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IFB NO. Y19-709-CH

INVITATION FOR BIDS

FOR

WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS PHASE 3B

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SPECIFICATIONS - VOLUME I

PROJECT MANUAL

FOR THE

WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS PHASE 3B

Volume 1 of 2

Prepared For:

ORANGE COUNTY GOVERNMENT
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ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE IIIB

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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.

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) or their designee 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 requestd 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, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving, and Christmas Day.

4. **Contractor shall pay for the RPR's overtime**. Overtime shall be defined as time beyond the 10-hour working period between 7:00 a.m. and 7:00 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 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.

1.06 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 (C.A.R) for Access to County Facilities at least 7 days in advance for entering buildings or other restricted areas or equipment, or any work that may affect pant operations.

1.07 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.

1.08 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 use water sprinkling, temporary enclosures, and other suitable methods 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 of work. Comply with governing regulations.

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

1.09 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 Lakeville 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 County's Security Representative 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.

1.10 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 Western Regional 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 WRWSF 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' WRWSF. Proof of background checks shall be submitted to County, prior to any on-site work commencing.

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 Lakeville 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.

1.11 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 products on County property, including County parking lots, break areas, and worksites. Smoking means the lighting of any cigarette, cigar or pipe, or the possession of any lighted cigarette, 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.

1.12 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 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 WORK COVERED BY CONTRACT DOCUMENTS

A. This Contract is for the expansion of the Western Regional Supply Facility Improvements Phase 3B 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. A new 2.0 million gallon ground storage tank and associated yard piping.

2. New well houses, pumping, piping, and equipment for raw water well No. 11.

3. New well pumps for existing raw water wells No. 4 and No. 7.

4. Site work and yard piping.

5. New electrical and instrumentation systems. Refer to Section 16010 for electrical summary of work.

1.02 CONTRACTOR'S USE OF PREMISES

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

1.03 PROJECT SEQUENCE

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

B. The Western Regional WSF shall remain operational throughout construction. Work sequence shall be staged such that at least six (6) raw water wells are operational at all times (no well shall be out of service for more than seven (7) days), at least one (1) ground storage tank is operational at all times, both pre- and

post disinfection are online at all times. The WSF shall not be taken off-line. All shutdowns shall be coordinated with and approved by the Owner (no shut downs will be allowed from March - July).

C. Raw Water Supply Line Modifications.

1. In order to facilitate the raw water piping modifications shown in the Drawings, the portions of raw water piping affected can be isolated from the system and the raw water flow re-routed to maintain the capability of supplying raw water to the existing ground storage tanks. This will require bypassing the existing static mixer where sodium hypochlorite is added for pre disinfection along with hydrofluosilicic acid for fluoridation.

2. The dosing of hydrofluosilicic acid can be temporarily discontinued with coordination with the County.

3. A temporary sodium hypochlorite feed line shall be provided and installed prior to re-routing the raw water flow to isolate the portion of raw water piping required for the proposed piping modifications.

    a. The temporary feed line connection shall be coordinated with the County at either the sodium hypochlorite building or at the existing static mixer and run to the north chemical vault.

    b. Provide all piping, valves, and appurtenances necessary for routing the sodium hypochlorite feed to the temporary feed location in the north chemical vault. Piping, fittings and valves shall be schedule 80 PVC in accordance with Specification Section 15070. Piping located outside of secondary containment areas shall be PVC tubing or schedule 80 PVC piping routed through schedule 80 PVC chase piping.

    c. An injection quill with PVC ball valve and PVC ball check valve shall be provided to connect to an existing tap inside the north injection vault.

    d. 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.

4. Contractor shall coordinate piping connections, use of the temporary sodium hypochlorite feed line, re-routing of the raw water and temporary shutdown of the hydrofluosilicic acid feed system with a CAR.

D. The Contractor shall submit a detailed, step by step, sequence of construction plan demonstrating the WSF remaining on-line during construction to be approved by the Owner and Engineer. Details shall include temporary piping routing, all protective measures, materials to be used and connections to the existing piping.

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 Western Regional Water Supply Facility Improvements – Phase 3B:

   a. Measurement for various items covered under Construction of the Western Regional Water Supply Facility Improvements – Phase 3B 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 $100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.

e. Payment for the Western Regional Water Supply Facility construction will be made at the contract lump sum price, based upon the approved schedule of values and progress payments. This item shall include all materials, equipment, testing, permits, appurtenances, and work required for the construction of the Western Regional Water Supply Facility Improvements, 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 the 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 the 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 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 shutdowns 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.

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. Owner has awarded or anticipates to award the following related contracts:

1. Western Regional WSF Phase 3A Part 2 (July 2019 - May 2020)

The dates provided above in parentheses represent anticipated project durations, and do not guarantee limits of coordination with other on-site contractors. The listed contracts may commence or be completed prior to or after the dates stated. Therefore, the Contractor is responsible for coordination with other contractors including sequencing of work, work areas and onsite storage for the duration of 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 accomplished at times convenient to County.

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: _____

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

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

4. 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 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, equipment, and ground storage tanks that will contact raw water or potable water and potable water wells shall be disinfected in accordance with County, FDEP, and AWWA requirements and Specification Section 15041 prior to being put into service.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 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.

1.15 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.

1.16 HAZARDOUS LOCATIONS

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

1.17 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. The Contractor shall cooperate and coordinate with the Engineer to schedule and administer the preconstruction meeting, periodic progress meetings, and specifically called meetings throughout the progress of the Work. The Contractor shall:

a. Prepare agenda for meetings.

b. Make physical arrangements for meetings.

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

3. The Owner will attend meetings to ascertain that the Work is expedited consistent with Contract Documents and construction schedules.

4. The Contractor shall record the preconstruction meeting and each progress meeting in its entirety, and shall provide the Engineer with a CD of such recording, having good quality and clarity, and a typed transcript of the minutes of the meeting in a format approved by Owner.

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 suggested 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. Projected schedules.

c. 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.

    e. Change Orders.

    f. Applications for Payment.

6. 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 suggested 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 Work progress since previous meeting and Work scheduled (3-week look ahead schedule).

3. Field observations, problems, conflicts.

4. Problems which impede construction schedule.

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

6. Corrective measures and procedures to regain projected schedule.

7. Status of Construction Schedule and revisions to the Construction Schedule as appropriate.

8. Progress schedule during succeeding work period.

9. Coordination of schedules.

10. Review status of submittals and submittal schedule, expedite as required.

11. Maintenance of quality standards.

12. Pending changes and substitutions.

13. Shop drawing problems.

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. Other business.

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.

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 five (5) 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 Drawing.

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 a 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 recommended award of the Contract.

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;

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

C. 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.

D. 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.

E. 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.

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

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

H. The total value of electrical work.

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

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

K. 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.

1.06 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.

1.07. 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 Owner 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 DVD
PRECONSTRUCTION RECORD

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Prior to commencing work, the Contractor shall have a continuous color DVD 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 standard DVD disk in standard Mpeg2 format. Audio portion shall description the location of the video footage.

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 DVD shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business or preconstruction color DVD documentation.

B. The electrographer shall furnish to the Engineer a list of all equipment to be used for the DVD, 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 DVD 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 DVD covering the construction area by the Owner and Engineer. The Engineer shall have the authority to reject all or any portion of a DVD 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 DVD coverage.

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

PART 2 - PRODUCTS

2.01 DVD

A. DVD shall be new. Reprocessed DVDs will not be acceptable.

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, DVD 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 DVD 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 DVD 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 DVD shall have a log of that DVD's contents. The log shall describe the various segments of coverage contained on that DVD 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 01400

WEB BASED PROJECT CONTROLS SYSTEM

PART 1 - GENERAL

1.01 PROJECT CONTROLS

A. The Project Controls on this project shall be performed through the use of web-based project controls software. In fulfilling this requirement the Contractor shall provide the following:

1. Utilization of Primavera Contract Management (BCM), Business Intelligence Publisher Edition Version 14.2 or version as required by the County of Primavera Contract Management web-based software hosted and managed by a third party provider. No other software shall be acceptable. The intended users on the individual license shall include the Owner (seven (7) users), Construction Consultant (three (3) users), Engineer (three (3) users), and Contractor (minimum of two (2) users).

   The software, owner's manuals, licensing and database shall be owned and retained by the County. If the Contractor requires additional users, additional user licenses shall be provided to the County by the Contractor at no cost to the County and those additional licenses may be retained by the Contractor at project final completion.

2. OCU reserves the right to migrate to another software during the course of the project, the contractor will be properly notified and may be required to attend a training session for the new system.

3. A maintenance agreement including but not limited to technical support, training, maintenance and software upgrades shall be provided from the software supplier on the software for the duration of the project.

B. A web-based hosting service to provide individual user access for a minimum of fifteen (15) named PCM licenses, including sequel server database software, BI Publisher as the report engine, email functionality, minimum of 100 gigabytes of memory shall be provided for the duration of the contract. Contract Management shall be hosted by LoadSpring Solutions Inc.

1. Contractor shall provide and attend a one day joint training session for the Owner, owner construction consultant, Engineer and Contractor, for all components of the software in the manner detailed in section 3.01 of this specification.

2. Contract Management and the LoadSpring Solutions access portal shall be operational within 14 calendar days after issuance of Notice to Proceed and once the County approves Version 14.2 software.

3. The Contractor shall be responsible for providing all the necessary connections at the temporary office facility including but not limited to, patch panels, switches routers, etcetera, at both ends of the fiber optic cables, also, installing a single mode fiber optic cable exterior and Multi-Mode interior, from the existing Administration Building to the temporary Contractor's and Owner's field offices to be located in the general vicinity of the South Effluent Pump Station.

4. Contractor shall provide two fiber optic patch panels with four fiber adapters PN# FAP6WST2. Contractor shall terminate fiber optic cable to patch panel at each end.

5. The Contractor shall be responsible for providing internet connection averaging download speeds of 45 Mbps. The download speed shall be no less than specified elsewhere in the contract specifications. The contractor is to provide internet connectivity for the duration of the project and until no longer necessary as determined by the RPR.

6. The Primavera Contract Management 14.2 application (PCM) utilizes BI Publisher to allow users to run pre-defined reports. The user may select filters or parameters to only view data of interest, and report access is permission based making for a secure environment. The contractor will also be required to purchase two Business Intelligence Publisher for Oracle Applications licenses.

7. At least 8 custom reports and forms are to be provided under this contract. OCU will determine and identify the required reports/forms. These reports/forms will be created and tested in the OCU environment on the LoadSpring cloud. The contractor shall budget at least 5 hours per report/form for LoadSpring to create, test and implement each report/form.

8. All project correspondence and documentation including but not limited to Requests for information, Notices, Change Orders / Change Management, noncompliance notices, Notice of claims, requests for clarification, updates, meeting minutes, shop drawing transmittals, shop drawings in PDF format, shop drawing comments, letters, memos, etc. shall be created and managed in Contract Management. **The use of emails as project correspondence and documentation is unacceptable and shall be considered to be noncompliance with this specification**.

9. Statement of capability and cooperation - The Contractor shall have the capability of preparing and utilizing the specified document control software, critical path scheduling techniques and specified software packages. A statement of capability shall be submitted in writing to the Engineer with the return of the executed Agreement to the Owner and will verify that either the Contractor's organization has in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. The statement shall include the name of the individual on the Contractor's staff or qualified Consultant who will be responsible for the use of Contract Management and associated reports and for providing the required updating information of same.

1.02 SUBMITTALS

A. Provide a statement of Capability and Cooperation per 1.01.

B. Provide for approval a minimum of fifteen (15) user licenses in Orange County Utilities' name for the latest version (at the Notice to Proceed preconstruction meeting) of Contract Management.

C. Provide for approval two Business Intelligence Publisher for Oracle Applications licenses

D. Maintenance Agreement – Provide proof of maintenance agreement with Oracle/Primavera Systems that will last for the duration of the project.

E. Provide proof of web hosting services for the duration of the project.

PART 2 - PRODUCTS

2.01 Web-based Project Controls Software – Primavera Contract Management 14.2 or latest edition. Software. Collaboration by all parties on a single project database storing all project documentation during construction and through project final completion.

A. Web based hosting services to be provided by:

LoadSpring Solutions, Inc.
15 Union Street, #401
Lawrence, MA 01840
Scott D Harrison
Account Executive | LoadSpring Solutions, Inc.

Mobile: +1 781.820.0704
Office: +1 978.685.9715 x125
Web: www.loadspring.com

PART 3 - EXECUTION

3.01 REQUIREMENTS FOR OPERATION OF CONTRACT MANAGEMENT

The Contractor, Owner and Engineer shall use the following functions of the Contract Management Software:

A. Project Information Modules

1. Companies – All contact information for parties involved in this project will be entered by the County. Contractor shall provide a digital list of all contact information (Full Name with middle initial, Company Name, address, phone number, cell phone, email address, title, etc).

2. Issues – Issues shall be created as necessary to monitor potential problems on the project. Issues shall be assigned from items in requests for information, meeting minutes, or independently generated items. The project team shall be responsible for entering data and maintaining this list.

B. Communication Modules

1. Transmittal – All transmittals between the Contractor, Owner and Engineer shall be generated in the Contract Management software including but not limited to shop drawing transmittal cover letters, submittals and other project related packages or documentation.

2. Requests for Information - All requests for information shall be generated and performed through Contract Management. Requests for Information shall be performed completely electronically. All requests shall be complete. If necessary, the Contractor shall attach electronic attachments of all sketches, photographs or other documentation as necessary to provide full details of the issue or concern. References to all pertinent details, drawings, schedule activities, and issues shall be noted in each request for information. All project participants shall be responsible for electronic updates for their action items. Contractor shall submit all RFI's with a ball in court (BIC) to the Engineer. The Engineer shall provide a response and submit the RFI with a ball in court to the County. RFI's shall not be considered answered and shall not be acted upon by the Contractor until the County has officially CLOSED the RFI.

3. Notices – All notices be performed in this module. Notices shall be comprised of all documentation previously written in the form of letters, memo's, emails, test requests, Notice of claim, general correspondence, clarification, schedule update, bulletin, etc and shall be created in Contract Management with the appropriate attachments as required.

4. Notices of Non-compliance – All notices of non-compliance shall be generated and performed through Contract Management. Both the original notice from the Owner/Engineer and the proposed corrective action by the Contractor shall be completed in web-based software. Owner/Engineer shall submit all notices of non compliance with a ball in court (BIC) to the Contractor. The Contractor shall provide a response and submit the NCN with a ball in court to the Engineer. NCN's shall not be considered answered and shall not be acted upon by the Contractor until the County has officially CLOSED the NCN.

5. Meeting Minutes – All meetings shall be documented in Contract Management. Business Items and Attendees will be documented, and attachments will be attached as appropriate. Recurring meetings shall be generated using delivered functionality within Contract Management, and will be updated by the meeting organizer. Logs presented at the meetings including but not limited to Shop drawing logs, RFI logs, Change Order Logs, Test Request & Results logs, and correspondence logs shall be generated from Contract Management, dispersed and attached to the meeting minutes module. Logs shall be downloaded as of the date of the meeting to provide the most current status of all logs.

C. Contract Information Modules

1. Change Management – Change Management shall be used to organize all related documents for each change to scope of work, schedule, or budget. Related documents shall be linked via Issues and included in the CPM schedule. Estimates, proposals, and final change orders shall be linked as Attachments. The contractor shall input data and maintain this module. The Change Management process shall only be initiated from a request for information in the RFI module.

2. Payment Requisition – The Contractor shall utilize the Payment Requisition module for the purpose of inputting the monthly pay applications into Contract Management for the project record as well as for the required approval of the "pencil copy" or preliminary submittal for approval by the County inspector prior to submitting each month's printed copy through normal means.

D. Logs Modules

1. Submittal Packages – Submittals will be combined into Submittal Packages as appropriate, when workflow is similar and using Packages increase efficiency.

2. Submittals – Contract Management shall be used to create all transmittals between the Engineer, Owner and Contractor for all submittals. The printed copy of the submittals will be transmitted through normal means. Contractor shall enter a complete list of all known submittals for the project at the start of the project. Submittals shall include required by dates so that all parties are aware of upcoming submittals, and will use industry standard specification codes to categorize the submittals and shall be included in the Primavera CPM schedule.

   Contractor shall provide and attach a digital copy of the shop drawing submittal including all revisions, in PDF format for a complete project record and access for all users. However, only hard copy shop drawings submittals shall be reviewed and approved by the Engineer.

3. Contractor Daily Reports – Daily Reports shall be inputted daily through Contract Management by the Contractor. Daily Reports shall be complete and include electronic attachments, photographs, or other documentation as appropriate. Daily Reports shall be documented in accordance with the Standard Specifications for the project.

E. Other

1. Correspondence Sent – All correspondence sent shall be logged within Contract Management by the originating party in the appropriate module. Documents generated within Contract Management shall be recorded via delivered functionality within Contract Management. Documents generated external to Contract Management shall be kept to an absolute minimum and shall be manually added to appropriate contract Management module. Digitally Attach applicable documents as appropriate to Contract Management.

2. Correspondence Received – All correspondence received from outside parties pertinent to the project shall be logged within Contract Management by the receiving party. Receipt of submittals or other documents that originated out of Contract Management shall be recorded by the contractor via delivered functionality within Contract Management in the appropriate module. Digitally Attach applicable documents as appropriate to Contract Management.

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.

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. 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 for 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. Earthwork: Section 02200.

2. 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 plastic 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 finished water to be metered and reported to the County 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 structures shall be performed prior to start-up.

7. All start-up equipment and subsystems, plant startups, and performance testing shall be witnessed by the Engineer, Owner's Construction Inspector, and Operations Staff. 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. Instrumentation and Controls: Division 13.

5. Mechanical: Division 15.

6. 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 7 days in advance of start-up activities.

B. Provide adequate chemicals and diesel fuel to perform start-up services. After completion and acceptance of the performance testing, all bulk chemical and fuel tanks shall be completely filled to provide a minimum of 30 days storage.

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 six (6) copies

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. Wellfield and Pumps. Verify the control and operation of the Floridan Aquifer wellfield pumps.

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 ten (10) consecutive days. The Work must operate successfully during the ten (10) 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. Raw Water Supply Well Pumps.

2. Mechanical Systems

    a. Valves
    b. Pumps

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

    a. 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. Transfer switch (manual).

7. 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 equipment specification requires 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 writable DVDs.

J. Upon completion of all specified operator training, the Contractor shall submit to the Engineer six (6) 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. General Terms and Conditions and Contract Requirements

2. Start-Up: Section 01650

3. Cleaning: Section 01710.

4. Project Record Documents: Section 01720.

5. Operating and Maintenance Data: Section 01730.

6. Warranties and Bonds: Section 01740.

7. 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 the 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.

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.

1.05 SUBMITTALS

A. Comply with pertinent provisions of Section 01300 "Submittals" 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.

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.

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

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.

PART 2 - PRODUCTS

2.01 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 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.

3.03 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 version 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 (1) 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 copies in PDF format and one (1) in Microsoft Word format.

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 copies (indexed PDFs with a TOC).

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. Upon successful completion of the start-up, demonstration, and testing, 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 and field instruction. All designated 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.

E. 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.

F. All instruction sessions shall be recorded with portable DVD recording devices supplied by the Contractor. DVD recordings shall be made by the Contractor under the direction of the Owner using new DVDs and shall include audio recording.

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.

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. The Owner shall incur no labor or equipment cost during the guarantee period.

D. 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.

B. The Contractor shall ensure that the site is secured during the work day and shall replace plant fences at the end of each work day. The Contractor shall monitor the fenceline as necessary during the work day.

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 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.

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 dewatering, 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. 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.

C. 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.

D. 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.

E. 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.

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.

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 98% 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 necessary to bring the project site to the lines and grades shown on the Drawings.

B. The Contractor must determine for himself the volume of material required for the site.

C. Definitions:

1. Open Areas: Open areas shall be those areas that do not include building sites, limerock areas, access road right-of-way 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.

D. Related Work Described Elsewhere:

1. Earthwork: Section 02200.

1.02 SUBMITTALS

A. Submit six (6) copies of a report from a testing laboratory verifying that off-site borrow material conforms to the gradation specified.

1.03 TESTING REQUIREMENTS

A. Determination of laboratory moisture-density relationship and maximum density shall be by the Modified Proctor Method of ASTM D-1557. At least one (1) test per soil type shall be made.

B. In place soil density shall be determined either by use of a Nuclear Density Meter per ASTM D-2922 or by use of the Sand Cone Method per ASTM D-1556. In place field densities shall be taken at one (1) every 5,000 square feet at not greater than 1 foot vertical intervals for all fill areas under structures and pavement. One (1) density test is required for each pad or isolated footing and for every 20 lined feet of strip/wall footing length.

C. Compaction shall be deemed to comply with the Specifications when no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work no conforming to the Specifications.

D. Relative compaction is defined as the ratio, expressed as a percentage, of the in-place density to the laboratory maximum density.

