be completed.

3. The Demonstration Test shall demonstrate that all items of these Specifications have been met by the equipment, as installed, and shall include the following tests:

a. That the pump can deliver the specified pressure and discharge flow at rated efficiency.

4. In the event that the equipment does not meet the Demonstration Test, the Contractor shall, at his own expense, make sure changes and adjustments in the equipment which he deems necessary and shall conduct further tests until written certification is received from the Engineer.

E. All piping, fittings and valves shall be hydrostatically tested in accordance with Section 15044: Pressure Testing of Piping.

TABLE 11304-A

Service Conditions

1. Pump performance conditions and design data shall be as shown below:

2. Location: Process 50 Post Disinfection Bulk Storage Containment

Service Descriptions	**Design Value**
Wetted parts	Polypropylene
Motor horsepower (minimum):	1.0 hp
Motor speed (maximum):	1800 rpm
Suction strainer:	Yes
Manufacturers:	Vanton Series SG 300 or equal

END OF SECTION

SECTION 11400

TEMPORARY CHEMICAL FEED SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. This section covers the furnishing of all labor, materials, equipment, accessories, and incidentals required and installation, placing in operation, and field testing of a temporary sodium hypochlorite storage and feed system for pre disinfection and the FDA cleaning system.

2. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the specific equipment application. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation of all materials, equipment and appurtenances for the complete system as specified herein, whether specifically mentioned in these Specifications or not.

3. The temporary sodium hypochlorite feed system shall be furnished, installed and tested by the Contractor. Once the system is functional and accepted, it will be operated by the Owner.

4. The PLC control panel for the temporary feed system shall be provided by the project integrator. All aspects of the control system shall be coordinated with the integrator. Reference section 13300 for additional information.

B. Related Work Described Elsewhere

1. Section 01010: Summary of Project.

2. Section 02050: Demolition

3. Section 01340: Shop Drawings, Working Drawings, and Samples.

4. Section 01730: Operating and Maintenance Data.

5. Section 11241: Chemical Feed Systems.

6. Section 13300: Instrumentation and Controls

7. Mechanical piping, valves, pipe hangers, and supports are included in their respective Section of Division 15.

8. Electrical work, except as hereinafter specified, is included in Division 16.

C. General Design

1. Contractor shall be responsible for supplying a temporary chemical feed system, adequately sized to supply the existing Water Supply Facility pre disinfection and FDA cleaning system sodium hypochlorite. Sodium hypochlorite supplied shall be 12.5 percent solution.

2. All of the equipment specified herein shall be in complete conformity with Section 11241: Chemical Feed Systems and these Specifications. All of the equipment specified herein is intended to be for use in the liquid chemical feed systems and shall include, but not be limited to, the following items of material and equipment:

a. Skid mounted mechanically or hydraulically actuated metering pumps.

b. Calibration chambers.

c. Pressure relief valves.

d. Pulsation dampeners with integral pressure gauge.

e. Pressure switches.

f. Backpressure valves.

g. Diaphragm valves.

h. Pump drives and controls.

i. Chemical Storage Facilities with Containment.

1.02 QUALITY ASSURANCE

A. The temporary chemical system supplier shall assume complete responsibility for the satisfactory installation and proper operation of the entire temporary storage and pumping system including pumps, motors, controls, storage tank(s) and accessories. The temporary chemical system supplier shall coordinate with the

I&C Contractor. The I&C Contactor shall be responsible for the controls and wiring of the temporary system.

B. The pumps covered by these Specifications shall be standard pumping equipment of proven ability. The temporary chemical system supplier shall be a reputable, qualified manufacturer having a successful record of manufacturing, installation and servicing the equipment and systems specified herein a minimum of five (5) years.

C. Pre-Installation and Coordination Meetings

1. Well in advance of the temporary chemical storage and feed system installation, Contractor shall hold a pre-installation meeting to review the temporary chemical plan including the system design, schedule and phasing, construction, and temporary operation. Coordination meetings shall be held to review details of testing and transitions from the existing system to the temporary system, and from the temporary system to the permanent system. Parties concerned with the temporary chemical system shall be notified of all meetings at least 10 days prior to the scheduled dates.

1.03 SUBMITTALS

A. Materials and Shop Drawings

Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with the provisions of the General Conditions and Section 01340: Shop Drawings, Working Drawings and Samples of these Specifications. Submittals shall include at least the following:

1. Contractor shall submit a temporary chemical plan detailing the temporary chemical skids and storage tanks supplied, location, secondary containment for both the temporary skids and storage tanks, connections to the existing piping, and schedule/phasing of chemical improvements. The plan shall include details of testing and transitions from the existing system to the temporary system, and from the temporary system to the permanent system.

2. Drawings showing all important details of construction, dimensions and equipment locations. Coordinate all equipment and piping locations as requied to facilitate access for servicing temporary equipment, and to maintain normal plant operations.