E. Density tests will be made for determination of specified compaction by an independent testing laboratory provided by the Owner. Tests will be made in locations reviewed and approved by the Engineer. If any tests are unsatisfactory, re-excavate and recompact the fill or backfill until the specified compaction is obtained. Additional compaction tests will be taken to each side of an unsatisfactory test at locations approved by the Engineer to determine the extent of re-excavation and recompaction necessary.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Suitable: Suitable materials for fills shall be classified as A-1, A-3 or A-2-4 in accordance with AASHTO Designation M-145 and shall be free from vegetation and organic material. Not more than 10 percent (10%) by weight of fill material shall pass the No. 200 sieve. The Contractor shall furnish all additional fill material required.

B. Suitable Material To Be Placed In Water: Suitable material for fills to be placed in water shall be classified as A-l or A-3 in accordance with AASHTO Designation M-145.

C. Unsuitable: Unsuitable materials are 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.

D. Water for Compaction: Water shall be free of acid, alkali, or organic materials and shall have a pH of 7.0 to 9.0, a maximum chloride concentration of 500 mg/l, and a maximum sulfate concentration of 500 mg/l. Provide all water needed for earthwork. Provide temporary piping and valves to convey water from the source to the point of use. Provide any meters if the water is taken from a water district or agency pipeline.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Unless otherwise specified or shown on the Drawings, compact fill, embankments, and backfills to 95 percent (95%) Modified Proctor Density.

B. Excavation:

1. Excavation shall conform to the limits indicated on the plans or specified herein. This work shall included shaping and 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, and where necessary to waste much material it shall be 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.

C. Fills:

1. Fills shall be formed of suitable material placed in layers of not more than 8 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 6 inch diameter ring shall not be placed within the top 12 inches of the surface of the completed fill. Rock that will not pass through a 3 inch diameter ring shall not be placed within the top 4 inches of the completed fill. Broken concrete or asphaltic pavement shall not be used in fills.

3. 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.

4. Final elevations shall be within 0.1 foot of the required elevation and surfaces shall be sloped to drain as shown on the Drawings.

D. Excess excavation of suitable materials shall become, unless otherwise noted, the property of the Owner and shall be disposed of on-site at an area to be determined by the Owner. The Owner may elect to not keep the material in which case the Contractor shall make arrangements and bear all cost of disposing the material off-site. All unsuitable excess material shall be disposed off-site by the Contractor.

E. Moisture Control of Earth Material: During the compaction operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the material. Maintain moisture content uniform throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement by sprinkling the material. At the time of compaction, the water content of the material shall be at optimum water content or within 2 percentage points above optimum. Aerate material containing excessive moisture by blading, discing, or harrowing to hasten the drying process.

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. Site Grading: Section 02210.

3. 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 Owner.

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 02232

LIMEROCK BASE COURSE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The work specified in this section consists of the construction of a base course composed of limerock constructed on the prepared subbase in accordance with these specifications and in conformity with the lines-, grades, notes, and typical cross sections shown on the plans.

B. Related Work Described Elsewhere:

1. Clearing, Grubbing and Stripping: Section 02110

2. Earthwork: Section 02200

3. Site Grading: Section 02210

4. Finish Grading: Section 02212

5. Testing and Testing Laboratory Services: Section 01410

1.02 SUBMITTALS

A. Materials and Shop Drawings:

1. Materials supplied should be presented with information concerning source and quality of limerock base supplied for this project.

B. Additional Information:

1. Submit copies of a certification from a testing laboratory that the material used for the base meets the specified criteria and contains less than 1% by weight asbestos.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The materials delivered to this site should be as needed or just in time delivery. Substantial storage is not recommended on-site. Materials should be delivered to the areas it is need and spread as required.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Use limerock having a minimum percentage of carbonates of calcium and magnesium of 70, a maximum percentage of water-sensitive clay mineral of 3, and a liquid limit not exceeding 35. The material shall be non-plastic and contain less than 1% by weight asbestos.

B. Limerock material shall not contain cherty or other extremely hard pieces, or lumps, balls or pockets of sand or clay size material in sufficient quantity as to be detrimental to the proper bonding, finishing, or strength of the limerock base.

C. At least 97 percent (by weight) of the material shall pass a 3-1/2 inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust of fracture. All crushing or breaking up which might be necessary in order to meet such size requirements shall be done before the material is placed on the road.

D. Limerock material used in construction of limerock base shall have an average LBR value of not less than 100.

PART 3 - EXECUTION

3.01 PREPARATION

A. Sub-base shall be prepared as per Section 02240 – Stabilized Subgrade, prior to delivery of limerock in the area to be prepared.

3.02 INSTALLATION

A. Transporting Limerock

1. Transport limerock to the point where it is to be used, over rock previously placed and dumped on the end of the preceding spread. In no case shall rock be dumped directly on the subbase.

B. Spreading Limerock

1. Spread limerock uniformly. Remove and replace all segregated areas of fine or coarse rock with well-graded rock.

2. Construct base in courses between 4 inches and 6 inches in thickness.

3. For double-course base, spread rock in two courses. Thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without disturbing the subgrade.

C. Compacting and Finishing Grade

1. For double-course base, blade the first course if necessary to secure a uniform base and compact to the density specified below immediately prior to spreading the second course. No other finishing of this course is required.

2. After spreading is completed, scarify the entire surface and shape to produce the specified grade and cross section after compaction. For double-course bases, scarifying shall penetrate by at least 1/2-inch the surface of the first course.

3. As soon as proper moisture conditions are attained, compact the material to an average density of 98 percent of the maximum density obtainable under AASHTO Method T-180: Standard Method of Test for Moisture-Density Relations of Soils Using a 454 Kg (10 lb) Rammer and a 457 mm (18 in) Drop (modified). Take density readings after grading and cross sectioning have been completed.

4. "Hard-plane" the surface with a blade immediately prior to the application of prime coat to remove thin-glazed or cemented surface, leaving a granular or porous condition that will allow free penetration of prime material. Remove materials planed from the base area.

5. If at any time, the subbase material becomes mixed with the base course material, excavate and remove the mixture, reshape and compact the subbase, and replace the materials removed with clean base material, shaped and compacted as specified above.

3.03 INSPECTION AND TESTING

A. Testing Surface:

1. Check the finished surface of the base course with a templet cut to the required cross section and with a 15-foot straight edge laid parallel to the center line of the road or other approved testing devices. Correct all irregularities greater than +1/4 inch by scarifying and removing or adding rock, as may be required, after which the entire areas shall be compacted as specified herein.

2. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, complete the compacting operations for such areas prior to making the density tests on the finished grade.

B. Thickness Testing:

1. After the base is completed, test holes or cores shall be taken by an independent testing laboratory at intervals of not more than 300 feet in roadways or 2,400 sq. ft. in area paving. The average thickness of three consecutive holes must be equal to at least the specified thickness. Where the base is more than 1/2 inch deficient in thickness, or does not meet the average thickness requirement, rework the area covered by this deficient base by scarifying to a depth of at least 3 inches and adding more base material, so that after proper compacting the thickness and shape will conform to the plans.

C. Density Testing:

1. After the base is completed, the density shall be checked at intervals of not more than 300 feet of roadway or 2,400 sq. ft. of area paving. If any field density tests are below the specified density, rework and recompact the area until the minimum density is achieved.

2. MAKE AT LEAST THREE DENSITY DETERMINATIONS ON EACH DAY'S FINAL COMPACTION OPERATIONS ON EACH COURSE. The density determinations shall be made at more frequent intervals if deemed necessary by the Engineer.

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. Limerock Base Course: Section 02232.

2. Clearing, Grubbing and Stripping: Section 02110

3. Earthwork: Section 02200

4. Site Grading: Section 02210

5. Testing and Testing Laboratory Services: Section 01410

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 100 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 02509

CONCRETE SIDEWALKS

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 sidewalks to the lines and grades as shown on the Drawings.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.

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.

1.03 TESTING

A. Testing requirements and frequencies for concrete sidewalks shall be as outlined in Section 03300: Cast-In-Place Concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Concrete shall have a 28 day compressive strength of 3,000 pounds per square inch (psi).

B. Preformed Joint Filler: Preformed joint filler shall be non-extruding and resilient bituminous type and shall conform to the requirements of ASTM Designation D-1751.

C. Membrane Curing Compound: Membrane curing compound shall be clear fugitive dye and conform to the requirements of AASHTO Designation M-148, Type l-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 pouring operations. Large boulders and other obstructions shall be removed to a minimum depth of 6 inches below the finished subgrade elevation, and the space shall be backfilled with sand. Base course material or other suitable material shall be thoroughly compacted by rolling or tamping.

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 and 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 finishing operations. The alignment and grade of all forms shall be approved before and immediately prior to the placing of concrete.

C. Slipforming: The slipforming method will be allowed, provided that an acceptable finished product, true to line, grade, and cross section is consistently produced.

D. Mixing Concrete: Concrete shall be mixed in accordance with the requirements of Section 03300: Cast-In-Place Concrete.

3.02 INSTALLATION

A. Placing Concrete:

1. The concrete shall be distributed on the subgrade to such depth that, when it is consolidated and finished, the 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. 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 thoroughly consolidated against and along the faces of all forms by means of vibrators. Vibrators shall not be permitted to come in contact with 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 product conforming to the cross section, width, and surface finish required by the Drawings and Specifications.

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 10 foot straightedge. The straightedge shall be furnished by the Contractor. The straightedge shall be held in successive positions parallel to the walk 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 walk shall be in successive stages of not more than one-half the length of the straightedge.

2. Any depressions shall be immediately filled with freshly mixed concrete and struck-off, consolidated, and refinished. High areas shall be cut down and refinished.

3. Straightedge testing and surface correction shall continue until the entire surface conform to the required grade and cross section within tolerances stated herein. All surface irregularities exceeding 1/4 inch in a 10 foot straightedge span shall be corrected.

D. Final Finish: As soon as the water sheen has disappeared and just before the concrete becomes non-plastic, the concrete shall be given a light broom finish perpendicular to the forms. Finally, all edges, including expansion joint edges, shall be finished with an edging tool having a radius of 1/4 inch.

E. Joints:

1. Transverse Construction Joints: Transverse construction joints shall be constructed at the end of all pours and at other locations where the pouring operations are stopped for as long as 30 minutes. Construction joints, however, shall not be placed within 5 feet of any other transverse joint or of either end of a section of walk. If sufficient concrete has not been placed to form a slab at least five 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 walk. Construction joints shall have tooled edges with a 1/4 inch radius.

2. Transverse Contraction Joints: Transverse contraction joints shall be formed at five foot intervals and shall consist of planes of weakness created by an edging tool. The cut in the fresh concrete shall be perpendicular to the surface of the walk, shall extend to a depth of 1-1/2 inches below the top surface and shall have 1/4 inch radius tooled edges.

3. Transverse Expansion Joints: 1/2 inch expansion joints shall be formed by placing preformed joint filler around all structures and at intervals not exceeding 100 feet.

F. 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 sprayer.

3. Curing compound shall not be applied during periods of rainfall. 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.

G. Form Removal: After the concrete has sufficiently set a minimum of 12 hours, the Contractor shall remove the forms and shall backfill the space on each side. The earth shall be compacted and graded in a satisfactory manner without damage

to the concrete work. Honeycombs shall be filled with sand cement mortar. Plastering will not be allowed on the face of the walk. Rejected walk shall be removed and replaced by the Contractor without additional compensation.

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 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

SECTION 02830

CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of furnishing and installing a black, vinyl-coated (galvanized) steel chain-link fence, nominally 8 feet high with 3 strands of barbed wire, complete with gates to replace any fencing damaged during construction.

1.02 QUALITY ASSURANCE

A. Erection Qualifications: The fencing erector must be a firm experienced in the erection of fencing and accessories of the types specified. The erector must be approved by the manufacturer of the fencing.

B. Design Criteria: Comply with the standards of the Chain-link Fence Manufacturer's Institute for Galvanized Steel Chain-link Fence Fabric, Federal Specification RR-F-191/1A, unless otherwise shown or specified.

C. Sole Quality Control: Provide each type of fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. ASTM A-53, Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.
2. ASTM A-90, Test Method for Weight of Coating on Zinc-Coated (galvanized) Iron or Steel Articles.
3. ASTM A-392, Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
4. ASTM A-569, Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
5. Chain-link Fence Manufacturers Institute, Galvanized Steel Chain-Link Fence Fabric.

6. Federal Specifications, RR-F-191/1A, Fencing and Wire and Post, and Metal (Chain-Link Fence Fabric).

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings in accordance with Section 01340: Shop Drawings, Working Drawings and Samples.

1. Shop drawings for chain-link fence system including plan layout and details illustrating fence height, location and sizes of posts, rails, braces, gates, footings, hardware list and erection procedures.

2. Descriptive literature of materials to be provided to determine compliance with the Specifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of materials shall be in manufacturer's original packaging with all tags and labels intact and legible.

B. Handle and store materials in such a manner as to avoid damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fabric: The fabric shall be black, vinyl-coated chain-link 96 inches high, No. 9 gauge wire woven in a 2 inch mesh. Bottom selvage shall be barbed, top selvage shall be knuckled. The fabric shall conform to the requirements of ASTM Designation A-392. The weight of coating shall be determined as defined in ASTM Designation A-90.

B. Posts and Other Appurtenances: All posts and other appurtenances used in the construction of this fence shall be hot dipped galvanized with a minimum of 1.8 ounces per square foot of surface. Pipe sections shall conform to the requirements of ASTM Designation A-53.

C. Sizes of posts and rails are identified in Table 02830-A.

D. Gates: Swing gates shall be as indicated on the Drawings and hinged to swing through 180 degrees from closed to open and shall be complete with latches, locking devices, stop keeper, hinges, fabric, and braces. Gates shall be the same height as the fence and the gate fabric shall be the same as the fence fabric.

E. Posts, Braces, Rails and Gate Frames - Option: Steel pipe manufactured from steel conforming to ASTM A-569, cold-rolled and coated with a minimum of 0.9 ounces of zinc per square foot, a minimum of 15 micrograms of zinc chromate per square inch and a minimum of 3 mils cross link polyurethane acrylic exterior coating may be furnished in lieu of round posts specified in Paragraphs 2.01B., and 2.01C. Steel pipe shall be of the same external dimension as round posts for the respective uses with minimum wall thickness as designated in Table 02830-B.

F. Top Rail: The top rail shall be provided with couplings approximately every 20 feet. Couplings shall be the outside sleeve type, at least 6 inches long.

G. All fence and gates shall have three (3) rows of barbed wire at the top. The wire shall be supported by steel, wrought iron, or malleable iron arms attached to fence posts and vertical gates members. The arms may be attached to the fence post or be integral with the post weather cap. The arms shall support the barbed wire at an angle of 45° from vertical. All arms shall be hot-dip galvanized.

H. Barbed wire shall be 2-strand, 12-1/2 gauge wire with 14 gauge, 4-point barbs at 5 inches on center. Barbed wire shall conform to ASTM A121 and shall be zinc coated.

I. Concrete: Concrete shall have a minimum compressive strength of 3,000 psi at 28 days.

J. Hardware: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain-Link Fence Manufacturer's Institute. All parts shall be galvanized except ties and clips may be of aluminum.

PART 3 - EXECUTION

3.01 ARRANGEMENT

A. Posts: All posts shall be uniformly spaced. Post spacing shall not exceed 10 feet. Intermediate posts shall have waterproof tops which have integrally cast openings through which the top rails shall pass. Terminal posts shall consist of end, corner and pull posts.

B. Braces: Braces shall be provided at each gate, corner, pull and end post.

C. Top Rails: The top rails shall pass through the line post tops and form a continuous brace from end to end of each stretch of fence. The top rail shall be securely fastened to the terminal posts by heavy pressed steel brace bands and malleable end connections.

D. Bottom Tension Wire: The bottom tension wire shall be No. 7 gauge aluminum coated spring coil and crimped wire. Minimum weight of aluminum coating shall be 0.40 ounces per square foot of wire surface. The tension wire shall be stretched taut between terminal posts and securely fastened to each intermediate post 6 inches above the finish grade line. Tension wire shall be attached to the fence fabric with aluminum hog rings every 24 inches.

E. Stretcher Bars: Each stretcher bar shall be no less than 3/16 inch by 3/4 inch in cross section and shall have a minimum length 2 inches shorter than the fabric height. Stretcher bars shall be used for attaching the fabric to all terminal posts by threading through the fabric and being attached to the posts with 11 gauge tension bands, or other positive mechanical means, spaced at 12 inch centers. One (1) stretcher bar shall be provided for each gate and end post and two (2) for each corner and pull post.

F. Ties and Clips: Fabric shall be fastened to all intermediate posts with 9 gauge tie wires, with spacing not to exceed 12 inches apart. Fabric shall be tied to top rail with 9 gauge tie wires, with spacing not to exceed 14 inches on centers.

3.02 INSTALLATION

A. Post Setting: Line posts shall be set in holes 12 inches in diameter, 38 inches deep with 36 inch post embedment. Terminal posts shall be set in holes 15 inches diameter, 38 inches deep with 36 inch post embedment. After the post has been set and plumbed, the hole shall be filled with concrete. The exposed surface of the concrete shall be crowned to shed water.

B. Terminal and Gate Posts: Terminal and gate posts shall be set as specified above and shall be braced to the nearest post with a galvanized horizontal brace used as a compression member and a galvanized 3/8 inch steel truss rod used as a tension member.

C. Fabric: Fence fabric shall not be stretched until concrete footings have cured a minimum of three (3) days. Chain-link fabric shall be placed on the side designated by the Engineer and shall be stretched taut approximately 2 inches above finish grade and securely fastened to all posts. Rolls of wire fabric shall be

joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

TABLE 02830-A

DIMENSIONS OF POSTS, RAILS AND GATE FRAMES

Designation	Nominal Diameter (Inches)	Outside Diameter (Inches)	Thickness (Inches)	Pounds Per Foot Plain Ends
End, Corner and Pull Posts	2.50	2.875	0.203	5.79
Gate Posts (one (1) leaf width over 18 feet)	8.00	8.625	0.322	28.55
Gate Posts (one (1) leaf width 13 feet to 18 feet)	6.00	6.625	0.280	18.97
Gate Posts (one (1) leaf width 6 feet to 13 feet)	3.50	4.000	0.226	9.11
Gate Posts (one (1) leaf width 6 feet or less)	2.50	2.875	0.203	5.79
Intermediate Posts	2.00	2.375	0.154	3.65
Braces	1.25	1.660	0.140	2.27
Top Rails	1.25	1.660	0.140	2.27

TABLE 02830-B

STEEL PIPE MINIMUM
WALL THICKNESSES

Outside Dimension (Inches)	Wall Thickness (Inches)
1.66	0.111
1.90	0.120
2.375	0.130
2.875	0.160

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein. Work under this Section shall also include bonding new concrete to existing concrete.

B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts and other items furnished under other Sections and required to be cast into concrete, or approved in advance by the Engineer.

1.02 RELATED WORK

A. Concrete Reinforcement is included in Section 03200.

B. Concrete Joints and Joint Accessories are included in Section 03250

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

D. Grout is included in Section 03600.

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. Form release agent

2. Form ties

B. Samples

1. Demonstrate to the Engineer on a designated area of the concrete substructure exterior surface that the form release agent will not adversely affect concrete surfaces to be painted, coated or otherwise finished and will not affect the forming materials.

C. Certificates

1. Certify that form release agent is suitable for use in contact with potable water after 30 days (non-toxic and free of taste and odor).

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 - Standard Specification for Structural Concrete

2. ACI 318 - Building Code Requirements for Reinforced Concrete

3. ACI 347 - Formwork for Concrete

B. American Plywood Association (APA)

1. Material grades and designations as specified

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

1.05 SYSTEM DESCRIPTION

A. General: Architectural Concrete is wall, slab, beam or column concrete which will have surfaces exposed to view in the finished work. It includes similar exposed surfaces in water containment structures from the top of walls to 2-ft below the normal water surface in open tanks and basins.

B. Formwork shall be designed and erected in accordance with the requirements of ACI 301 and ACI 318 and as recommended in ACI 347 and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete.

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 MATERIALS

A. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material.

Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms may be used when approved by the Engineer and shall be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.

B. Wall Forms

1. Forms for all exposed exterior and interior concrete walls shall be "Plyform" exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group, or equal acceptable to the Engineer. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades of interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.

2. All joints or gaps in forms shall be taped, gasketed, plugged, and/or caulked with an approved material so that the joint will remain watertight and will withstand placing pressures without bulging.

C. Rustication strips shall be at the location and shall conform to the details shown on the Drawings. Moldings for chamfers and rustications shall be milled and planed smooth. Rustications and corner strips shall be of a nonabsorbent material, compatible with the form surface and fully sealed on all sides to prohibit the loss of paste or water between the two surfaces.

D. Form Release Agent

1. Coat all forming surfaces in contact with concrete using an effective, non-staining, non-residual, water based, bond-breaking form coating unless otherwise noted. Form release agents used in potable water containment structures shall be suitable for use in contact with potable water and shall be non-toxic and free of taste or odor and meet the requirements of NSF/ANSI Standard 61. Form release agent shall be Farm Fresh by Unitex or approved equal.

E. Form Ties

1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1-1/2-in of the face of the concrete. The part of the tie to be removed shall be at least 1/2-in diameter or be provided with a wood or metal cone at least 1/2-in diameter and 1-1/2-in long. Form ties in concrete exposed to view shall be the cone-washer type.

2. Form ties for exposed exterior and interior walls shall be as specified in the preceding paragraph except that the cones shall be of approved wood or plastic.

3. Flat bar ties for panel forms, if used, shall have plastic or rubber inserts having a minimum depth of 1-1/2-in and sufficient dimensions to permit proper patching of the tie hole.

4. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie.

5. Common wire shall not be used for form ties.

6. Alternate form ties consisting of tapered through-bolts at least 1-in in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the Contractor's option. Obtain Engineer's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill and seal form tie hole with non-shrink cement grout. A vinyl plug shall be inserted into the hole to serve as a waterstop. The Contractor shall be responsible for water-tightness of the form ties and any repairs needed.

PART 3 - EXECUTION

3.01 GENERAL

A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions and appearance indicated on the Drawings.

B. Forms for walls shall have removable panels at the bottom for cleaning, inspection and joint surface preparation. Forms for walls of considerable height shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, to prevent segregation and to prevent the accumulation of hardened concrete on the forms above the fresh concrete.

C. Molding, bevels, or other types of chamfer strips shall be placed to produce block outs, rustications, or chamfers as shown on the Drawings or as specified herein. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a 3/4-in chamfer. Rectangular or trapezoidal moldings shall be placed in locations requiring sealants where specified or shown on the Drawings. Sizes of moldings shall conform to the sealants manufacturer's recommendations.

D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for the adequacy of the forming system.

E. Before form material is re-used, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.

3.02 FORM TOLERANCES

A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 347 and shall meet the following additional requirements for the specified finishes.

1. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within 1/16-in and forms for plane surfaces shall be such that the concrete will be plane within 3/16-in in 4-ft. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed 1/4-in from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.

2. Formed surfaces not exposed to view or buried shall meet requirements of Class "C" Surface in ACI 347.

3. Formed rough surfaces including mass concrete, pipe encasement, electrical duct encasement and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be plus or minus 1-in.

3.03 FORM PREPARATION

A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.

B. Steel forms shall be thoroughly cleaned and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

3.04 REMOVAL OF FORMS

A. The Contractor shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301 and ACI 347. Form removal shall conform to the requirements specified in Section 03300 and a curing compound applied.

3.05 INSPECTION

A. The Engineer on site shall be notified when the forms are complete and ready for inspection at least 6 hours prior to the proposed concrete placement.

B. Failure of the forms to comply with the requirements specified herein or to produce concrete complying with requirements of Section 03300 shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the Engineer at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements of this Section and approval of the Engineer.

END OF SECTION

SECTION 03150

MODIFICATIONS AND REPAIR TO CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein. Work under this Section shall also include bonding new concrete to existing concrete.

1.02 RELATED WORK

A. Concrete Formwork is included in Section 03100.

B. Concrete Reinforcement is included in Section 03200.

C. Concrete Joints and Accessories are included in Section 03250.

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

E. Concrete Finishes are included in Section 03350.

F. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit manufacturer's technical literature on all product brands proposed for use, to the Engineer for review. The submittal shall include the manufacturer's installation and/or application instructions.

B. When substitutions for acceptable brands of materials specified herein are proposed, submit brochures and technical data of the proposed substitutions to the Engineer for approval before delivery to the project.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

2. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Sheer.

3. ASTM C883 - Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.

4. ASTM D570 - Standard Test Method for Water Absorption of Plastics.

5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.

6. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

7. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.

8. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

B. Where reference is made to one of the above standards, the latest revision as referenced in the FBC shall be used.

1.05 QUALITY ASSURANCE

A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.

B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and to prevent damage to the structures or contents by falling or flying debris. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.

C. Manufacturer Qualifications: The manufacturer of the specified products shall have a minimum of 10 years experience in the manufacture of such products and shall have an ongoing program of training, certifying and technically supporting the Contractor's personnel.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with the manufacturer's name, labels, product identification and batch numbers.

B. Store and condition the specified product as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. Materials shall comply with this Section and any state or local regulations.

B. Epoxy Bonding Agent

1. General

a. The epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete complying with the requirements of ASTM C881, Type II and the additional requirements specified herein.

2. Material

a. Properties of the cured material:

i. Compressive Strength (ASTM D695): 8500 psi minimum at 28 days.

ii. Tensile Strength (ASTM D638): 4000 psi minimum at 14 days.

iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 6,300 psi minimum at 14 days.

iv. Shear Strength (ASTM D732): 5000 psi minimum at 14 days.

v. Water Absorption (ASTM D570 - 2 hour boil): One percent maximum at 14 days.

vi. Bond Strength (ASTM C882) Hardened to Plastic: 1500 psi minimum at 14 days moist cure.

vii. Effective Shrinkage (ASTM C883): Passes Test.

viii. Color: Gray.

3. Approved manufacturers include: Sika Corporation, Lyndhurst, NJ - Sikadur 32, Hi-Mod; Master Builder's, Cleveland, OH - Concresive Liquid (LPL) or equal.

C. Epoxy Paste

1. General

a. Epoxy Paste shall be a two-component, solvent-free, asbestos free, moisture insensitive epoxy resin material used to bond dissimilar materials to concrete such as setting railing posts, dowels, anchor bolts and all-threads into hardened concrete and shall comply with the requirements of ASTM C881, Type I, Grade 3 and the additional requirements specified herein. It may also be used to patch existing surfaces where the glue line is 1/8-in or less.

2. Material

a. Properties of the cured material:

i. Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.

ii. Tensile Strength (ASTM D638): 3,000 psi minimum at 14 days. Elongation at Break - 0.3 percent minimum.

iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 3,700 psi minimum at 14 days.

iv. Shear Strength (ASTM D732): 2,800 psi minimum at 14 days.

v. Water Absorption (ASTM D570): 1.0 percent maximum at 7 days.

vi. Bond Strength (ASTM C882): 2,000 psi at 14 days moist cure.

vii. Color: Concrete grey.

3. Approved manufacturer's include:

a. Overhead applications: Sika Corporation, Lyndhurst, NJ - Sikadur Hi-mod LV 31; Master Builders, Inc., Cleveland, OH - Concresive 1438 or equal.

b. Sika Corporation, Lyndhurst, N.J. - Sikadur Hi-mod LV 32; Master Builders, Inc., Cleveland, OH - Concresive 1438 or equal.

D. Non-Shrink Precision Cement Grout, Non-Shrink Cement Grout, Non-Shrink Epoxy Grout and Polymer Modified mortar are included in Section 03600 GROUT.

E. Adhesive Capsule type anchor system shall be equal to the HIT-HY 200 adhesive Anchoring System by Hilti Fastening Systems, Tulsa, OK, or approved equal. The capsule shall consist of a sealed glass capsule containing premeasured amounts of polyester or vinylester resin, quartz sand aggregate and a hardener contained in a separate vial within the capsule.

F. Acrylic Latex Bonding Agents shall not be used for this project.

G. Crack Repair Epoxy Adhesive

1. General

a. Crack Repair Epoxy Adhesive shall be a two-component, solvent-free, moisture insensitive epoxy resin material suitable for crack grouting by injection or gravity feed. It shall be formulated for the specific size of opening or crack being injected.

b. All concrete surfaces containing potable water or water to be treated for potable use that are repaired by the epoxy adhesive injection system shall be coated with an acceptable epoxy coating approved by the FDA for use in contact with potable water.

2. Material

a. Properties of the cured material

i. Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.

ii. Tensile Strength (ASTM D638): 5,300 psi minimum at 14 days. Elongation at Break - 2 to 5 percent.

iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 12,000 psi minimum at 14 days (gravity); 4,600 psi minimum at 14 days (injection)

iv. Shear Strength (ASTM D732): 3,700 psi minimum at 14 days.

v. Water Absorption (ASTM D570 - 2 hour boil): 1.5 percent maximum at 7 days.

vi. Bond Strength (ASTM C882): 2,400 psi at 2 days dry; 2,000 psi at 14 days dry plus 12 days moist.

vii. Effective Shrinkage (ASTM 883): Passes Test.

3. Approved manufacturer's include:

a. For standard applications: Sika Corporation, Lyndhurst, NJ - Sikadur Hi-Mod; Master Builders Inc., Cleveland, OH - Concressive 1380 or equal.

b. For very thin applications; Sika Corporation, Lyndhurst, NJ - Sikadur Hi-Mod LV; Master Builders Inc., Cleveland, OH - Concressive 1468 or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Cut, repair, reuse, demolish, excavate or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified herein, or necessary to permit completion of the Work. Finishes, joints, reinforcements, sealants, etc, are specified in respective Sections. All work shall comply with other requirements of this of Section and as shown on the Drawings.

B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.

C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.

D. When drilling holes for dowels/bolts at new or existing concrete, drilling shall stop if rebar is encountered. As approved by the Engineer, the hole location shall be relocated to avoid rebar. Rebar shall not be cut without prior approval by the Engineer. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drilled hole locations may be adjusted to avoid rebar interference.

3.02 CONCRETE REMOVAL

A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits followed by chipping or jack-hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete or existing reinforcing to be left in place and existing in place equipment is not damaged. Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, or after obtaining written approval from the Engineer.

B. Where existing reinforcing is exposed due to saw cutting/core drilling and no new material is to be placed on the sawcut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4-in.

C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete.

D. Concrete specified to be left in place which is damaged shall be repaired by approved means to the satisfaction of the Engineer.

E. The Engineer may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate.

3.03 CONNECTION SURFACE PREPARATION

A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified herein, or as directed by the Engineer.

B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. - sandblasting, grinding, etc, as approved by the Engineer. Be sure the areas are not less than 1/2-in in depth. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete, subject to the Engineer's final inspection.

C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1/2-in. Reinforcing to be saved shall not be damaged during the demolition operation.

D. Reinforcing from existing demolished concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with a minimum cover all around as specified on the contract drawings or 2-in.

E. The following are specific concrete surface preparation "methods" are to be used where called for on the Drawings, specified herein or as directed by the Engineer. All installation of anchors shall be according to the manufacturer’s recommendations.

1. Method A: After the existing concrete surface at connection has been roughened and cleaned, thoroughly moisten the existing surface with water. Brush on a 1/16-in layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.

2. Method B: After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations.

   Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. Method C: Drill a hole 1/4-in larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing epoxy. The drilled hole shall first be filled with epoxy paste, and then dowels/bolts shall be buttered with paste then inserted by tapping. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of fifteen bar diameters. If not noted on the Drawings, the Engineer will provide details regarding the size and spacing of dowels.

4. Method D: Combination of Method B and C.

5. Method E: Capsule anchor system shall be set in existing concrete by drilling holes to the required depth to develop the full tensile and shear strengths of the anchor material being used. The anchor bolts system shall be installed per the manufacturer's recommendation in holes sized as required. The anchor stud bolt, rebar or other embedment item shall be tipped with a double 45 degree chamfered point, securely fastened into the chuck of all rotary percussion hammer drill and drilled into the capsule filled hole.

3.04 GROUTING

A. Grouting shall be as specified in Section 03600.

3.05 CRACK REPAIR

A. Cracks on horizontal surfaces shall be repaired by gravity feeding crack sealant into cracks per manufacturer's recommendations. If cracks are less than 1/16-in in thickness they shall be pressure injected.

B. Cracks on vertical surfaces shall be repaired by pressure injecting crack sealant through valves sealed to surface with crack repair epoxy adhesive per manufacturer's recommendations.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

B. Furnish only all deformed steel reinforcement required to be entirely built into concrete masonry unit construction.

1.02 RELATED WORK

A. Concrete Formwork is included in Section 03100.

B. Cast-in-place Concrete is included in Section 03300.

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. Reinforcing steel. Placement drawings shall conform to the recommendations of ACI 315. All reinforcement in a concrete placement shall be included on a single placement drawing or cross referenced to the pertinent main placement drawing. The main drawing shall include the additional reinforcement (around openings, at corners, etc) shown on the standard detail sheets. Bars to have special coatings and/or to be of special steel or special yield strength are to be clearly identified.

2. Bar bending details. The bars shall be referenced to the same identification marks shown on the placement drawings.

3. Schedule of all placements to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each of the placements shall be noted on the schedule. The name of the manufacturer of the fibers and the product data shall be included with the submittal.

B. Submit Test Reports, in accordance with Section 01300, of each of the following items.

1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis.

2. Welder's certification. The certification shall be in accordance with AWS D1.4 when welding of reinforcement required.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

3. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

5. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement

6. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

7. ASTM A616 - Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

8. ASTM A617 - Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement

9. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

10. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

11. ASTM A775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

12. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

13. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

B. American Concrete Institute (ACI)

1. ACI 301 - Standard Specification for Structural Concrete

2. ACI 315 - Details and Detailing of Concrete Reinforcement.

3. ACI 318 - Building Code Requirements for Structural Concrete

4. ACI SP-66 - ACI Detailing Manual

C. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice

D. American Welding Society (AWS)

1. AWS D1.4 - Structural Welding Code Reinforcing Steel

E. 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. Provide services of a manufacturer's representative, with at least 2 years experience in the use of the reinforcing fibers for a preconstruction meeting and assistance during the first placement of the material.

1.06 DELIVERY, HANDLING AND STORAGE

A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.

B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.

C. Reinforcing steel shall be stored off the ground and kept free from dirt, oil, or other injurious contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall be new, of domestic manufacture and shall comply with the following material specifications.

B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars.

C. Concrete Reinforcing Bars required on the Drawings to be Welded: ASTM A706.

D. Welded Steel Wire Fabric: ASTM A185. Provide in flat sheets.

E. Welded Deformed Steel Wire Fabric: ASTM A497.

F. Welded Plain Bar Mats: ASTM A704 and ASTM A615 Grade 60 plain bars.

G. Fabricated Deformed Steel Bar Mats: ASTM A184 and ASTM A615 Grade 60 deformed bars.

H. The following alternate materials are allowed:

1. ASTM A615 Grade 60 may be used for ASTM A706 provided the following requirements are satisfied:

a. The actual yield strength of the reinforcing steel based on mill tests shall not exceed the specified yield strength by more than 18,000 psi. Retests shall not exceed this value by more than an additional 3000 psi.

b. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.

c. The carbon equivalency (CE) of bars shall be 0.55 or less.

I. Reinforcing Steel Accessories

1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.

2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.

3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks. Blocks shall have equal or greater strength than the surrounding concrete.

4. Steel Protected Bar Supports: #4 Steel Chairs with plastic or rubber tips.

J. Tie Wire

1. Tie Wires for Reinforcement shall be 16-gauge or heavier, black annealed wire or stranded wire.

K. Mechanical reinforcing steel butt splices shall be positive connecting taper threaded type employing a hexagonal coupler such as Lenton rebar splices as manufactured by Erico Products Inc., Solon, OH or equal. They shall meet all ACI 318 Building Code requirements. Bar ends must be taper threaded with coupler manufacturer's bar threader to ensure proper taper and thread engagement. Bar couplers shall be torqued to manufacturer's recommended value.

1. Unless otherwise noted on the Drawings, mechanical tension splices shall be designed to produce a splice strength in tension or compression of not less than 125 percent of the ASTM specified minimum yield strength of the rebar.

2. Compression type mechanical splices shall provide concentric bearing from one bar to the other bar and shall be capable of developing the ultimate strength of the rebar in compression.

L. Fiber Reinforcement

1. Synthetic reinforcing fiber for concrete shall be 100 percent polypropylene collated, fibrillated fibers as manufactured by Propex Concrete Systems Chattanooga, TN - Propex or equal. Fiber length and quantity for the concrete mix shall be in strict compliance with the manufacturer's recommendations as approved by the Engineer.

2.02 FABRICATION

A. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice.

B. Bars shall be cold bent. Bars shall not be straightened or rebent.

C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the ACI 318.

D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut.

Such ends shall terminate in flat surfaces within 1-1/2 degrees of a right angle to the axis of the bar.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice.

The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.

B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:

1. Concrete cast against and permanently exposed to earth: 3-in

2. Concrete exposed to soil, water, sewage, sludge and/or weather: 2-in (Including bottom cover of slabs over water or sewage)

3. Concrete not exposed to soil, water, sewage, sludge and/or weather:

a. Slabs (top and bottom cover), walls, joists, shells and folded plate members – 3/4-in

b. Beams and columns (principal reinforcement, ties, spirals and stirrups) - 1-1/2-in

C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.

D. No reinforcing steel bars shall be welded either during fabrication or erection unless specifically shown on the Drawings or specified herein, or unless prior written approval has been obtained from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.

E. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items, may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Engineer.

F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.

G. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the Engineer. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the Engineer. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings.

3.02 REINFORCEMENT AROUND OPENINGS

A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

A. Splices designated as compression splices on the Drawings, unless otherwise noted, shall be 30 bar diameters, but not less than 12-in. The lap splice length for column vertical bars shall be based on the bar size in the column above.

B. Tension lap splices shall be provided at all laps in compliance with ACI 318. Splices in adjacent bars shall be staggered. Class A splices may be used when 50 percent or less of the bars are spliced within the required lap length. Class B splices shall be used at all other locations.

C. Splicing of reinforcing steel in concrete elements noted to be "tension members" on the Drawings shall be avoided whenever possible. However, if required for constructability, splices in the reinforcement subject to direct tension shall be welded to develop, in tension, at least 125 percent of the specified yield strength of the bar. Splices in adjacent bars shall be offset the distance of a Class B splice.

D. Install wire fabric in as long lengths as practicable. Wire fabric from rolls shall be rolled flat and firmly held in place. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI-318 but not less than 12-in. The spliced fabrics shall be tied together with wire ties spaced not more than 24-in on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.

E. Mechanical reinforcing steel splicers shall be used only where shown on the Drawings. Splices in adjacent bars shall be offset by at least 30 bar diameters. Mechanical reinforcing splices are only to be used for special splice and dowel conditions approved by the Engineer.

3.04 ACCESSORIES

A. Determine, provide and install accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.

C. Stainless steel bar supports or steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified herein.

D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Engineer.

3.05 INSPECTION

A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the Engineer and the Engineer's release to proceed with the concreting has been obtained. The Engineer shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished his/her observations of the reinforcing steel.

END OF SECTION

SECTION 03250

CONCRETE JOINTS AND JOINT ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install accessories for concrete joints as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Concrete Formwork is included in Section 03100.

B. Concrete Reinforcement is included in Section 03200.

C. Cast-In-Place Concrete is included in Section 03300.

D. Concrete Finishes are included in Section 03350.

E. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data. Submittals shall include at least the following:

1. Standard Waterstops: Product data including catalogue cut, technical data, storage requirements, splicing methods and conformity to ASTM standards.

2. Special Waterstops: Product data including catalogue cut, technical data, location of use, storage requirements, splicing methods, installation instructions and conformity to ASTM standards.

3. Premolded joint fillers: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.

4. Bond breaker: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.

5. Compressible joint filler: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.

6. Bonding agents: Product data including catalogue cut, technical data, storage requirements, product life, application requirements and conformity to ASTM standards.

B. Certifications

1. Certification that all materials used within the joint system is compatible with each other.

2. Certifications that materials used in the construction of joints are suitable for use in contact with potable water 30 days after installation.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A675 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.

2. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

3. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

4. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Types).

5. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

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

1. CRD C572 - Specification for Polyvinylchloride Waterstops.

C. Federal Specifications

1. FS SS-S-210A - Sealing Compound for Expansion Joints.

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

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. All materials used together in a given joint (bond breakers, backer rods, joint fillers, sealants, etc) shall be compatible with one another. Coordinate selection of suppliers and products to ensure compatibility. Under no circumstances shall asphaltic bond breakers or joint fillers be used in joints receiving sealant.

C. All chemical sealant type waterstops shall be products specifically manufactured for the purpose for which they will be used and the products shall have been successfully used on similar structures for more than five years.

2.02 MATERIALS

A. Standard Waterstops

1. PVC Waterstops - The waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. The waterstop shall be Greenstreak Group, Inc. model No. 732 or approved equal for construction joints and Greenstreak Group Inc. Model No. 738 for expansion joints. Provide grommets or pre-punched holes spaced at 12 inches on center along length of waterstop.

2. Factory Fabrications: Provide factory made waterstop fabrications for all changes of direction, transitions, and intersections, leaving only straight butt joints of sufficient length for splicing in the field.

B. Special Waterstops

1. Base Seal PVC Waterstop - The waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. Waterstops shall be style 925 for expansion joints, style 928 for control joints, and style 927 for construction joints by Greenstreak Plastic Products, St. Louis, MO or equal.

2. Preformed adhesive waterstops - The waterstop shall be a rope type preformed plastic waterstop meeting the requirements of Federal Specification SS-S-210A. The rope shall have a cross-section of approximately one square inch unless otherwise specified or shown on the Drawings. The waterstop shall be Synko-Flex waterstop as manufactured by Synko-Flex Products of Houston, TX, Lockstop by Greenstreak Group Inc., or equal. Primer for the material shall be as recommended by the waterstop manufacturer.