3. Descriptive literature, bulletins, and/or catalogs of the equipment.

4. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, linearity, and horsepower.

5. Data including principle dimensions, materials and construction, space required, clearances, piping and electrical connections and requirements, controls, type of finish, installation instructions and other pertinent information.

6. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels, etc., including connections to work of other Sections.

7. Quality Control Submittals:

   a. Manufacturer's Certification of Compliance demonstrating that all materials of construction that come into direct or indirect contact with the chemicals being pumped are fully compatible for the specified service.

   b. Manufacturer's Certificate of Proper Installation.

   c. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

   d. Field Performance Test Certificate.

   e. All materials that come into contact with the chemicals shall be on either the EPA or NSF lists of products approved for use in contact with potable water.

B. Additional Information

1. In the event that it is impossible to conform with certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged storage period at the site.

C. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

PART 2 - PRODUCTS

2.01 GENERAL

A. The pumping units required under this section shall be complete including proper alignment and balancing of the individual units. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.

B. All equipment and piping shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed.

C. Engraved laminated nameplates giving the name and function of all selector switches, pushbuttons, alarm lights and control devices shall be securely attached to each panel furnished.

D. The temporary system shall meet all regulatory requirements and provide the Owner with a fully functional system to supply sodium hypochlorite to the existing pre disinfection injection and FDA cleaning system locations. The temporary system shall be set up and implemented such that there is no interruption in sodium hypochlorite capacity. Chemical for start-up and testing shall be furnished by the Contractor. After completion and acceptance of testing, all bulk chemical tanks shall be completely filled. Chemical will be supplied by the Owner for operation of the temporary system after testing is complete and accepted, all other required accessories and consumables for a fully functional temporary system shall be the responsibility of the Contractor, including any repairs, maintenance or spare parts. Any chemical disposal required as part of the demolition of the existing system shall be the responsibility of the Contractor. Chemical shall be disposed of at an EPA approved facility.

E. Temporary chemical tanks, metering pumps, piping, fittings, and seals shall be adequate for safe storage and conveyance of the chemical that is being stored.

F. Temporary chemical piping shall be visibly marked with signage or by other means to prevent damage that could be caused by construction activities, vehicular traffic, foot traffic, lawn/grounds crew maintenance, etc. Ramps, steel

plates, or other methods shall be deployed by the Contractor to prevent trip hazards over temporary surface piping.

2.02 MATERIALS AND EQUIPMENT

A. The Temporary Sodium Hypochlorite System shall consists of, but not limited to, the following:

1. Chemical Storage:

a. Provide, at a minimum, 30,000 gallons of bulk chemical storage.

b. Chemical storage shall be doubled-walled and contained within OSHA approved secondary containment with 110% capacity of the largest tank within containment.

c. Chemical storage tank(s) shall be provided with appropriate fill, vent, overflow and drain piping.

d. Chemical Storage tank(s) shall be equipped with level indicating and transmitting device(s).

e. Provide fill connection(s) angled toward the roadway to facilitate filling of the storage tank(s) and a means of visual level indication in sight of the fill connection(s). Provide cam lock type quick connect couplings on all fill connections. Quick connects shall be provided with a cap and chain.

2. Metering Pump System:

a. Provide a metering pump system for pre disinfection with a minimum of four (4) metering pumps (three duty, one standby). Provide a metering pump system for the FDA cleaning system with a minimum of one (1) metering pump. Metering pumps shall be mechanically actuated or hydraulically actuated diaphragm metering pumps.

b. Total firm metering pump capacity shall be 285 gph.

c. Metering pump turndown shall be capable of providing a minimum sodium hypochlorite flow rate of 9 gph with speed control.

d. Provide containment under metering pump system to capture any leaks or spills.

3. Power and Controls:

   a. Contractor shall coordinate with Owner and provide temporary power and controls for metering pumps and instrumentation.

   b. Temporary instrumentation and controls shall provide the Owner with the necessary signals to operate and monitor the temporary system identical to the proposed permanent system. Wiring, conduit, and programming necessary to integrate the temporary system into the existing control system shall be the responsibility of the contractor. The anticipated signals include the following:

      i. Pump start/stop command
      ii. Pump speed and stroke control
      iii. Pump speed feedback
      iv. Pump fault
      v. Pump in remote
      vi. Tank Level
      vii. Pressure Switch
      viii. Flow Meter
      ix. Off-Gas Solenoid

4. Accessories:

   a. Provide all piping, valves, and appurtenances necessary for transfer and feed of sodium hypochlorite in the existing system. Piping, fittings and valves shall be schedule 80 PVC in accordance with Specification Section 15070.

   b. Piping located outside of secondary containment areas shall be PVC tubing or schedule 80 PVC piping routed through schedule 80 PVC chase piping.

   c. The metering pumps system shall include the following accessories at a minimum:

      i. Calibration Column - Provide transparent calibration column to be mounted on the suction piping. The calibration column shall be piped such that one (1) metering pump can be calibrated while the other pumps are fully operational.