C. Premolded Joint Filler

1. Premolded joint filler - structures. Self-expanding cork, premolded joint filler shall conform to ASTM D1752, Type III. The thickness shall be 3/4-in unless shown otherwise on the Drawings.

2. Premolded joint filler - sidewalk and roadway concrete pavements or where fiber joint filler is specifically noted on the Drawings. The joint filler shall be asphalt-impregnated fiber board conforming to ASTM D1751. Thickness shall be 3/4-in unless otherwise shown on the Drawings.

D. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.

2. Except where tape is specifically called for on the drawings, bond breaker for concrete shall be either bond breaker tape or a nonstaining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc.; Silcoseal 77, by SCA Construction Supply Division, Superior Concrete Accessories or equal.

E. Bonding Agent

1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881, Type II. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, N.J.; Concresive Liquid (LPL) by Master Builders of Cleveland, OH or equal. Acrylic may be used if approved by the Engineer.

F. Compressible Joint Filler

1. The joint filler shall be a non-extruded watertight strip material use to fill expansion joints between structures.

The material shall be capable of being compressed at least 40 percent for 70 hours at 68 degrees F and subsequently recovering at least 20 percent of its original thickness in the first 1/2 hour after unloading. Compressible Joint filler shall be Evasote 380 E.S.P, by E-Poxy Industries, Inc., Ravena, NY, Sikaflex 1a by Sika or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Standard Waterstops

1. Install waterstops for all joints where indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Provide factory made waterstop fabrications for all changes in direction, intersections and transitions leaving only straight butt joints splices for the field.

2. Horizontal waterstops in slabs shall be clamped in position by the bulkhead (unless previously set in concrete).

3. Waterstops shall be installed so that half of the width will be embedded on each side of the joint. Care shall be exercised to ensure that the waterstop is completely embedded in void-free concrete.

4. Waterstops shall be terminated 3-in below the exposed top of walls. Expansion joint waterstop center bulbs shall be plugged with foam rubber, 1-in deep, at point of termination.

B. Special Waterstops

1. Install special waterstops at joints where specifically noted on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Provide factory made waterstop fabrications for all changes in direction, intersections and transitions leaving only straight butt joints splices for the field.

2. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of connections or splices. Connections and splices shall conform to the manufacturer’s recommendations and as specified herein.

3. Waterstops shall be terminated 3-in below the exposed top of walls.

C. Construction Joints

1. Make construction joints only at locations shown on the Drawings or as approved by the Engineer.

   Any additional or relocation of construction joints proposed by the Contractor, must be submitted to the Engineer for written approval.

2. Additional or relocated joints should be located where they least impair strength of the member. In general, locate joints within the middle third of spans of slabs, beams and girders. However, if a beam intersects a girder at the joint, offset the joint a distance equal to twice the width of the member being connected. Locate joints in walls and columns at the underside of floors, slabs, beams or girders and at tops of footings or floor slabs. Do not locate joints between beams, girders, column capitals, or drop panels and the slabs above them. Do not locate joints between brackets or haunches and walls or columns supporting them.

3. All joints shall be perpendicular to main reinforcement. Continue reinforcing steel through the joint as indicated on the Drawings. When joints in beams are allowed, provide a shear key and inclined dowels as approved by the Engineer.

4. Provide sealant grooves for joint sealant where indicated on the Drawings.

5. At all construction joints and at concrete joints designated on the Drawings to be "roughened", uniformly roughen the surface of the concrete to a full amplitude (distance between high and low points or side to side) of approximately 1/4-in to expose a fresh face. Thoroughly clean joint surfaces of loose or weakened materials by water-blasting or sandblasting and prepare for bonding.

6. Provide waterstops in all wall and slab construction joints in liquid containment structures and at other locations shown on the Drawings.

7. Keyways shall not be used in construction joints unless specifically shown on the Drawings or approved by the Engineer.

D. Expansion Joints

1. Do not extend through expansion joints, reinforcement or other embedded metal items that are continuously bonded to concrete on each side of joint.

2. Position premolded joint filler material accurately. Secure the joint filler against displacement during concrete placement and compaction. Place

joint filler over the face of the joint, allowing for sealant grooves as detailed on the Drawings. Tape all joint filler splices to prevent intrusion of mortar. Seal expansion joints as shown on the Drawings.

3. Expansion joints shall be 3/4-in in width unless otherwise noted on the Drawings.

4. Where indicated on Drawings, install smooth dowels at right angles to expansion joints. Align dowels accurately with finished surface. Rigidly hold in place and support during concrete placement. Unless otherwise shown on the Drawings, apply oil or grease to one end of all dowels through expansion joints. Provide plastic expansion caps on the lubricated ends of expansion dowels.

5. Provide center bulb type waterstops in all wall and slab expansion joints in liquid containment structures and at other locations shown on the Drawings.

E. Control Joints

1. Provide sealant grooves, sealants and waterstops at control joints in slabs on grade or walls as detailed. Provide waterstops at all wall and slab control joints in water containment structures and at other locations shown on the Drawings.

2. Control joints may be sawed if specifically approved by the Engineer. If control joint grooves are sawed, properly time the saw cutting with the time of the concrete set. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses have developed sufficiently to induce cracking. No reinforcing shall be cut during sawcutting.

3. Extend every other bar of reinforcing steel through control joints or as indicated on the Drawings. Where specifically noted on the Drawings, coat the concrete surface with a bond breaker prior to placing new concrete against it. Avoid coating reinforcement or waterstops with bond breaker at these locations.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

A. Concrete Formwork is included in Section 03100.

B. Concrete Reinforcement is included in Section 03200.

C. Concrete Joints and Joint Accessories are included in Section 03250.

D. Concrete Finishes are included in Section 03350.

E. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data including the following:

1. Sources of cement, pozzolan and aggregates.

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

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

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

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

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

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

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

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

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

B. Samples

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

C. Test Reports

1. Fine aggregates - sieve analysis, physical properties, and deleterious substance.

2. Coarse aggregates - sieve analysis, physical properties, and deleterious substances.

3. Cements - chemical analysis and physical properties for each type.

4. Pozzolans - chemical analysis and physical properties.

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

D. Certifications

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

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

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

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

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

2. ASTM C33 - Standard Specification for Concrete Aggregates.

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

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

5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

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

7. ASTM C150 - Standard Specification for Portland Cement

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

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

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

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

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

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

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

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

B. American Concrete Institute (ACI).

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

2. ACI 305 - Hot Weather Concreting.

3. ACI 306.1 - Standard Specification for Cold Weather Concreting.

4. ACI 318 - Building Code Requirements for Structural Concrete.

5. ACI 350 - Environmental Engineering Concrete Structures.

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

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

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

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

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

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

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

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

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

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

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

G. Field testing and inspection services will be provided by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid by the Owner. Testing of the following items shall be by the Owner to verify conformity with this Specification Section.

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

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

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

1.06 DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

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

G. Liquid Curing Compounds: Store in closed containers.

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

2.02 MATERIALS

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

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

1. Class A,B,C,D Concrete - Type I/II

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

D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed

in ASTM C33 Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 1 herein.

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

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

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

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

3. High-Range Water-Reducer (Plasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations. Where walls are 14” thick or less and the wall height exceeds 12 ft a mix including a plasticizer must be used.

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

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

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

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

2.03 MIXES

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

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

C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

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

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

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

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

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

TABLE 1

CONCRETE MIX REQUIREMENTS

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

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

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

* HRWR used at contractor's option except where walls are 14" thick or less and the wall height exceeds 12 ft a mix including a plasticizer must be used.

PART 3 - EXECUTION

3.01 MEASURING MATERIALS

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

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

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

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

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

2. Inject multiple admixtures separately during the batching sequence.

3.02 MIXING AND TRANSPORTING

A. Batch plants shall have a current NRMCA Certification or equal.

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

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

D. Keep the water tank valve on each transit truck locked at all times. Any addition of water above the appropriate W/Cm ratio must be directed by the Engineer.

Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

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

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

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

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

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

J. Temperature and Mixing Time Control

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

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

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

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

TABLE 2

MAXIMUM TIME TO DISCHARGE OF CONCRETE

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

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

3.03 CONCRETE APPEARANCE

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

1. The gradation of aggregate.

2. The proportion of fine and coarse aggregate.

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

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

3.04 PLACING AND COMPACTING

A. Placing

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

2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

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

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

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

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

7. Slabs

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

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

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

8. Formed Concrete

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

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

B. Compacting

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

2. All concrete shall be placed and compacted with mechanical vibrators. The number, type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until

sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Concrete for slabs less than 8-in thick shall be consolidated with vibrating screeds; slabs 8 to 12-in thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.

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

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

   a. Frequency returns to normal.

   b. Surface appears liquefied, flattened and glistening.

   c. Trapped air ceases to rise.

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

3.05 CURING AND PROTECTION

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

B. Curing Methods

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

   a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet

cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.

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

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

2. Specified applications of curing methods.

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

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

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

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

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

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

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

D. Cold Weather Concreting:

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

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

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

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

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

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

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

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

E. Hot Weather Concreting

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

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

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

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

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

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

3.06 REMOVAL OF FORMS

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

TABLE 3

MINIMUM TIME TO FORM REMOVAL

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

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

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

3.07 INSPECTION AND FIELD TESTING

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

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

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

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

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

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

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

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

G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.

H. See Specification Section 03900 for Leak Testing.

3.08 FAILURE TO MEET REQUIREMENTS

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

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

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

3.09 PATCHING AND REPAIRS

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

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

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

D. Immediately after removal of forms remove plugs and break off metal ties as required by Section 03100. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

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

3.10 SCHEDULE

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

TABLE 4

CONCRETE SCHEDULE

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

END OF SECTION

SECTION 03350

CONCRETE FINISHES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and finish cast-in-place concrete surfaces as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Concrete Formwork is included in Section 03100.

B. Cast-In-Place Concrete is included in Section 03300.

C. Grout is included in Section 03600.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:

1. Concrete sealer. Confirmation that the sealer is compatible with additionally applied coatings shall also be submitted.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

B. 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. Finishes

1. For concrete which will receive additional applied finishes or materials, the surface finish specified is required for the proper application of the specified manufacturer's products.

Where alternate products are approved for use, determine if changes in finishes are required and provide the proper finishes to receive these products.

2. Changes in finishes made to accommodate products different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for approval.

3. Services of Manufacturer's Representative

a. Make available at no extra cost to the Owner, upon 72 hours notification, the services of a qualified field representative of the manufacturer of curing compound, sealer or hardener to instruct the user on the proper application of the product under prevailing job conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Chemical hardener shall be Lapidolith by Sonneborn; Hornolith by A.C. Horn; Penalith by W.R. Meadows or equal fluosilicate base material.

B. Concrete sealer shall be "Kure-N-Seal", by Sonneborn, Minneapolis, MN or equal.

PART 3 - EXECUTION

3.01 FORMED SURFACES

A. Forms shall not be removed before the requirements of Section 03300, have been satisfied.

B. Exercise care to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or performing any other work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.

D. Rough-Form Finish

1. Immediately after stripping forms and before concrete has changed color, carefully remove all fins and projections.

2. Promptly fill holes left by tie cones and defects as specified in Section 03300.

E. Rubbed Finish

1. Immediately upon stripping forms and before concrete has changed color, carefully remove all fins. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete. Avoid coating large areas with the slurry at one time.

2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout proportioned by volume and consisting of 1 part cement to 1-1/2 parts of clean masonry sand having a fineness modulus of approximately 2.3 and complying with the gradation requirements of ASTM C33 for such a material. Grout shall be uniformly applied by means of damp pads of coarse burlap approximately 6-in square used as a float. Scrub grout into the pits and air holes to provide a dense mortar in all imperfections.

3. Allow the mortar to partially harden for 1 or 2 hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. (Note: Grout allowed to remain on the wall too long will harden and will be difficult to remove.)

4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout shall remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cutoff with the trowel so it can be wiped off clean with the burlap.

5. On the day following the repair of pits, air holes and blemishes, the walls shall again be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, such a film is present, a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without changing the texture of the concrete.

6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation. No extraneous materials shall remain on the surface of the wall.

The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.

F. Abrasive Blast Finish

1. Coordinate with Rubbed Finish application. Do not begin until Rubbed Finish operation is complete or before concrete has reached minimum 7-day strength. The Rubbed Finish application may be deleted by the Engineer if the unfinished concrete surface is of superior quality. Apply the abrasive blast finish only where indicated on Drawings.

2. Prepare a sample area of minimum 4-ft high by 16-ft wide Blast Finish as directed by Engineer on a portion of new wall construction which will not be exposed in the final work. Sample area shall contain a variety of finishes obtained with different nozzles, nozzle pressures, grit materials and blasting techniques for selection by Engineer. Final accepted sample shall remain exposed until completion of all Blast Finish operations.

3. Blast finish operation shall meet all regulatory agency requirements. Blast Finish contractor shall be responsible for obtaining all required permits and/or licenses.

4. Perform abrasive blast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns or variances in depths of blast as present on the accepted sample.

5. Use an abrasive grit of proper type and gradation as well as equipment and technique to expose aggregate and surrounding matrix surfaces as follows:

   a. Medium: Generally expose coarse aggregate - 1/4-in to 3/8-in reveal.

6. Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure and blasting techniques required to match Architect's samples.

7. Upon completion of the Blast Finish operation, thoroughly flush finished surfaces with clean clear water to remove residual dust and grit. Allow to air dry until curing of concrete is complete.

8. After the concrete has cured for a minimum of 28 days, apply a clear acrylic sealer as directed by manufacturer.

3.02 FLOORS AND SLABS

A. Floated Finish

1. Machine Floating

a. Screed floors and slabs with straightedges to the established grades shown on the Drawings. Immediately after final screeding, a dry cement/sand shake in the proportion of two sacks of portland cement to 350 lbs of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 lbs /1,000 sq ft of floor. Do not sprinkle neat, dry cement on the surface.

b. The application of the cement/sand shake may be eliminated at the discretion of the Engineer if the base slab concrete exhibits adequate fattiness and homogeneity and the need is not indicated. When the concrete has hardened sufficiently to support the weight of a power float without its digging into or disrupting the level surface, thoroughly float the shake into the surface with a heavy revolving disc type power compacting machine capable of providing a 200 lb compaction force distributed over a 24-in diameter disc.

c. Start floating along walls and around columns and then move systematically across the surface leaving a matte finish.

d. The compacting machine shall be the "Kelly Power Float with Compaction Control" as manufactured by Kelley Industries of SSP Construction Equipment Inc., Pomona, CA or equal. Troweling machines equipped with float (shoe) blades that are slipped over the trowel blades may be used for floating. Floating with a troweling machine equipped with normal trowel blades will not be permitted. The use of any floating or troweling machine which has a water attachment for wetting the concrete surface during finishing will not be permitted.

2. Hand Floating

a. In lieu of power floating, small areas may be compacted by hand floating. The dry cement/sand shake previously specified shall be used unless specifically eliminated by the Engineer. Screed the floors and slabs with straightedges to the established grades shown on the Drawings.

While the concrete is still green, but sufficiently hardened to support a finisher and kneeboards with no more than 1/4-in indentation, wood float to a true, even plane with no coarse aggregate visible. Use sufficient pressure on the wood floats to bring moisture to the surface.

3. Finishing Tolerances

a. Level floors and slabs to a tolerance of plus or minus 1/8-in when checked with a 10-ft straightedge placed anywhere on the slab in any direction. Where drains occur, pitch floors to drains such that there are no low spots left undrained. Failure to meet either of the above requirements shall be cause for removal, grinding, or other correction as directed by the Engineer.

B. Broom Finish

1. Screed slabs with straightedges to the established grades indicated on the Drawings. When the concrete has stiffened sufficiently to maintain small surface indentations, draw a stiff bristle broom lightly across the surface in the direction of drainage, or, in the case of walks and stairs, perpendicular to the direction of traffic to provide a non-slip surface.

C. Steel Trowel Finish

1. Finish concrete as specified in Paragraph 3.04 and 3.05. Then, hand steel trowel to a perfectly smooth hard even finish free from high or low spots or other defects.

D. Concrete Sealer

1. Prepare and seal surfaces indicated on the room finish schedule to receive a sealer as follows:

a. Finish concrete as specified in the preceding paragraphs and in accordance with the Schedule in Paragraph 3.05 below.

b. Newly Placed Concrete: Surface must be sound and properly finished. Surface is application-ready when it is damp but not wet and can no longer be marred by walking workmen.

c. Newly-Cured Bare Concrete: Level any spots gouged out by trades. Remove all dirt, dust, droppage, oil, grease, asphalt and foreign matter. Cleanse with caustics and detergents as required. Rinse thoroughly and allow to dry so that surface is no more than damp, and not wet.

d. Aged Concrete: Restore surface soundness by patching, grouting, filling cracks and holes, etc. Surface must also be free of any dust, dirt and other foreign matter.

Use power tools and/or strippers to remove any incompatible sealers or coatings. Cleanse as required, following the procedure indicated under cured concrete.

e. Methods: Apply sealer so as to form a continuous, uniform film by spray, soft-bristle push broom, long-nap roller or lambs wool applicator. Ordinary garden-type sprayers, using neoprene hose, are recommended for best results.

f. Applications: For curing only, apply first coat evenly and uniformly as soon as possible after final finishing at the rate of 200 to 400 sq ft per gallon. Apply second coat when all trades are completed and structure is ready for occupancy at the rate of 400 to 600 sq ft per gallon.

g. To meet guarantee and to seal and dustproof, two coats are required. For sealing new concrete, both coats shall be applied full-strength. On aged concrete, when renovating, dustproofing and sealing, the first coat should be thinned 10 to 15 percent with reducer per manufacturer's directions.

3.03 CONCRETE RECEIVING CHEMICAL HARDENER

A. After 28 days, minimum, concrete cure, apply chemical hardener in three applications to a minimum total coverage of the undiluted chemical of 100 sq ft per gallon and in accordance with manufacturer's recommendations as reviewed.

3.04 APPROVAL OF FINISHES

A. All concrete surfaces, when finished, will be inspected by the Engineer.

B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked.

C. After finishing horizontal surfaces, regardless of the finishing procedure specified, the concrete shall be cured in compliance with Section 03300 unless otherwise directed by the Engineer.

3.05 SCHEDULE OF FINISHES

A. Concrete shall be finished as specified either to remain as natural concrete to receive an additional applied finish or material under another section.

B. Concrete for the following conditions shall be finished as noted on the Drawings and as further specified herein:

1. Concrete to Receive Dampproofing: Rough-form finish. See Paragraph 3.01D above.

2. Concrete Not Exposed to View and Not Scheduled to Receive an Additional Applied Finish or Material: Rough-form finish. See Paragraph 3.01D above.

3. Exterior Vertical Concrete Above Grade Exposed to View: Rubbed finish. See Paragraph 3.01E above.

4. Interior Vertical Concrete Exposed to View Except in Water Containment Areas: Rubbed finish. See Paragraph 3.01E above.

5. Vertical Concrete in Water Containment Areas. Rubbed finish on exposed surfaces and extending to two feet below normal operating water level: Rough-form finish on remainder of submerged areas. See Paragraphs 3.01E and 3.01D above.

6. Interior and Exterior Underside of Concrete Exposed to View: Rubbed finish. See Paragraph 3.01E above.

7. Exterior surfaces exposed to view and indicated to have an abrasive blast finish. See Paragraph 3.01F above.

8. Interior or Exterior Horizontal Concrete not Requiring Floor Hardener or Sealer: Floated finish. See Paragraph 3.02A above.

9. Concrete for Exterior Walks, Interior and Exterior Stairs: Broomed finish perpendicular to direction of traffic. See Paragraph 3.02B above.

10. Concrete Slabs On Which Process Liquids Flow or In Contact with Sludge: Steel trowel finish. See Paragraph 3.02C above.

11. Concrete to Receive Hardener: See Paragraph 3.03 above.

12. Concrete to Receive Floor Sealer: See Paragraph 3.02D above.

13. Concrete tank bottoms to be covered with grout: See Section 03600.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

A. Formwork is included in Section 03100.

B. Concrete Reinforcement is included in Section 03200.

C. Concrete Joints and Joint Accessories are included in Section 03350.

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

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

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

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

4. Concrete grout. The submittal shall include data as required for concrete as delineated in Section 03300 and for fiber reinforcement as delineated in Section 03200. This includes the mix design, constituent quantities per cubic yard and the water/cement ratio.

B. Laboratory Test Reports

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

C. Certifications

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

D. Qualifications

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

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

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

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

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

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

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

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

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

1.05 QUALITY ASSURANCE

A. Qualifications

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

B. Pre-installation Conference

1. Well in advance of grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product proposed for use. Parties concerned with grouting shall be notified of the meeting at least 10 days prior to its scheduled date.

C. Services of Manufacturer's Representative

1. A qualified field technician of the nonshrink grout manufacturer, specifically trained in the installation of the products, shall attend the pre-installation conference and shall be present for the initial installation of each type of nonshrink grout. Additional services shall also be provided, as required, to correct installation problems.

D. Field Testing

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

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

1.06 DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

1.07 DEFINITIONS

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

PART 2 - PRODUCTS

2.01 GENERAL

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

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

2.02 MATERIALS

A. Nonshrink Cementitious Grout

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

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

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

B. Nonshrink Epoxy Grout

1. Nonshrink epoxy-based grout shall be a pre-proportioned, three component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 14,000 psi in 7 days when tested in conformity with ASTM D695 and have a maximum thermal expansion of 30 x 10-6 when tested in conformity with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders Inc.; Five Star Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co. or equal.

C. Cement Grout

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

D. Concrete Grout

1. Concrete grout shall conform to the requirements of Section 03300 except as specified herein. It shall be proportioned with cement, coarse and fine aggregates, water, water reducer and air entraining agent to produce a mix having an average strength of 2900 psi at 28 days, or 2500 psi nominal strength. Coarse aggregate size shall be 1/2-in maximum. Slump should not exceed 5-in and should be as low as practical yet still retain sufficient workability.

2. Synthetic reinforcing fibers as specified in Section 03200 shall be added to the concrete grout mix at the rate of 1.5 lbs of fibers per cubic yard of grout. Fibers shall be added from the manufacturer's premeasured bags and according to the manufacturer's recommendations in a manner which will ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.

E. Water

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

PART 3 - EXECUTION

3.01 PREPARATION

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

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

C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to a minimum of ¼" amplitude or provide a raked finish in order to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

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

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

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

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

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

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

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

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

3.02 INSTALLATION – GENERAL

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

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

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

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

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

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

3.03 INSTALLATION - CEMENT GROUTS AND NONSHRINK CEMENTITIOUS GROUTS

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

B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum

amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

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

D. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

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

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

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

3.04 INSTALLATION - NONSHRINK EPOXY GROUTS

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

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

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

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

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

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

3.05 INSTALLATION - CONCRETE GROUT

A. Screed underlying concrete to the grade shown on the Drawings. Prepare the surface according to 3.01B. Protect and keep the surface clean until placement of concrete grout.

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

C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Saturation may be maintained by ponding, by the use or soaker hoses, or by other methods acceptable to the Engineer. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed.

Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste. (A bonding grout composed of 1 part portland cement, 1.5 parts fine sand, an approved bonding admixture and water, mixed to achieve the consistency of thick paint, may be substituted for the cement slurry.)

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

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

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

3.06 SCHEDULE

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

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

C. Flowable nonshrink cementitious grout: Use under all base plates greater in area than 3-ft by 3-ft. Use at all locations indicated to receive flowable nonshrink grout by the Drawings. The Contractor, at his/her option and convenience, may also substitute flowable nonshrink grout for general purpose nonshrink cementitious grout.

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

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

END OF SECTION

SECTION 03800

LEAKAGE TESTING OF HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Hydrostatically test concrete hydraulic structures which are intended to contain liquid to determine that they are watertight and free of detectable leaks as described herein.

PART 2 - PRODUCTS

2.01 GENERAL

A. Water: Potable.

B. Piping: As required to fill and empty structures.

C. Equipment: As required to fill and empty structures.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING

A. Prior to testing, clean exposed surfaces by thorough hosing and remove all loosened matter and wash water from the structures.

B. Conduct testing before backfill is placed against walls and after all concrete has attained the specified compressive strength.

C. Fill hydraulic structures to be subjected to leakage tests with water to the normal liquid level line. Do not fill more than 10 feet of water depth per day, unless otherwise approved by the Engineer. Repair any running leaks which appear during filling before continuing. After the structure has been kept full for 48 hours, it will be assumed, for the purposes of the tests, that the absorption of moisture by the concrete in the structure is complete. Then, close all valves and gates to the structure and measure the change in water surface each day for a five-day period.

D. During the test period, examine all exposed portions of the structure, and mark all visible leaks or damp spots. Repair such leaks or damp spots later. If the drop in water surface in a 24 hour period exceeds 1/20 of 1 percent of the normal volume of liquid contained in the structure, the leakage will be considered excessive.

E. If the leakage is excessive, drain the structure, repair leaks and damp spots, refill the structure and again test for leakage. Continue this process until the drop in water surface in a 24 hour period, with the structure full, is less than 1/20 of 1 percent of the volume.

F. Evaporation and precipitation rates shall be independently measured as part of the leakage test.

G. Make repairs and additional tests at no additional cost to the Owner.

H. Apply specified coatings only after acceptance of leakage testing by the Engineer.

3.02 REPAIR METHODS

A. Repair concrete not passing the leakage test in conformance with the applicable provisions of Division 3 and to the satisfaction of the Engineer.

END OF SECTION

DIVISION 4

MASONRY

SECTION 04230

REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all materials, equipment and labor required to complete the reinforced unit masonry construction in accordance with the Drawings and Specified herein. Coordinate all work with that of other trades.

B. The work under this section includes, but is not necessarily limited to, the following:

1. Split-face concrete masonry units (CMU)

2. Reinforced CMU block and lintels

3. Masonry reinforcing, ties, and anchors

4. Grouting for masonry work

1.02 SUBMITTALS

A. Submit shop drawings, product data, mixes, etc., in accordance with Section 01300.

B. Submit complete shop drawings, including bar lists and placement drawings Comply with ACI 315 “Details and Detailing Concrete Reinforcement”. Include elevations of all reinforced walls showing reinforcement.

C. Submit manufacturer’s certifications that all masonry units meet or exceed all specified standards.

D. Product data for split-face CMU types indicating composition, shape, surfaces, and dimensions.

E. Submit 3 color samples for integral colored split-faced concrete masonry units and colored mortar mixers.

F. Submit catalog data for metal ties and anchors, joint reinforcement, and control joint material.

G. Samples of split-face CMU illustrating face profile, color range, surface, and texture for Architect’s review.

H. Installation instructions.

PART 2 - PRODUCTS

2.01 MASONRY UNITS

A. Split-Face concrete masonry units:

a. Standard and lightweight CMU shall conform to ASTM C90 as shown on the Drawings.

b. CMU shall be free from substances that will cause staining or pop-outs and shall be fine, even textured with straight and true edges. All units shall have been wet steam cured for at least 18-hours and then air cured in covered storage for not less than 28-days before delivery. Units shall have a maximum linear drying shrinkage of 0.25% (percent) (ASTM C426) and have a moisture content at time of delivery not exceeding 30% (percent) of total absorption.

c. Split-face CMU's for interior and exterior walls where indicated on the Drawings, shall be as manufactured by DeMaco Corporation, Rockblock, Inc., or approved equal. Units shall have 8-inch by 16-inch nominal face size. Matching end and corner units shall be selected from samples provided by the block manufacturer. Split-face units shall be high strength units having a minimum compressive strength of 1,900-psi for any 1-unit. Minimum acceptable water absorption rate shall be 6% of the oven dry weight of the masonry unit in pounds per cubic feet. Split-face CMU's shall be factory prefinished with an integral coloring agent that is added during the mixing process. The coloring agent used for this project shall be from the same lot and batch numbers. The color for the split-face CMU's shall be selected by the County from the CMU manufacturer's standard color samples.

d. CMU noted as fire rated on the Drawings shall conform to Underwriters Laboratories, Inc. Standard for Concrete Masonry Units UL618, and shall have a 2-hour fire resistant rating.

e. All split rib CMU shall have a height minimum of 7-1/2-inch equally spaced 3/4-inch deep by 3/4-inch wide bevels. The projected face shall have a rough texture.

f. Units shall be obtained from 1 manufacturer to ensure even color and texture.

g. Provide special units required by the Drawings including solid, corner, pilaster, lintels, and jamb units

B. Concrete Masonry Units:

a. CMU's for structures shall conform to ASTM C90, normal weight units with minimum compressive strength of 1,900-psi.

b. Vertical Reinforcing: Provide as shown on the Drawings.

C. Integral Water Repellent

a. Provide units made with integral water repellant for exposed units. Integral water repellant to be a liquid polymeric admixture that does not reduce flexural bond strength. Integral water repellant shall be ACM Chemistries; Rainbloc, Grace Construction Products; Dry-Block or equal.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM Designation A615, Grade 60, unless otherwise specified. Single width reinforcement shall be ladder or truss type, fabricated with a single pair of galvanized 9-gauge side rods and continuous 9-gauge cross-rods spaced not more than 16-inches on center

B. 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.

C. 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 MASONRY LINTELS

A. General: Provide precast or built-in-place masonry lintels in compliance with the requirements below.

B. Built-in-place masonry lintels:

1. Built-in-place lintel to be made from lintel and bond beam concrete masonry units with reinforcing bars places ad indicated and filled with grout.

2. Lintels shall be of length sufficient to bear 8” on either side of opening.

3. Temporarily support all built-in-place lintels until cured.

C. Pre-cast concrete lintels:

1. U-Lintel units, minimum compressive strength: 3500 psi at 28 days.

2. All units shall have sand block finish

3. Manufacture and tolerances shall be in compliance with PCI MNL-116, “Manual for Quality Control for Precast and Prestressed Concrete.”

4. Manufacturer shall rate U-lintel units for gravity, uplift, and lateral loads in units of pounds per linear foot, and provide load vs. deflection data.

5. Lintels shall be of length sufficient to bear 8” on either side of opening.

6. Proposed Pre-cast lintel locations are subject to review and approval by Architect.

2.04 MORTAR AND GROUT MATERIALS

A. Mortar:

1. Portland Cement shall conform to ASTM C150 Type I/II requiring only sand and water for mixing. Masonry cements may be used for colored mortar when specifically accepted.

2. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.

3. Sand shall be clean, durable particles, free from detrimental 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.

4. Water shall be potable, free from detrimental amounts of oils, acids, alkalis, or organic matter, and shall be clean and fresh.

5. 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 Owner from the mortar manufacturer's standard color samples.

6. Water repellent admixture added to mortar shall match water repellent used in manufacture of split-face CMU.

7. Mortar shall comply to the proportion requirements of ASTM C270.

8. Grout for setting bearing plates, machinery, or any other non-masonry use shall be as specified in Section 03600 "Grouting."

B. Grout: Course grout proportioned in accordance with ASTM C746

a. Portland cement shall conform to ASTM C150, Type I.

b. Aggregates:

Sand for grout shall conform to ASTM C404.

Pearock for grout shall conform to ASTM C404, number 89

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erection, support, bracing, and maintenance of formwork are the Contractor's responsibility.

B. Construct formwork to conform to shape, line, and dimensions shown and sufficiently tight to prevent leakage of mortar grout or concrete.

C. Do not remove forms and shoring 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.

3.02 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 5-minutes, approximately 2-minutes of which shall be for mixing the dry materials and not less than 3-minutes for continuing the mixing after the water has been added.

Where hydrated lime is used for mortar requiring lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into 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 that has begun to set shall not be used.

D. Mortar shall be used and placed in final position within 1-1/2 hours after mixing.

E. Mortar boards and boxes shall be cleaned at the end of each days work, and all tools shall be kept clean.

3.03 LAYING CONCRETE BLOCK

A. Do not wet concrete masonry units (CMU).

B. Masonry shall not be laid at temperatures below 40°F, without the approval of the Owner, 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°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.

C. All CMU shall be laid in a full bed of mortar, 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-face CMU's shall be laid with the horizontal stringline control to the inside face of block in a full bed of mortar on all 4 sides.

D. Masonry units shall be laid in a running bond unless otherwise shown.

E. Sizes shall be as specified and called for on the Drawings and where "Soaps" and "Splits" are used, the space between these members and the backup material shall be slushed full of mortar.

F. Masonry joints which are exposed to view shall be tooled in accordance with the following:

1. Wait until unit mortar is thumbprint hard before tooling joint.

2. Both vertical and horizontal joint spacing shall be uniform.

3. Joints for CMU shall be 3/8-inch.

4. Joints for structural block shall be 1/4-inch.

5. Joints shall be tooled slightly concave.

6. Joints for standard CMU shall be rubbed with a sponge to provide a flush, neat, rubbed joint.

7. Exterior joints for split-face CMU shall be rubbed with a sponge, paddle, or Styrofoam tool to cause the joint to blend with the masonry unit's exterior split-face. Interior face joints of split-face CMU shall match standard CMU joints.

G. Install all frames required to be set in masonry. Set masonry tightly against frames, build in and mortar in all frame anchors and fill frames solid with mortar.

H. 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 by the County.

I. Field cut split-face CMU with power tools to provide straight true edge and avoid damage to split-face. Do not install chipped or broken units.

J. Exercise care that wet mortar is not splashed onto split-face during installation. Excess or splashed mortar shall be cleaned from face with a burlap wipe.

K. During grouting, placement of foamed-in-place insulation, and application of sealants, ensures that materials are not smeared onto split-faces of CMU. Remove smeared materials as recommended by manufacturer.

L. Surfaces shall be brushed as work progresses and maintained as clean as practical. 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, and before continuing work, previously laid surfaces 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 reviewed by the County.

M. 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.

N. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.

O. All ties and reinforcing for masonry shall be furnished and installed by the

Contractor.

P. 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.

Q. Bed and grout all 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.

R. Block work shall be laid plumb, level, and true to line and grade. Lay block within the following tolerances from specified dimensions:

1. Mortar joint thickness:

   a. Bed: 3/8", +/- 1/8"

   b. Head: 3/8", -1/4", + 3/8"

2. Variation from plumb, level, and line: ¼ inch in 10 feet, 3/8 inch total

S. Where solid CMU units are shown, lay units with full mortar head and bed joints.

T. Walls

1. 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 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.

U. 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.

3.03 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 straight, centered in cells, and tied at laps and intersection of bars. 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 reinforces masonry work to supporting structure as indicated.

3.04 GROUTING

A. Use fine grout for filling spaces less than 4 inches in both horizontal directions.

B. Use course grout for filling 4 inch spaces or larger in both horizontal directions.

C. Place grout within 1.5 hours from introducing water in the mixture and prior to initial set.

D. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

E. Consolidate grout by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

F. 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.

G. 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. Openings shall have a minimum area of 12 square inches and a minimum opening dimension of 3 inches.

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.

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-gauge wire ties spaced 16-inches on center for members with 20-inches or less side dimensions, and 8-inches on center 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 1 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.

17. Grout for filled cells shall be tested.

3.05 PROTECTION

A. During erection: Cover top of walls with waterproof sheeting at end of day. Cover partially completed walls when work is not in progress. Extend 24-inches minimum down both sides and hold securely in place.

B. Protect face of walls, sills, and other projections from roof run-off, water, mud, grout, and mortar.

C. Spread sand or straw at base of walls to minimize dirt and clay splashed.

D. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

E. Clean installed block at the end of each work day.

3.06 CLEANING

A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and re-pointed 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 reviewed by the County. No further cleaning work may proceed until the sample area has been reviewed by the County, after which time the same cleaning materials and method shall be used on the remaining wall area.

E. After cleaning, treat exposed split-face CMU surfaces and mortar joint sealer applied in accordance with manufacturer's instructions. Verify surfaces are clean and thoroughly dry prior to application.

END OF SECTION

DIVISION 5

METALS

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Rough hardware
2. Loose bearing and leveling plates
3. Miscellaneous framing and supports
4. Steel channels for overhead door openings
5. Steel Pipe bollards

B. Refer to structural Drawings for catwalk system.

1.02 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.03 SUBMITTALS

A. Product Data: Include data for paint products and grout.

B. Shop Drawings:

1. Show fabrication details for metal fabrications.
2. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

3. Provide templates for anchors and bolts specified for installation under other Sections.

1.04 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

2. AWS D1.3, "Structural Welding Code--Sheet Steel."

3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.05 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of in place construction to which fabrications must fit by field measurements before fabrication. Show measurements on final shop drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.06 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Rolled Structural Steel Shapes: ASTM A 572, Grade 50.

B. Steel Plates and Bars: ASTM A36.

C. Steel Tubing, hot dipped galvanized per ASTM A53:

1. Cold-Formed Steel Tubing: ASTM A 500

2. Hot-Formed Steel Tubing: ASTM A 501

D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Galvanized finish

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

F. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

G. Galvanized sheet metal shall be commercial quality with 0.20 percent copper, ASTM A 525; G90 hot-dip galvanized, mill phosphatized where indicated for painting; 24 gauge thickness except as otherwise indicated.

2.03 ALUMINUM

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6

2.04 PAINT

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, and complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.05 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.

C. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

2.06 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.07 CONCRETE FILL FOR BOLLARDS

A. Concrete Materials and Properties: Comply with requirements of Division 03 Section, Cast-in-Place Concrete, for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.

2.08 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Shear and punch metals cleanly and accurately. Remove burrs.

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. Remove sharp or rough areas on exposed traffic surfaces.

G. 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 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.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.09 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware

1. Furnish bent or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.

2. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

B. Loose Bearing and Leveling Plates: Flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

C. Steel Channels for Overhead Door Openings

1. Fabricate steel door frame channels from structural shapes of size and to dimensions indicated in final shop drawings, meeting wind load requirements.

2. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

3. Galvanize frames and anchors in all locations:

D. Steel Pipe Bollards: Fabricate from Schedule 80 steel pipe. Fill with concrete, dome top.

2.010 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products

2. ASTM A 153, for galvanizing steel and iron hardware

B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and

Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which fabrications are to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal 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. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

E. Fit exposed connections together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

F. Field Welding:

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.

G. 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 other gasketing material as recommended by manufacturer for the intended purpose.

H. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on reviewed Shop Drawings.

3.03 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use non-shrink, metallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLING STEEL PIPE BOLLARDS

A. Anchor bollards in concrete as indicated on the Drawings.

B. Grout bollards solid, mound top surface.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil minimum dry film thickness.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05510

MISCELLANEOUS METAL

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 03350.

B. Masonry reinforcement, ties and accessories are included in Division 4.

C. Metal doors and frames are included in Section 08100.

D. Painting is included in Division 9.

E. Louvers are included in Division 10.

F. Sluice gates, slide gates, operators and appurtenances, including wall thimbles, are included in Division 11.

G. Pipe hangers and sleeves are included in Division 15.

H. Equipment anchor bolts are included in the respective Sections of Divisions 11 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.

2. Submit to the Engineer, in accordance with Section 01300, detailed shop drawings, schedules and data for all structural steel. Approval will be for strength only and shall not relieve the Contractor of responsibility for proper fit of members, of connections not detailed on the Drawings, or for

supplying all material required by the Contract Documents. Mark numbers painted on the shop assembled pieces of steel shall be the same mark numbers used on the detailed shop and erection drawings.

B. Samples

1. Submit samples as requested by the Engineer during the course of construction.

C. Test Reports

1. Certified mill test reports for the structural steel and the bolting materials.

D. Certificates

1. Certifications that welders are qualified, in accordance with AWS D1.1, on the shop and field welding procedures to be used.

1.04 REFERENCE STANDARDS

A. 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 A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

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.

19. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Caps Screws, and Studs.

20. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Iron and Steel Institute (AISI).

1. Specification for Structural Steel Buildings.

C. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code Steel.

2. AWS D1.2 - Structural Welding Code Aluminum.

3. AWS D1.6 - Structural Welding Code Stainless Steel.

D. Occupational Safety and Health Administration (OSHA)

E. 2014 Florida Building Code. (FBC)

F. 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.

D. High strength bolt materials, accessories and installation shall be in accordance with AISC Specifications for Structural Joints Using ASTM A325 bolts.

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. Store materials on skids and not on the ground. Pile and block materials so that they will not become bent or otherwise damaged.

C. Handle materials with cranes or derricks as far as practicable. Do not dump steel off cars or trucks nor handle in any other manner likely to cause damage.

D. 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	
	a. W Shapes:	ASTM A992, Gr.50
	b. M Shapes:	ASTM A36
	c. S, C and MC Shapes:	ASTM A36
	d. L Shapes:	ASTM A36
	e. Plates, rods and Bars:	ASTM A36
2.	HSS Rectangular Shapes:	ASTM A500, Grade B, 42 ksi
3.	HSS Round Shapes	ASTM A500, Grade B, 35 ksi
4.	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
5.	Steel Sheets	ASTM A366
6.	Gray Iron Castings	ASTM A48, Class 35
7.	Ductile Iron Castings	ASTM A536, Grade 65-45-12
8.	Aluminum Extruded Pipe	ASTM B429, Alloy 6063 T6
9.	Aluminum Extruded Shapes	ASTM B221, Alloy 6061 T6
10.	Aluminum Sheet and Plate	ASTM B209, Alloy 6061 T6

11.	Stainless Steel Plates, Sheets, and Structural Shapes	
	a. Exterior, Submerged or Industrial	ASTM A240, Type 316 (Type Use 316L for welded)
	b. Interior and Architectural Use	ASTM A240, Type 304
12.	Stainless Steel Bolts, Nuts, and Washers	ASTM A276, Type 316
13.	Carbon Steel Bolts and Studs	ASTM A307, Grade A or ASTM F1154, Gr.36 (galvanized unless noted otherwise)
14.	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
15.	Galvanizing	ASTM A123, Zn w/0.5 percent minimum Ni
16.	Galvanizing, hardware	ASTM A153, Zn w/0.5 percent minimum Ni
17.	Welding electrodes:	AWS A5.1, E70XX

2.03 ANCHORS, BOLTS AND FASTENING

A. Furnish anchors, bolts, fasteners, etc., as necessary for installation of the work of this section or as specified for securing the work of other sections.