      ii. Pressure Relief Valves – Provide pressure relief valves on the discharge piping of each metering pump. Pressure relief valves shall use a diaphragm design and be externally

adjustable by means of a screwdriver. The size of the pressure relief valve shall match the associated metering pump capacity.

iii. Backpressure (Pressure Sustaining) Valves – Provide a backpressure valve on the discharge piping of each metering pump or on the discharge piping manifold. Backpressure valves shall use a diaphragm design and be externally adjustable by means of a screwdriver. The size shall match the associated capacity of the metering pump(s).

iv. Pulsation Dampeners - Pulsation dampeners shall provide for a volumetric residual fluctuation of ±4 percent or less based upon a single feed pump in operation. The pulsation dampeners shall be equipped with a pressure gauge and charging valve mounted on top of the gas chamber. All materials of construction shall be compatible with and fully resistant to corrosion by the liquids being pumped. Pulsation dampeners shall be supplied by the pump manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION (NOT APPLICABLE)

3.02 INSTALLATION

A. Installation of the temporary chemical system shall be in strict accordance with the manufacturer's instructions and recommendations in the location shown on the Drawings. Installation shall include furnishing the required lubricants for operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Installation shall include any pipe and fittings necessary to connect the metering pumps to the existing injection point.

3.03 INSPECTION AND TESTING

A. Furnish the services of a manufacturer’s representative who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise test runs of the equipment.

B. Upon completion of installation, the manufacturer, in the presence of the Engineer and Owner, shall perform a preliminary test of the complete chemical feed system as specified under Section 11241: Chemical Feed Systems.

3.04 START-UP AND INSTRUCTION

A. Contractor shall furnish at his expense the services of a factory-trained service engineer for system start-up, calibration and instruction briefings for operating personnel.

B. Manufacturer's Representative: Present at site or classroom at the WSF site as designated by Owner, for minimum person-days listed below, travel time excluded with additional time furnished if required to correct problems or deficiencies:

1. 1 person-day for installation assistance and inspection

2. 3 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.

3. 1/2 person-day for prestartup classroom or site training.

4. 1/2 person-day for temporary system startup.

C. The temporary chemical feed system plan detailing the testing and transitions from the existing system to the temporary system, and from the temporary system to the permanent system including schedule/phasing of chemical improvements shall be approved prior to the beginning of start-up.

D. Temporary chemical feed system shall run for a minimum of 7-days without interruption and to the satisfaction of the Owner before any demolition of the existing storage tanks or pre treatment metering pumps can begin. The existing chemical feed system and controls shall remain available for operation at all times during the testing and acceptance of the temporary chemical feed system.

END OF SECTION

DIVISION 12

NOT USED

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13216

FIBERGLASS REINFORCED PLASTIC TANKS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This section covers the furnishing and installation of three (3) horizontal fiberglass reinforced plastic (FRP) tanks and two (2) vertical FRP tanks for the storage of 12.5 trade percent sodium hypochlorite.

2. Tanks furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the fabricator unless exceptions are noted by the Engineer.

3. The Contractor shall coordinate the work between the suppliers of equipment to be used with or connected to the tank to ensure that all required provisions for mounting the accessories are included.

B. Related Work Described Elsewhere:

1. Painting: Section 09900.

2. Mechanical - General Requirements: Section 15000.

3. Chemical Feed System Piping: Section 15090.

C. General Design (not applicable)

1.02 QUALITY ASSURANCE

A. Governing Standards: Except as modified or supplemented herein, all materials and construction methods shall comply with the applicable provisions of the following standards:

1. ASTM C581, " Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures".

2. ASTM C582, "Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion Resistant Equipment".

3. ASTM D3299, "Standard Specification for Filament-Wound Glass-Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks".

4. ASTM D4097, "Standard Specification for Contact-Molded Glass-Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks".

5. Florida Building Code.

6. Fabricator's Quality Assurance Supervisor: Minimum of 3 years' experience in the fabrication of fiberglass structures.

7. Designer: Registered Professional Engineer in Florida.

8. The tanks shall be furnished, coordinated, and tested by one supplier. The system shall be completely shop-assembled, skid-mounted, and shop-tested prior to shipment.

9. The tanks shall be ASME RTP-1 certified.

1.03 SUBMITTALS

A. Materials and Shop Drawings:

1. Complete drawings, details, and specifications covering the storage tanks and accessories shall be submitted in accordance with Section 01340: Shop Drawings, Working Drawings and Samples.

2. The data shall include full information on basic materials and test data confirming the chemical resistance of the proposed resins to the intended tank contents.

3. The data shall also indicate the sizes of all major tank components including tank diameter, wall thickness, overall length, nozzle details and locations, anchor bolt locations and details, and full information and details concerning field assembly and installation.

4. Fabricator's catalog information, descriptive literature, specifications, and identification of materials of construction. Include complete resin system information.

5. Detailed fabrication drawings.