B. Anchor bolt material shall be ASTM F1154, Grade 36, or ASTM A307, Grade A standard headed bolts with heavy hex nuts, Grade A washers, hot-dipped galvanized, unless noted otherwise on drawings.

C. Unless otherwise noted, bolts for the connection of carbon steel or iron shall be steel bolts; bolts for the connection of galvanized steel or iron shall be galvanized steel or stainless steel bolts; and bolts for the connection of aluminum or stainless steel shall be stainless steel bolts.

D. Unless otherwise noted, expansion anchors shall be zinc plated carbon steel 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. Expansion anchors shall be Hilti, Kwik-Bolt TZ or approved equal.

E. Unless otherwise noted, adhesive anchors shall be a two-component chemical resin anchoring system. Capsules shall be self-contained, exactly premeasured amounts of polyester or vinyl ester resin, aggregate and hardener. Stud assemblies shall consist of a stainless steel type 316 all-thread anchor rod with nut and washer. Provide manufacturer's recommended installation tools for installing anchor components. Install anchors in full compliance with the manufacturer's recommendations. Adhesive anchor system shall be Hilti, HIT-HY 200; Simpson Strong Tie, SET-XP Epoxy-Tie or approved equal.

F. Anchors used in masonry construction shall be as indicated in Section 2.03.C above where anchors are installed into solid grouted cells. Additional, Hilti, HIY-HY70 adhesive anchoring system, or approved equal, may also be used in grouted masonry construction. When fastening to hollow concrete block or brick, adhesive anchors 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 a stainless steel type 316 all-thread anchor rod with nut and washer. Anchors shall be Hilti, HIT HY-70 System or approved equal.

G. 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.

H. 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.

I. Connection bolts for wood members shall be ASTM A307, galvanized where specified.

J. Toggle bolts shall be Hilti, Toggler Bolt or equal.

2.04 METAL GRATING

A. Grating shall have rectangular, 3/16-in thick, bearing bars spaced 1-3/16-in on center with cross bars spaced at 4-in on center. All grating panels shall be banded with a bar the same size as the bearing bars.

1. Grating shall not exceed the fabricator's maximum recommended span, and meet or exceed the following load and deflection criteria for the maximum span length at the opening being covered by the grating.

   a. The grating shall produce a deflection of 1/360 of the span or less under a uniform live load of 100 lbs/sq ft on the maximum span.

   b. The grating shall produce a deflection of 1/360 of the span or less under a concentrated live load of 300 lbs applied at the mid point of the maximum span.

2. Openings 2-in or greater in diameter/dimension and grating edges shall be banded with a bar of the same depth and thickness as the bearing bars. Cut bearing bars or cross bars shall be welded to the banding bar.

3. Provide trench grating with symmetrical cross bar arrangement.

4. Grating clamps, nuts, bolts, washers and other fastening devices for grating and grating supports shall be Type 316 stainless steel. All grating shall be anchored to the supporting system using saddle clips.

B. Aluminum grating material shall be aluminum alloy 6063-T6 with a mill finish. Cross bars shall be attached to the bearing bars with interlocked swaged joints. The grating shall be Type BS by IKG Borden, Houston, TX; Type 19 SG-4 by Ohio Gratings, Inc., Canton, OH; Type 19S4 by Seidelhuber Metal Products, San Carlos, CA or equal.

C. Metal frames and supports for grating shall be of the same material as the grating unless otherwise shown on the Drawings. Where aluminum supports are used, they shall be fabricated from aluminum alloy 6061-T6.

2.05 RAILINGS

A. Guardrails and railing systems shall comply with the requirements of the FBC and shall be custom pre-engineered, mechanically fastened or welded pipe aluminum railing systems. Mechanically fastened railing system shall be TUFrail as provided by Thomson Fabrication Company or equal.

B. Rails and posts shall be 6061-T6, 6063-T6 or 6105-T5. Splice and reinforcing sleeves, brackets, end caps, toeboards, etc, shall be aluminum alloy 6061-T6, 6063-T6 or 6105-T5 alloy. Cast fittings shall be aluminum alloy No. 214. Railing system fastening hardware shall be Type 316 stainless steel. After welding, aluminum shall be anodized. All railing, posts, toeboards and exposed aluminum shall be anodized with a clear architectural Class I satin finish providing a minimum coating thickness of 0.7 mils and a minimum coating weight of 32 milligrams per square inch in compliance with AA M10C22A41.

C. Railings shall be 2 rail welded railing systems, as shown on the Drawings, fabricated with 1-1/2-in nominal diameter pipe. Posts shall be Schedule 80 pipe, and railing shall be Schedule 40 pipe, minimum. Posts and top rails shall be continuous. The top surface of the top railing at all points, including corners and terminations, shall be smooth and shall not be interrupted by projected fittings or posts. Spacing of posts shall not exceed 5-ft on center and shall be uniformly spaced except as otherwise shown on the Drawings. Posts will be required on each side of structure expansion joints. All railing posts shall be vertical.

D. Welds shall be circumferential welds ground smooth and even to produce a railing that is neat in appearance and structurally sound. Welding methods shall be in conformity with AWS standards for the materials being joined. All rail to post connections shall be coped and fastened by continuous welds. There shall be no burrs, sharp edges or protrusions on any weld on any part of the handrail system. After fabrication, the welds and surrounding area shall be cleaned and hand buffed to blend with the adjacent finish. All mechanical fasteners shall be unobtrusively located in countersunk holes with the top flush with the surface of the rail. Bends in the railing shall be as indicated by the Drawings. No distortion of the circular railing shape will be allowed. Bends and terminal sections shall be made without the use of fittings. Corner bends shall be mitered and welded bends.

E. Railing shall be assembled in sections as long as practical but shall not be greater than 24-ft in length. A field splice shall be used when an assembled section is to be attached to another section. Field splices shall be used in all railing panels that cross over structure expansion joints.

1. Field splices shall use internal splice sleeves located within 8-in of railing posts. The sleeve shall be welded to the rail on one side and fastened with a set screw to the rail on other side. The field splice shall be detailed to take the differential expansion between the railing system and the supporting structure.

2. When the field splice occurs in a railing panel crossing a structure expansion joint, the sleeve shall be welded to the rail on one side and be free to slide in the rail on other side. The field splice shall be detailed to take the same movement as the structure expansion joint.

F. The bases or supports for railing posts and handrail shall be the types indicated on the Drawings.

1. Where non-removable railing is set in concrete, the posts shall be placed in 2-1/2-in diameter formed concrete openings and firmly caulked with a nonsulphur compound, hydraulic cement equal to Por-Rok by Minwax Construction Products Division Sterling Drug, Montvale, NJ. Collars shall

be placed around the post bases and fastened in place with set screws on the side of the post away from the walkway. Posts shall be placed with the centerline 4-in from the edge of the concrete except that posts shall be set at the centerline of concrete curbs.

2. aluminum railing posts, which may collect condensation, shall have a 3/16-in drain hole drilled immediately above the concrete encased area, the base flange, or supporting socket on the side away from the walking area. The bottom of the rail post between the drain hole and the bottom of the post shall be filled with an inert material such as a compressed closed cell neoprene rod.

G. Toeboards shall be provided on all railing adjacent to a drop in elevation of 4-ft or more. Toeboards are not required on the inclined portion of stairway railings or where concrete or steel curbs, 4-in or more in height, are present. Toeboards shall be 4-in high channels of the same material as the railing. The channels shall have a minimum thickness of 1/8-in and have flanges of not less than 3/4-in nor more than 1-1/2-in in width. Toeboards shall be positioned with a maximum clearance of 1/4-in from the floor and fastened to railing posts with 1/4-in stainless steel U-bolts, with J-bolts at corner posts and with clip angles and two 1/4-in stainless steel expansion bolts at walls. Toeboards shall not be welded to the posts. Connection to post shall allow expansion and contracting movements.

H. All railings shall be properly protected by paper, or by an approved coating or by both against scratching, splashes or mortar, paint, or other defacements during transportation and erection and until adjacent work by other trades has been completed. After protective materials are removed, the surfaces shall be made clean and free from stains, marks, or defects of any kind.

I. Aluminum shapes, including mounting brackets, in contact with concrete or a different type of metal shall be separated by a 1/32" neoprene gasket or provided with a heavy coating of protective zinc chromate for separation of dissimilar materials.

J. Safety gates, for railing openings, shall be fabricated of matching pipe and rail material and configuration. The gates shall be self-closing gates with approved stop, latch and stainless steel closure spring and hinges.

K. Barrier chains, for railing openings, shall be fabricated of stainless steel chains. Chain shall be 1/4-in stainless steel links, with eleven links per foot as manufactured by Eastern Chain Works, Inc., NY; Lawrence Metal Products, Inc. or equal. Chains shall be fastened to the handrail posts at the elevation of each rail. One end of each chain shall be connected to one post with a 1/4-in diameter stainless steel eye bolt and the other end shall be connected to the other post by means of a heavy chromium plated bronze swivel eye slide harness snap and a similar eye bolt.

2.06 ACCESS HATCHES

A. Access hatches shall be as indicated by the Drawings. Where hatch is supported by steel framing members, these members shall be modified as needed to support the hatch chosen. This includes the addition of angles, tube members, etc. Hardware shall be durable and corrosion resistant with Type 316 stainless steel hardware used throughout. Provide removable lock handle. Access hatches shall be Types as indicated on the Drawings by Bilco Company, New Haven, CT or equal.

2.07 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, grates, hatches, floor plates, stop plates, stair nosings, 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. Stair treads for aluminum stairs shall have abrasive non-slip nosing as approved.

G. Aluminum nosing at concrete stairs shall be Wooster Products, Inc.; Alumogrit Treads, Type 116; similar by Barry Pattern and Foundry Co.; Andco or equal. Furnish with wing type anchors and flat head stainless steel machine screws, 12-in on center. Nosing shall also be used at concrete ladder openings. Nosing shall a single piece for each step extending to within 3-in at each side of stair or full ladder width. Set nosing flush with stair tread finish at concrete stairs. Furnish treads with heavy duty protective tape cover.

H. Miscellaneous aluminum items shall have a cleaned and degreased mill finish.

2.08 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.

2.09 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 railings shall be erected to line and plumb with tightly fitted joints proving smooth transitions. For mechanically fastened systems provide gaps between connecting members no greater than 1/8” unless at designated expansion joints.

I. 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.

J. 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.

K. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.

L. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

M. Between aluminum grating, aluminum stair treads, or aluminum handrail brackets and steel supports, insert 1/4-in thick neoprene isolator pads, 85 plus or minus 5 Shore A durometer, sized for full width and length of bracket or support.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

SECTION 06615

FIBERGLASS REINFORCED PLASTIC COMPONENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install the fiberglass reinforced plastic (FRP) guard rails, grating, platform, stairs and support system and as specified herein.

1.02 SUBMITTALS

A. Submit, in accordance with Section 01300, complete shop drawings of all FRP products specified herein. Submit shop drawings and calculations for FRP, ladders, platform, stairs and railing systems sealed by a licensed professional engineer. Submittals shall indicate construction details, sizes, thicknesses of sections, profiles, attachments, dimensions and field joints, method of support from structure, work to be built-in or provided by other sections and finishes to conform to the Drawings and this Section. Indicate connections, both shop and field. Submittals shall include the following:

1. Strength tests, physical properties, dimensions, chemical resistance tests and material composition.

2. Manufacturer's certification that materials meet specification requirements.

B. Certified test data based on tests of actual production samples which demonstrate that the products conforms to the stress and deflection requirements specified herein.

1.03 REFERENCE STANDARD

A. American Society for Testing and Materials (ASTM).

1. ASTM E84 - Standard Test Methods for Surface Burning Characteristics of Building Materials.

2. ASTM D349 - Standard Test Methods for Laminated Round Rods Used for Electrical Insulation.

3. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.

4. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

5. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

B. Occupational Safety and Health Administration (OSHA)

C. Florida Building Code (FBC), Current Edition

D. American Iron and Steel Institute (AISI)

E. 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. The fiberglass reinforced plastic components manufacturers shall be experienced in the manufacture of items of similar size and quality and shall present proof as required of successful installations involving the items under similar conditions to this project.

B. 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.

C. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections

1.05 DESIGN CRITERIA

A. The design of FRP products shall be in accordance with OSHA structural guidelines, ASTM standard testing procedures and generally accepted structural design practice.

B. The design of FRP products shall be the responsibility of the manufacturer and shall be acceptable to the Engineer.

C. The design criteria of FRP railing systems shall comply with section 1607.8 of the FBC.

D. Specific design criteria for individual components or structures shall be in accordance with OSHA 29 CFR 1910 Subpart D and as follows:

1. The designed FRP products shall meet the following loading requirements. In addition to the dead load, the FRP gratings, platforms and stairs shall be capable of supporting a uniform live load of 100 psf while maintaining a deflection of less than 0.25-in or L/360, whichever is smaller. The gratings, platforms and stairs shall also be capable of supporting a concentrated live load of 500 lbs applied over a 12-in by 1-in area at the midpoint of the spans indicated on the Drawings.

2. Factor of safety shall be 5 based on ultimate stress. Grating shall be a minimum of 2-in deep, and have either a T-bar or rectangular bar shape.

PART 2 - PRODUCTS

2.01 MATERIALS AND PROPERTIES

A. Resin for FRP components shall be an acceptable vinyl ester, integrally resistant without applied coatings to ultra-violet radiation; to high concentrations of hydrogen sulfide gas, its solutions and associated compounds and to the wastewater occurring at the project site.

B. Provide compatible and equally resistant resin as acceptable for shop and field sealing of cut edges.

C. Minimum physical properties for pultruded structural FRP shapes and plates shall be as follows:

1. Tensile Strength (coupon): 30,000 psi - ASTM D638

2. Tensile Strength (full section in bending): 20,000 psi at 75 degrees F

3. Modulus of Elasticity: 2.3 x 106 psi at 75 degrees F, 1.8 x 106 psi at 125 degrees F - ASTM D790

4. Barcol Hardness - 50

5. Water Absorption - 0.75 percent (by weight) - ASTM D349

6. Specific Gravity - 1.66 - ASTM D792

D. FRP components shall have integral colors acceptable to the Engineer selected from standard resin colors.

E. Stainless Steel

1. Shapes - AISI Type 304

2. Fasteners and components - Type 18-8.

2.02 GRATING

A. FRP grating shall be Fibergrate Molded Grating by Fibergrate Composite Structures Inc., Dallas TX, similar by Strongwell Corporation, Bristol VA; Imco Reinforced Plastics Inc., Moorestown NJ; Grating Pacific, Inc, Los Alamitos CA; or equal.

B. Outer surfaces, cut edges, or any surfaces that are exposed to air during cure shall be finished so as to obtain complete cure of the resin without air inhibition by coating the surface after initial cure with resin containing paraffin. Softening or tackiness of any surface under an acetone test will be considered evidence of incomplete cure.

C. I-bar shaped FRP grating shall be constructed of straight parallel bearing bars and composed of a glass fiber and thermosetting resin pultruded composite. The bearing bars to be placed edgewise and joined by structural crossties every 12-in, maximum. Crossties shall be 3/8-in diameter fiberglass rod with glass fiber reinforced plastic or stainless steel ferrules and polypropylene spacers. The upper bar surface shall have a coarse quartz/epoxy grit surface to provide skid resistance.

D. Rectangular shaped FRP grating shall be constructed of straight parallel bearing bars and cross bars composed of glass fiber and resin, compression molded at high temperatures and pressure. No dry glass fibers shall be visible on any surface of bearing bars or cross bars. Bearing bars shall be spaced at a maximum on 1-in centers and cross bars spaced at a maximum on 6-in centers. Top surfaces shall have grit surface for skid resistance.

E. Provide structural FRP angle frames, structural support shapes, grit impregnated plate where required and appurtenances as shown.

F. Angle frames shall be continuous around the opening in order to present an even and flat support for the grating except as otherwise shown. The angles and anchors shall be as detailed.

G. FRP grating shall be securely attached to supporting members and angles.

Attachment to FRP supporting members shall be either stainless steel or FRP with stainless steel fasteners. Each grating panel shall be attached to supporting members at a minimum of four locations (two each edge).

All materials and incidentals required for attaching grating to angle frame and supports shall be furnished and installed under this Section.

H. Coordinate the layout of grating panels with work of other Sections to provide openings for approved mechanical equipment, operators, gates and other items which require penetrations or openings in the grating. Grating panels shall be further subdivided and supported to provide maximum panel weight of 75 lbs.

2.03 HANDRAILING

A. FRP handrailing shall be Dynarail Modular Handrail by Fibergrate Composite Structures Inc., Dallas TX, similar by Strongwell Corporation, Imco Reinforced Plastics Inc., or Grating Pacific, Inc. System shall withstand a 300 lb. load applied at any point, in any direction to the top rail with a maximum deflection of L/360.

B. System shall be composed of FRP tubes with top and bottom rails to be 1.75" x 0.125" (44.4 mm x 3.2 mm) wall square tubes, the posts are to be 2.125" x 0.1875" (53.9 mm x 4.8 mm) wall square tubes and kickplates are to be ½" deep x 4" wide with two reinforcing ribs.

C. Fabricate with continuous posts and toprail, with intermediate rails cut between posts.

D. All fasteners used in the railing system are to be 316 SS. Rivets to be 18-8 SS.

2.04 STAIR TREADS

A. FRP stair treads to be Fibertred by by Fibergrate Composite Structures Inc., Dallas TX, similar by Strongwell Corporation, or equal. Stair treads shall be of a one piece molded construction, have a minimum 1-1/2” x 6” rectangular mesh pattern, and have a molded non-slip nosing meeting OSHA requirements.

B. Hardware: Type 316 stainless steel hold-down clips shall be provided and spaced as recommended by the manufacturer. A minimum of four hold-down clips shall be required for each tread.

2.05 STRUCTURAL SHAPES

A. Structural shapes shall be pultruded Dynaform Structural Shapes by Fibergrate Composite Structures Inc., Dallas TX, similar by Strongwell Corporation, or equal.

PART 3 - EXECUTION

3.01 FABRICATION AND SHIPPING

A. All FRP grating and supports shall be designed and fabricated by a single manufacturer.

FRP grating panels and structural members shall be shipped banded onto skids and covered with plywood to minimize shipping damage.

3.02 INSTALLATION

A. All components shall be installed in full accordance with the Drawings, the final shop drawings and manufacturer's recommendations by mechanics skilled in the installation of this type of work.

B. All FRP shall be installed securely and shall be level and true to line.

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.

1. Well House 11.

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 07143

METAL ROOF PANELS

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. Standing-seam metal roofing, custom fabricated.

B. Related Sections:

1. Division 7 Section "Sheet Metal Flashing and Trim" for gutters, downspouts, fasciae, copings, and flashings that are not part of sheet metal roofing.

2. Division 7 Section "Roof Accessories" for manufactured roof accessories.

3. Division 7 Section "Joint Sealants" for field-applied sealants adjoining sheet metal roofing.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, clips, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, underlayment, and accessories shall comply with requirements indicated without failure due to defective manufacture, fabrication, installation, or other defects in construction. Sheet metal roofing shall remain watertight.

B. Thermal Movements: Provide sheet metal roofing that allows for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with Florida Building Code for wind-uplift resistance for the project location.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal roofing, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Details for forming sheet metal roofing, including seams and dimensions.

2. Details for joining and securing sheet metal roofing, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.

3. Details of termination points and assemblies, including fixed points.

4. Details of expansion joints, including showing direction of expansion and contraction.

5. Details of roof penetrations.

6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings.

7. Details of special conditions.

8. Details of connections to adjoining work.

9. Detail the following accessory items, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

a. Flashing and trim.
b. Gutters and downspouts as they relate to adjacent sheet metal roofing.
c. Roof curbs.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Roofing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, and other attachments.

2. Trim and Metal Closures: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.

3. Other Accessories: 12-inch- (300-mm-) long Samples for each type of other accessory.

D. Coordination Drawings: Roof plans drawn to scale with coordinated details for penetrations and roof-mounted items. Show the following:

1. Sheet metal roofing and attachments.

2. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, and items mounted on roof curbs.

E. Qualification Data: For qualified Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

G. Maintenance Data: For roofing sheet metals and accessories to include in maintenance manuals.

H. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

A. Custom-Fabricated Sheet Metal Roofing Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal roofing similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal roofing materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal roofing materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal roofing from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal roofing installation.

1.07 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in other Sections.

B. Coordinate sheet metal roofing with rain drainage work, flashing, trim, and construction of sheathing, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

C. Manufacturer to attend pre-construction site meeting with Contractor and installation subcontractor prior to commencement of work and again at 30%, 60% & 90% roofing installation.

D. Manufacturer to provide at Final Project Inspection certification of installation and materials on manufacturer’s letterhead with notarized signature of overseeing company officer.

1.08 WARRANTY

A. Special Warranty: Warranty form at the end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including but not limited to rupturing, cracking, or puncturing.
b. Wrinkling or buckling.
c. Loose parts.
d. Failure to remain weathertight, including uncontrolled water leakage.
e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.
f. Galvanic action between sheet metal roofing and dissimilar materials.

2. Warranty Period: Two years from date of Final Completion.

B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Final Completion.

PART 2 - PRODUCTS

2.01 ROOFING SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.

2. Thickness: Nominal 0.028 inch (0.71 mm) unless otherwise indicated.

3. Surface: Smooth, flat.

a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: As selected by Architect from manufacturer's full range.

5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Berridge Manufacturing Company.
b. Fabral, Inc.
c. Flexospan Steel Buildings, Inc.
d. McElroy Metal, Inc.
e. Metal Sales Manufacturing Corporation

2.02 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).

2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).

3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
    c. Henry Company; Blueskin PE200 HT.
    d. Metal-Fab Manufacturing, LLC; MetShield.
    e. Owens Corning; WeatherLock Metal High-Temperature Underlayment.

B. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

B. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. General:

    a. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
    b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    c. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M, ASTM F 2329, or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.04 ACCESSORIES

A. Sheet Metal Accessories: Provide components required for a complete sheet metal 7roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.

1. Cleats: For mechanically seaming into joints and formed from the following materials:

    a. Metallic-Coated Steel Roofing: 0.0250-inch- (0.64-mm-) thick stainless steel.

2. Clips: Minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.

3. Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.

4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

5. Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum 0.018 inch (0.46 mm) thick.

B. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

C. Roof Curbs: Fabricated from same material and finish as sheet metal roofing, minimum thickness matching the sheet metal roofing; with bottom of skirt profiled to match roof panel profiles; with weatherproof top box and integral full-length cricket. Fabricate curb subframing of nominal 0.062-inch- (1.59-mm-) thick, angle-, C-, or Z-shaped galvanized steel or stainless-steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

2.05 FABRICATION

A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.

1. Standing-Seam Roofing: Form standing-seam panels with finished seam height of 1-1/2 inches (38 mm).

B. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks; true to line and levels indicated; and with exposed edges folded back to form hems.

1. Lay out sheet metal roofing so transverse seams, if required, are made in direction of flow with higher panels overlapping lower panels.

2. Offset transverse seams from each other 12 inches (300 mm) minimum.

3. Fold and cleat eaves and transverse seams in the shop.

4. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown on Drawings and as required for leakproof construction.

D. Expansion Provisions: Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of the metals in contact.

G. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

1. Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

H. Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances required for finished roofing installation.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for drainage, flashings, and penetrations through sheet metal roofing.

B. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Lay out and screw battens to wood sheathing before installation of sheet metal roofing.

1. Space fasteners not more than 18 inches (457 mm) o.c.

3.03 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Roof perimeter for a distance up from eaves of 24 inches (600 mm) beyond interior wall line.

2. Valleys, from lowest to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (150 mm).

3. Rake edges for a distance of 18 inches (460 mm).

4. Hips and ridges for a distance on each side of 12 inches (300 mm).

5. Roof to wall intersections for a distance from wall of 18 inches (460 mm).

6. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).

B. Install flashings to cover underlayment to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."

C. Apply slip sheet before installing sheet metal roofing.

3.04 INSTALLATION, GENERAL

A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other

miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

1. Field cutting of sheet metal roofing by torch is not permitted.

2. Provide metal closures at each side of ridge and hip caps.

3. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.

4. Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.

5. Install ridge and hip caps as sheet metal roofing work proceeds.

6. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition. Install backing plates at roofing splices.

7. Install sealant tape where indicated.

8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.

9. Do not use graphite pencils to mark metal surfaces.

B. Fasteners: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by SMACNA.

1. Coat back side of sheet metal roofing with bituminous coating where roofing will contact wood, ferrous metal, or cementitious construction.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Fasciae: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with closure strips where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.05 CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and

avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges unless otherwise indicated.

1. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.

2. Fasten cleats not more than 12 inches (300 mm) o.c. Bend tabs over fastener head.

3. Provide expansion-type cleats and clips for roof panels that exceed 30 feet (9.1 m) in length.

B. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3. Do not solder metallic-coated steel sheet.

C. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with cleats, double fastened at 12 inches (305 mm) o.c. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.

1. Lock each panel to panel below with sealed transverse seam.

2. Loose-lock panels at eave edges to continuous cleats and flanges at roof edge at gutters.

3. Leave seams upright after locking at ridges and hips.

3.06 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.

2. Install accessories integral to sheet metal roofing that are specified in Division 7 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.

2. Install continuous strip of self-adhering underlayment at edge of continuous flashing overlapping self-adhering underlayment, where "continuous seal strip" is indicated in SMACNA's "Architectural Sheet Metal Manual," and where indicated on Drawings.

3. Install exposed flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

4. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, and filled with butyl sealant concealed within joints.

C. Pipe Flashing: Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by SMACNA.

D. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet sheet metal roofing.

3.07 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.08 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal roofing installation, clean finished surfaces as recommended by sheet metal roofing manufacturer. Maintain sheet metal roofing in a clean condition during construction.

D. Replace sheet metal roofing components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.09 ROOFING INSTALLER'S WARRANTY

A. WHEREAS of, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:

2. Address:

3. Building Name/Type:

4. Address:

5. Area of Work:

6. Acceptance Date:

7. Warranty Period:

8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. Lightning;
b. Peak gust wind speed exceeding 120 mph (m/sec);
c. Fire;
d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
f. Vapor condensation on bottom of roofing; and
g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing

   Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing

failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this_____day of,_

1. Authorized Signature:

2. Name:

3. Title:

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Gutters and Downspouts

2. Coping caps

3. Scuppers

1.02 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Design coping assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. Coping design shall meet ANSI/SPRI ES-1 per the FBC

2. Coping design shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.03 SUBMITTALS

A. Shop Drawings:

1. Showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, and scuppers

2. Plans to be at 1/4-inch scale and details at 3-inch scale, for all sheet metal pieces and accessories

3. Coping cap shop drawings are to be designed to meet the wind loading requirements of ASCE 7-05 and shall be signed and sealed by a licensed engineer registered in the State of Florida

B. Samples:

1. 8-inch-square samples of specified sheet materials to be exposed as finished surfaces

2. Manufacturer's standard color chart for specified coating system

C. Sample warranties

1.04 QUALITY ASSURANCE

A. Except as otherwise shown on Drawings or specified, the workmanship of sheet metal work, method for forming joints, anchoring, cleating and provisions for expansion shall conform to the standard details and recommendations of the Copper and Brass Research Association; and workmanship shall be of the best quality, in accordance with best trade practice and the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

B. Where pre-engineered manufactured systems are specified, other field fabricated or shop fabricated substitutions will not be accepted.

C. Gutters and downspouts shall conform to SMACNA "Architectural Sheet Metal Manual" for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

D. Fabricator and installer shall be a company specializing in sheet metal work and installation with five (5) years documented experience.

E. Forming and assembling of sheet metal components shall be performed using methods that will not void the manufacturer's finish warranties.

1.05 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.06 WARRANTIES

A. Flashing warranty shall be part of the roofing system warranty. Refer to Division 07 Section, Modified Bituminous Sheet Roofing

B. Coping warranty shall be a wind warranty matching the roofing membrane design wind pressures.

1. Warranty period: 20 years starting on the Date of Final Completion

PART 2 - PRODUCTS

2.01 MATERIALS

A. The type and locations of the various kinds, gages, thickness, and finish of sheet metal to be used is specified hereinafter under the individual items. Where sheet metal is indicated on Drawings and kind or type of metal is not definitely specified, sheet metal shall match the type as used on the rest of the project.

B. Stainless Steel: AISI Type 302/304; 0.0156-inch thick (28 gauge) unless noted otherwise.

1. Finish: No. 4 (fine reflective, polished directional satin).

C. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14:

D. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions.

E. Finish (exposed to view)

1. Not exposed to View: Mill aluminum or galvanized steel as detailed.

2. Fluoropolymer Coating (where indicated on Drawings): Manufacturer's standard three-coat, thermo-cured, full-strength 70 percent Kynar 500 resin, 1 mil thick with 0.5 mil clear coat and 30 percent reflective gloss when tested in accordance with ASTM D 523.

A 20 year limited warranty against failure of the finish shall begin on the Date of Final Completion

F. Prefabricated reglets and counterflashings by

1. Manufacturers:

a. Basis of Design: Fry Reglet Corp.

b. Architectural Products Co.

c. Or approved equal.

2. Type: "SM" made of .025 Epox-E-Koted aluminum with slots for expansion, punched approximately 16 inches o.c. for surface mounting. Provide factory fabricated mitered corners.

a. Provide Type MA at masonry

3. Provide Fry "Springlock" counterflashing.

G. Shop fabricate flashings to configurations indicated on Drawings.

1. Fabricate from nominal, .060 inch thick aluminum sheet with factory applied finish as specified herein. Color shall be as selected by Architect.

2. Fascia shall be provided with concealed splice plates for joints 10 feet on center.

H. Metal termination bar shall be 1/8 inch by one (1) inch aluminum bar.

I. Roof Expansion Joint Covers: “Expand-O-Flash” by Johns Manville, or approved equal. Provide in configurations as shown or as required.

J. Coping Caps:

1. Type 316 stainless steel formed as indicated on the Drawings and as required for the installation. Support shall be coping chairs with perforated cleats. Concealed splice plate shall match color and finish of coping caps.

2. Shop or field fabricated coping caps are not acceptable.

3. All corners shall be pre-formed, mitered, and welded tight.

4. Provide continuous cleats at all copings.

K. Gutters and Downspouts:

1. Downspouts: 0.032 aluminum except for grade to 8 feet provide 0.125 extruded. Coordinate with drawings for cross section size.

2. Gutters: 0.032 aluminum

L. Scuppers:

1. Fabricate using 0.032 sheet aluminum to profiles and details shown.

2. Lock seam corners, solder watertight and hem outer exposed edges.

3. Provide 4-inch wide minimum flanges formed to fit cants, decks and vertical wall surface.

4. Shop punch flanges for fastenings at 6 inches on center.

2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as flashing/sheet metal or other non- corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

1. Use stainless steel at locations where pressure treated wood (ACO or CDDC) is the substrate.

B. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non- drying, nonmigrating sealant.

D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 07 Section, Joint Protection.

E. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

G. Paper Slip Sheet: 5-lb. rosin-sized building paper.

H. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.

I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

J. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

K. Roofing Cement: ASTM D 4586, asbestos-free.

2.03 FABRICATION

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions under which items will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Separate dissimilar metals from each other by painting each metal surface in area of contact with a heavy application of bituminous coating.

3.03 INSTALLATION REQUIREMENTS

A. General: Comply with recommendations with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof. Lap seam at movement joints and flat lock at non-movement joints.

B. Install work with provisions for thermal expansion of flashings, gravel stops, and other items exposed for more than 15 feet continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams where shown, or if not shown, in conformance with applicable recommendations of "Architectural Sheet Metal Manual" by SMACNA.

C. Sheet metal work shall be watertight and weathertight; lines, arises, and angles sharp and true; plain surfaces free from waves and buckles. Workmen shall be experienced in the trade and thoroughly capable of performing the Work in accordance with these requirements.

D. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

E. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

G. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

H. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at conductor heads, removable for cleaning downspouts.

H. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

1. Apply continuous bead of sealant or plastic cement to back of type "SM" reglet.

2. Install Type "SM" reglet on surface of flexible flashing on wall parallel to roof slope with fasteners furnished by manufacturer. Fill top groove with sealant and tool tight against wall with surface of sealant sloping to outside.

I. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

J. Roofing Expansion Joints: Installation shall be in accordance with the manufacturer's written instructions and final Shop Drawings.

K. Flashing installations at roof penetrations not detailed on the Drawing shall be performed according to the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), subject to approval by the Architect.

L. Install coping caps in accordance with the manufacturer’s written installation instructions to furnish the wind warranty.

3.04 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Provide protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION

SECTION 07910

CAULKING

PART 1 - GENERAL

1.01 SCOPE. This section covers caulking and sealing. Fire rated caulking is covered in the Fireproofing section.

1.02 GENERAL. The terms “caulking” and “sealing”, as used on the drawings and in these specifications, are synonymous. Both terms indicate the materials specified herein. Oil-base caulking shall not be used on this project.

1.03 APPROVALS. All caulking shall meet the requirements of the standards specified herein. All caulking and sealing to be used in contact with potable water shall meet the requirement& of ANSI/NSF Standard 61.

1.4 SUBMITTALS. Specifications and data covering the materials proposed for use, together with samples or color cards showing the manufacturer's full line of sealant colors, shall be submitted in accordance with the Submittals section.

PART 2 - PRODUCTS

2.01 MATERIALS

Thiokol Sealants (polysulfides)	Fed Spec TT-S-00227E, Class A or ASTM 920 Type M; polysulfide rubber, two component.
Nonsag	
Submerged Service,	Pecora "Synthacalk. GC-2+", Sonneborn, or approved equal
Non potable water	"Sonolastic Polysulfide Sealant", or approved equal
Nonsubmerged Service	Pecora "Synthacalk GC-2+"; Sonneborn "Sonolastic Polysulfide Sealant”, or approved equal

Self-Leveling, nonsubmerged	Polymeric Systems "PSl-350". A.C. Horn "Hornflex Traffic Grade" Polymeric Systems.PSI-350", or approved equal.
Urethane Sealants (Polyurethanes)	Fed Spec TT-S-00227E, Class A, Type 2 and ASTM C920, Type M, Grade NS, two component.
Nonsag	
Submerged service	
Potable Water	Polymeric Systems "RC-270"; Sika "Sikaflex-2cNS, or approved equal.
Nonpotable Water	Pecora "Dynatred"; Polymeric Systems "RC-270", or approved equal
Nonsubmerged Service	Bostik "Chem-Calk 500"; Tremco "Vulkem 227"; Pecora "Dynatro II"; Tremco "Dymeric 240"; Sika "Sikaflex-2cNS"
Self-Leveling, Nonsubmerged Service	Bostik "Chem-Calk 500"; Tremco "Vulkem 227"; Pecora "Urexpan NR-200 Polymeric System "RC-2SL"; Tremco "THC-900"
Acrylic Sealant	Fed Spec TT-S-230; ASTM C834 Bostik "Chem-Calk 600"; Pecora "AC20" Tremco "Mono 555", or approved equal
Silicone Sealant	Silicone rubber, neutral color; Dow Corning "Mildew-Resistant silicone 786"; General Electric "Silicone Sanitary 1702 Sealant", or approved equal.
Primer	As recommended by the sealant Manufacturer.
Backup Material	Polyethylene or polyurethane foam as recommended by the sealant manufacturer; Dow "Ethafoam SB" or Plateau "Denver Foam", or approved equal.
Bondbreaker Tape	Adhesive-backed polyethylene tape as recommended by the sealant manufacturer.

2.02 COLORS. Colors of sealants shall be as selected by Engineer from the manufacturer's. standard line of colors. Different colors may be required for different locations.

2.03 LOCATIONS TO BE CAULKED

A. With Thiokol or Urethane Sealant (Nonsag) - Nonsubmerged Serviced.

1. Entire perimeter of frames for exterior metal doors.

2. Entire perimeter of metal louvers.

3. Entire perimeter of metal dampers and metal shutter.

4. Entire perimeter of aluminum windows.

5. Control joints in masonry walls.

6. Perimeter of aluminum entrances and assembles, except exterior side of exterior sills.

7. Joints on the underside of prestressed, precast roof members where exposed to view.

8. Joints between masonry and cast-in-place concrete, where indicated on the drawings.

9. Joints between masonry and cast-in-place concrete, where indicated on the drawings.

10. Other locations where caulking is required for weatherproofing.

PART 3 - EXECUTION

3.01 JOINT PREPARATION. All surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces which have been contaminated by form oil, paint, or other foreign matter which would impair the bond of the sealant to the substrate shall be cleaned by sandblasting. All surfaces shall be wiped with a clean cloth saturated with xylol or other suitable solvent, and shall be primed before the sealant is applied.

Unless otherwise recommended by the sealant manufacturer and permitted by the Engineer, the depth of sealant in a joint shall be equal to the width of the joint, but not more than ½ -inch. Backup material shall be provided as necessary to control the depth of sealant and shall be of suitable size so that when compressed 25 to 50 percent, the space will be filled. Backup material shall be rolled or pressed into place in accordance with the manufacturer's installation instructions, avoiding puncturing and lengthwise stretching.
If depth of the joint does not permit use of backup material, bondbreaker tape shall be placed at the bottom of the joint to prevent three-sided adhesion.

3.02 SEALING. Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 50°F when sealing work is performed.

Upon completion of the sealing work, each sealed joint shall have a smooth, even, tooled finish, flush with the edges of the sealing recess, and all adjacent surfaces shall be clean. Sealant shall not lap onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

SECTION 08110

METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes hollow metal doors and frames.

B. Refer to Division 08 Section, Glazing for glass requirements.

1.02 DEFINITIONS

A. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.03 SUBMITTALS

A. Product Data: Details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

B. Shop Drawings:

1. Show elevations, details and methods of assembling sections, hardware locations and installation methods, dimensions, shapes of materials, anchorage and fastening methods, wall opening construction details, and weather-stripping.

2. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Documents.

C. Label Construction Certification: For fire-rated assemblies exceeding limitations of labeled assemblies, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

D. Sample warranty.

1.04 QUALITY ASSURANCE

A. Provide hollow metal work from a single manufacturer complying with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" ANSI/SDI A250.8 and as specified.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Door frames shall receive a permanent embossed label. Window and side light frames shall receive a mylar label.

C. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an A.H.C./C.D.C. who will be available at reasonable times to consult with the Architect regarding matters affecting the doors and frames.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish.

B. Inspect units upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged units as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4 inches high wood blocking. Avoid use of non-vented plastic or canvas shelters that could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products from one of the following manufacturers:

1. Amweld Building Products.

2. Ceco Door Products.

3. Steelcraft, an Ingersoll-Rand business.

4. Curries Company.

5. Mesker Door, Inc.

6. Firedoor Corp.

7. Architectural Openings, Inc.

2.02 MATERIALS

A. Cold-Rolled Steel Sheets: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Galvanized Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B; with minimum A60 metallic coating.

C. Supports and Anchors: Fabricate of not less than 18-gage Commercial Steel (CS) 40Z coating designation; mill phosphatized.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Asphaltic Emulsion Coating: Water-based, brush applied, emulsion dampproofing.

2.03 FABRICATION, GENERAL

A. Fabricate units rigid, free from defects, warp, or buckle. Form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Site.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

1. Lock edge of doors: Bevel 1/8 inch in 2 inches.

C. Fabricate panels and edge channels from galvanized sheet steel for exterior doors. For interior doors, fabricated from cold rolled sheet steel.

D. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold rolled or hot rolled steel (at fabricator's option).

E. Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws.

F. Hardware Preparation:

1. Prepare hollow metal units to receive mortised and concealed door hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI/SDI A250.6 and ANSI/DHI A115 Series "Specifications for Door and Frame Preparation."

2. Reinforce hollow metal units to receive surface applied hardware. Drilling and tapping for surface applied door hardware may be done on Site.

3. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with recommended hardware locations specified in ANSI/SDI A250.8.

4. Reinforce all steel doors and frames to receive surface mounted closers, whether or not scheduled to receive them.

G. Shop Painting

1. Clean, treat, and shop paint all surfaces of fabricated hollow metal doors and frames, including galvanized surfaces plus back priming at the following conditions:

a. All exterior doors in concrete or masonry.

b. Interior doors in concrete or masonry. Back priming shall not void any labeling requirements for fire rated assemblies.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before the application of the shop coat of paint.

3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive field applied paint.

a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate- free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

H. Asphaltic Emulsion Coating: Shop apply to frames; field application is not acceptable.

2.04 DOOR TYPES

A. Conform to the Steel Door Institute Standards, ANSI/SDI A250.8, and as follows:

B. Interior Doors: Grade II, 1-3/4 inch heavy duty, 18 gage cold rolled, Model 1, full flush, hollow steel construction.

1. Form door face sheets from one sheet of metal with no face seams. Seams on vertical door edges shall be tight, smooth, and devoid of irregularities. A kraft resin impregnated honeycomb core or rigid polystyrene slab shall be permanently bonded to both door skins with adhesive recommended by the manufacturer.

C. Seamless construction by welding and filling at factory only.

2.05 DOOR ACCESSORIES

A. Glass Stops and Moldings: Provided for vision light openings.

1. Glaze doors from the secure side.

2.06 FRAME TYPES

A. Frames for Interior Door and Window Openings: 16 gage, fabricated from cold rolled sheet steel.

B. Welded Frames: Weld flush face joints continuously, grind, fill, dress, and make smooth, flush and invisible.

2.07 FRAME ASSEMBLIES

A. Frame Anchors.

1. Wall anchors for frame attachment to masonry construction: Adjustable, flat, corrugated or perforated 'T' shaped anchors with leg not less than 2 inches wide by 10 inches long or masonry "wire" type not less than 3/16 inch diameter.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

a. Size anchors to accommodate frame jamb depth and face dimension on all welded frames.

3. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 30 inches o.c.

4. Floor anchors:

a. Angle clip type.

b. 16 gage minimum.

c. Two fasteners per jamb.

d. Weld to the bottom of each jamb.

5. Head Struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure where called for on schedule.

6. Sleeve anchors shall be fire rated for the types of openings required.

B. Stops and Beads: 20 gage, installed on the interior side of exterior frames.

C. Mortar Boxes: 26 gage steel, welded to the frame, at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

D. Interior Window Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

E. Door Silencers: Drill stops and install 3 silencers on strike jambs of single swing frames and 2 silencers on heads of double swing frames.

2.08 FIRE DOORS AND FRAMES

A. Provide approved and labeled hollow metal fire doors and frames at locations indicated in Door Schedule.

B. Labeled metal frames are required for labeled wood doors.

C. All labels shall be metal, attached to the frame where required by code. Stamped labels will not be acceptable.

2.09 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020 inch thick, cold-rolled steel sheet set into0.032 inch thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

a. Doors with louvers shall not incorporate a glass cutout.

b. Louvers shall be installed by the supplying steel door manufacturer.

c. Louvers are permitted in 1-1/2 hour and 3/4 fire doors.

d. The louver shall be a fusible link type no larger than 24 inches by 24 inches, tested in accordance with ASTM E 152, and listed by an independent testing and listing agency. Louver shall bear a listing mark indicating that the louver is listed.

Listed fire door louvers are designed to close by the use of a fusible link and a weight. Design link to break at a predetermined temperature (135 degrees F to 160 degrees F), releasing the weight closing the louver blades.

e. Install louvers in the bottom of fire doors, one louver per leaf.

B. All profiles, design, and louver blades of rated and non-rated louvers shall match.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install standard steel doors, frames, and accessories in accordance with final Shop Drawings and the Contract Documents.

B. Placing Frames: Comply with ANSI A250.11.

1. Except for frames located at existing concrete, masonry or drywall installations, place frames prior to construction of walls.

2. Set frames, plumbed, aligned, and braced until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.

a. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Coordinate installation to allow for grouting frames solid. Do not allow frames to deform by grout forces.

4. Install fire-rated frames in accordance with NFPA Standard No. 80.

5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.

6. Anchor bottom of frames to floors with expansion bolts or with power fasteners.

   Where frames require ceiling struts or other structural overhead bracing, anchor to ceilings or structural framing above, as indicated or specified.

7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb.

8. Finished work shall be rigid, neat in appearance, and free from defects. Form molded members straight and true with joints coped or mitered, well formed, and in true alignment. Welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.

9. Refer to Division 04 Section, Concrete Masonry Units for metal frame grout. Do not spot grout metal frames in gypsum wallboard partitions.

10. Recess bolt heads, bondo and sand smooth where anchor bolts are used in concrete or masonry openings.

11. Provide filler plate at all hardware preps, such as hinge and strike preps, that are unused.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8.

1. Jambs and Head: 1/8 inch plus or minus 1/16 inch.

2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

3. Install fire-rated doors with clearances as specified in NFPA 80.

3.02 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

3.03 FIELD QUALITY CONTROL

A. Damaged work will be rejected. Replace with new work at no additional cost to the Contract.

B. After installation, protect doors and frames from damage during subsequent construction activities.

END OF SECTION

SECTION 08332

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes overhead coiling doors.

1.02 PERFORMANCE REQUIREMENTS

A. Design door to meet wind-loading requirements of the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior door assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number.

1.03 SUBMITTALS

A. Shop Drawings:

1. Show elevations, details and methods of assembling sections, hardware locations and installation methods, dimensions, shapes of materials, anchorage and fastening methods, wall opening construction details, and weather-stripping.

2. Provide schedule of doors using same reference numbers for details and openings as those on Contract Documents.

3. Wind loading Calculations shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-05 for exterior applications.

4. Sample of Approved Product Label and location of attachment to assembly for exterior applications.

B. Sample warranty.

1.04 QUALITY ASSURANCE

A. Endlocks/windlocks shall be installed on every slat on doors as required to meet Performance Requirements.

B. Overhead coiling doors shall be designed to a standard maximum of 10 cycles per day and an overall maximum of 25,000 operating cycles for the life of the door.

C. All overhead coiling doors installed within a rated partition shall be constructed in accordance with the testing agency requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products of the following manufacturers are acceptable, providing their products equal or exceed the quality specified, and they can provide products of the type, size, function, and arrangement required.

1. Kinnear Division of Marsco Corp.

2. Overhead Door Corp.

3. North American Rolling Door Inc.

4. J. G. Wilson Corp.

2.02 MATERIALS AND CONSTRUCTION

A. Basis of Design: Non-Insulated Rolling Door – HVHZ by Cornell Ironworks, Inc.: Manually operated, face of wall mounted.

B. Door Curtain: Interconnected strip steel slats conforming to ASTM A-526.

1. 3 inch high by 7/8 inch deep flat roll-formed of 18 gage or as required to meet wind loading.

2. Door curtain for un-insulated doors shall be 22 gage slats.

3. Steel to be hot dipped galvanized G-90 consistent with ASTM A-525.

C. Finish: Manufacturer’s standard baked finish or powder-coat finish. Color by Owner.

D. Bottom bar: Two 1/8 inch angles mechanically joined together with a 1 inch diameter vinyl covered foam edge astragal continuous along the bottom.

1. Finish: One coat of bronze rust inhibiting primer.

E. Guides: 3 steel angles bolted together with 3/8 inch fasteners to form a channel to travel and shall include weather-stripping continuously along the exterior leg of the guide.

The wall angle portion shall be continuous and fastened to the surrounding structure with minimum 1/2 inch fasteners, 36 inches on center.

1. Finish: One coat of bronze rust inhibiting primer.

F. Brackets: Steel, minimum 1/4 inch thick, bolted to the wall angle with minimum 1/2 inch fasteners.

1. Finish: One coat of bronze rust inhibiting primer.

G. Gears: Cast iron. Gear ratio shall be designed for a maximum effort of not more than 30 pounds.

H. Barrel: Steel tubing. Oil tempered torsion springs shall be capable of counter balancing the weight of the curtain. Design barrel to limit the maximum deflection to .03" per foot of opening width.

1. Finish: One coat of bronze rust inhibiting primer.

I. Hood: Minimum 24 gage galvanized steel formed to fit the curvature of the brackets and contain a waterproof baffle to control air infiltration.

1. Finish: Match door.

2.03 OPERATION

A. Chain operated doors shall open and close with a maximum of 30 pounds of effort utilizing an endless chain and cast iron reduction gears.

2.04 LOCKING MECHANISMS

A. Manual doors shall be secured by chain lock system.

2.05 THRESHOLD

A. Mill aluminum, covering the expansion joint. Similar to Pemko 171. May be changed at contractor's option to suite existing conditions.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The doors shall be erected by the manufacturer or his authorized representative in compliance with detailed instructions of the manufacturer.

B. Install assemblies to provide a rigid, permanent attachment to the building according to supplier's instructions, approved shop drawings, and Architect's drawings.

C. After installation moving parts shall be properly adjusted to give free, effortless operation.

D. Install an additional hood around gears where exposed to view in their final configuration.

E. Threshold Installation: Attach only one side of threshold so opposite side can float over expansion joint.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Hollow Metal Doors and Frames

1.03 DESCRIPTION OF WORK

A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.

B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.

C. Hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.

D. Fasteners:

1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.

2. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.

3. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.

4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).

A. Exterior openings

1. Provide hardware for hurricane openings in compliance with local jurisdiction.

2. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by local authority for the types and sizes of doors required, and complies with the requirements of the door and door frame. Coordinate Section (08710) Finish Hardware with the Hollow Metal Doors and Frames (08110).

1.04 QUALITY ASSURANCE

A. The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the architect, owner and the general contractor at reasonable times during the course of work.

B. The finish hardware supplier shall prepare and submit to the architect six (6) copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.

C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.

D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.

E. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.

F. The hardware manufacturers are to supply both a pre-installation class as well as a post-installation walk-thru. This is to insure proper installation and provide for any adjustments or replacements of hardware as required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.06 WARRANTY

A. The material furnished shall be warranted for one year after installation or longer as the individual manufacturer's warranty permits.

B. The manufacturer against failure due to defective materials and workmanship shall warrant overhead door closers in writing for a period of ten (10) years. Commencing on the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. To the greatest extent possible, obtain each kind of hardware from only one manufacturer.

B. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers.

PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
1) Hinges	Ives	Hager, Stanley, Bommer
2) Locks & Latches	Crobin/Russwin	None (Owners Standard)
3) Exit Devices	Von Duprin	None (Owners Standard)
4) Door Closers	LCN	None (Owners Standard)
5) Wall Stops/Floor Stops, Flushbolts	Ives	Rockwood, Hager
6) Kick Plates	Ives	Rockwood, Hager
7) Threshold/Weather-strip	National Guard	Pemko, Zero
8) Silencers	Ives	Rockwood, Hager
9) Key Cabinet	Lund	Key Control

2.02 FINISH OF HARDWARE:

A. Exterior Hinges to be Stainless Steel (32D), Interior Hinges to be Satin Chrome (26D). Door Closers to be Aluminum. Locks to be Satin Chrome (26D), Exit Devices to be Satin Chrome (26D). Overhead Holders to be Satin Chrome (26D), Flat Goods to be Satin Chrome (26D) or Stainless Steel (32D) and the Thresholds to be Mill Finish Aluminum.

2.03 HINGES AND PIVOTS:

A. Exterior butts shall be Stainless Steel. Butts on all out swinging doors shall be furnished with non-removable pins (NRP).

B. Interior butts shall be as listed.

C. Doors 5’ or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2’6” in height or fraction thereof. Dutch door shall have two (2) butts per leaf.

2.04 KEYING:

A. Equip locks and cylinders with Corbin/Russwin cylinders.

B. All bittings shall be issued by lock manufacture per owners instructions.

C. Provide Two (2) each change keys per lock and Six (6) each grand master, master keys, two (2) construction and two (2) permanent control keys.

D. Hardware supplier to provide temporary cylinders or cores during the construction phase. The contractor is to change out the temporary cylinders for the permanent cylinders.

E. Keyway # is N-24. Contractor must key all new lock sets to current standard configuration. Owner to provide master key set to do this.

2.05 LOCKSETS:

A. Locksets shall be Heavy Duty Mortise type, unless specified otherwise, in “L” Series, Lever designs as manufactured by Corbin/Russwin Lock Company.

1. Acceptable substitutions:

a. None (Owners Standard)

2.06 EXIT DEVICES:

A. Exit devices shall be Von Duprin 98 Series in types and functions specified. All devices must be listed under “Panic Hardware” in accident equipment list of Underwriters Laboratories. All labeled doors with “Fire Exit Hardware” must have labels attached and be in strict accordance with Underwriters Laboratories.

B. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles must be provided.

C. Surface strikes shall be roller type and come complete with a plate underneath to prevent movement. And shall be provided with a dead-latching feature to prevent latch bolt tampering.

1. Acceptable substitutions:

a. None (Owners Standard)

2.07 DOOR CLOSERS:

A. Closers shall be LCN 4041 Series having non-ferrous covers, forged steel arms separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arm mounted on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.

B. Door closer cylinders shall be of high strength cast iron construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

C. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C.

D. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in

advance of the dead stop location to protect the door frame and hardware from damage. Pressure relief valves (PRV) are not acceptable.

1. Acceptable substitutions:

    a. None (Owners Standard)

2.08 TRIM AND PLATES:

A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 10" high, mop plates to be 4" high. All plates shall be two (2) inches less full width of door.

B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

2.09 DOOR STOPS:

A. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives WS407 Series are preferred, but where not practical furnish floor stops equal to Ives FS436 or FS438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 Series.

2.10 THRESHOLDS AND WEATHERSTRIP:

A. Thresholds and weather-strip shall be as listed in the hardware schedule.

2.11 DOOR SILENCERS:

A. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.

B. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

C. No hardware is to be installed until the hardware manufactures have provided a pre-installation class to insure proper installation of the specified products. A post installation inspection by a manufacturer's representative will be provided to insure proper installation.

3.02 ADJUSTING AND CLEANING:

A. Contractor shall adjust all hardware in strict compliance with manufacturer's instructions. Prior to turning project to owner, contractor shall clean and make any final adjustments to the finish hardware.

3.03 PROTECTION:

A. Contractor shall protect the hardware, as it is stored on construction site in a covered and dry place.

B. Contractor shall protect exposed hardware installed on doors during the construction phase.

3.04 KEY CABINET:

A. Set up and index one (1) Key Cabinet that allows room for expansion for 150% of the number of keys for the project.

3.05 HARDWARE SCHEDULE:

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.

HARDWARE GROUP NO. 01
Provide each SGL door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080P 06A	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CVX	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DRIP CAP	16A	AL	NGP
1	EA	THRESHOLD	896V	AL	NGP

END OF SECTION

DIVISION 9

FINISHES

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 surfaces disturbed during construction, 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 proposed major items of the Project shall be coated:

1. Interior and exterior 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 the new well houses. Water Repellant Masonry Coating for decorative CMU is specified in Section 07100.

2. Interior of concrete water retaining structures, including the new ground storage tank, where applicable.

3. Exterior of concrete structures including the new ground storage tank, 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, conduits, fittings and valves, and galvanized metals located on the interior and exterior of buildings and structures. This shall include new piping, 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.

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.

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 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.

E. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable manufacturer in this Section of these Specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

1. Manufacturer Inspection report showing the substrate has been reviewed; is properly prepared, and compatible for the scheduled coating system.

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 for the well houses:

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 Amine-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 ELAPSED TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

B. Class 2 Exposures - Exposed Concrete, Immersion, Potable

1. Class 2 exposures shall consist of all cast-in-place reinforced concrete and prestressed concrete that is subject to continuous or intermittent immersion in potable water. Coat the entire concrete interior including floors,

ceilings and walls (entire wall height). Coating system shall be NSF approved. Structures to be coated include the following:

a. Interior concrete surfaces of the new ground storage tank.

b. CMU baffle wall in the new ground storage tank.

2. Surface Preparation: As specified in Paragraph 3.02 herein and in addition to the following:

a. Abrasive blast cleaning to remove laitance and roughen the entire surface equivalent to the surface of No. 80 grit sandpaper.

b. Concrete surfaces shall be patched to produce a consistent, void free surface, eliminating all air pockets, pinholes, bug holes, tie holes, form fins and burrs, honeycombs and cracks. Patching compound shall be a sand/portland cement mixture with a liquid, acrylic-polymer bonding additive equal to Master Builders Acryl-Set Liquid Polymer.

c. After surface patching remove remaining laitance or other debris by high pressure water blasting.

3. Class 2 Coating System.

a. Prime Coat: Two component, cross lined epoxy. Tnemec Series 140-1255 (Beige) Pota-Pox Plus at 7.0 mils DFT. Spray and back roll. Thin with #4 thinner if required.

b. Filler Surfacer: Fill all voids with Tnemec Series 63-1500 filler and surfacer as required. Apply by trowel and squeegee.

c. Finish Coats: Two (2) coats, two component, cross linked epoxy. Tnemec Series 140-WH02 (tank white) Pota-Pox Plus at 7.0 mils DFT, each.

d. Total minimum system finish coating thickness shall be 21 mils DFT and the filler and surfacer where applied.

NOTE: MAXIMUM ELAPSED TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

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 structures including new ground storage tank and new well houses, other than decorative CMU.

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 – NOT USED

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)

1. Class 10 exposures consist of interior concrete floors (non-chemical exposure).

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.

b. Apply a vapor barrier coating system on all new concrete floors and slabs. Vapor barrier shall be Koester VAP 1-2000 or equal compatible system per the top coat manufacturer's recommendations.

3. Class 10 Coating System

a. Primer: The primer shall be a 100% reactive, epoxy based, penetrating primer that exhibits chemical resistance and equal to Floropoxy 4700 Epoxy primer by Crawford Laboratories, Inc. One coat at 10 mils DFT.

b. For non-skid areas add skid resistant sand to the mixed material or broadcast into the wet primer to achieve the desired non-slip finish.

c. Topcoat: The topcoat shall consist of an amber resistant, self-leveling 100% solids epoxy coating, and equal to Floropoxy System 4805 Epoxy by Crawford Laboratories, Inc. One coat at 10 mils DFT.

d. Minimum DFT for the three coats is 20.0 mils

NOTE: MAXIMUM ELAPSED TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

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.

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.

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. Non-Compatible Finishes: Materials or equipment with non-compatible factory finishes shall receive an application of an intermediate or barrier material as required by the manufacturer of finish product. If performance of specified finish system will be compromised due to incompatibility, Architect reserves the right to require removal of factory primer or finish, and application of a new compatible primer. Additional work and materials required by non-compatible finishes shall be provided at no additional cost to Owner.

B. 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.

C. 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.

D. 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.

E. Program the cleaning and painting so contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

F. 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.

G. 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.

H. 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

I. 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.

J. 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.

K. 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).

L. 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 the 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 weather.

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.

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
Drain	DR	Brown	Black
Raw Water	RW	Olive Green	Black
Plant Service Water	SVW	Gray	Black
Potable Water	PW	Dark Blue	Black
Water Main	WM	Blue	Black
Sample Line	SA	Gray	Black

Note: All color cording shall be in accordance with the recommendations of Ten State Standards.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10200

LOUVERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes extruded aluminum, prefinished, drainable blade louvers

1.02 DEFINITIONS

A. Louver Terminology: Refer to AMCA Publication 501 for definitions of terms for metal louvers.

1.03 PERFORMANCE REQUIREMENTS

A. Minimum Air Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500-L.

B. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission loss ratings indicated, as demonstrated by testing manufacturer's stock units according to ASTM E 90.

C. Design aluminum door and frame assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number.

D. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 Deg F ambient, 180 Deg F material surfaces.

1.04 SUBMITTALS

A. Product Data: Test reports evidencing compliance of units with Performance Requirements.

B. Shop Drawings:

1. Plans, elevations, sections, and details showing profiles, angles, spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; and profiles of frames at jambs, heads and sills.

2. Shop Drawings shall be signed and sealed by a licensed engineer registered in the State of Florida.

3. Wind loading Calculations shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-05.

4. Sample of Approved Product Label and location of attachment to assembly.

C. Color selection materials for type of finish specified

D. Product certificates signed by louver manufacturers certifying that their products which comply with Project requirements are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 500 and complying with AMCA Certified Ratings Program.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from a single source where alike in one or more respects with regard to type, design, and factory-applied color finish.

B. SMACNA Standard: Comply with SMACNA “Architectural Sheet Metal Manual" recommendations for construction details and installation procedures.

1.06 PROJECT CONDITIONS

A. Field Measurements: Check openings by field measurements before fabrication; show recorded measurements on final Shop Drawings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Visually inspect all materials at time of delivery for damage. Any damaged boxes, crates, louver sections.

B. Storage: Per manufacturer's instructions, off ground, covered with a weather proof flame resistant sheeting or tarpaulin.

C. Handling: Handle in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products of the following manufacturers are acceptable provided compliance with technical requirements.

1. American Warming and Ventilating

2. Airolite Co.

3. CS Louvers by Construction Specialties, Inc.

4. Greenheck Fan Corporation.

5. Ruskin Louvers

6. United Enertech Corp.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26, alloy 319.

D. Fasteners: 300 Series stainless steel.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.03 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Where indicated, provide subsills made of same material as louvers for recessed louvers.

F. Join frame members to each other and to fixed louver blades in accordance with tested assembly and Performance Requirements.

2.04 LOUVERS

A. Louvers shall be 6 inches deep with 35 degree stationary blades. Blades and frames shall be 0.081 inches extruded aluminum, alloy 6063-T5.

1. Louver shall be fitted with 16 by 18 mesh, 0.063 inches aluminum insect screen in extruded aluminum frames.

B. Louver blades shall be joined to each side frame and vertical stiffener with two, one inch long fillet Gas Metal Arc Welds with a minimum 1/8 inch throat.

C. Louvers shall bear AMCA Ratings Seals for air performance and water penetration ratings.

D. Minimum Free Area: 7.68 sq. ft. per 4' X 4' unit.

Free area velocity: 721 fpm free area velocity at a pressure drop not exceeding .15 inches W.G. per AMCA Standard 500.

E. Water Penetration: No more than .01 ounces of water per square foot of free area at a free area velocity of 1250 fpm when tested for 15 minutes per AMCA Standard 500.

2.05 ALUMINUM FINISHES

A. Fluoropolymer Coating: Manufacturer's standard three-coat, thermo-cured, full-strength 70 percent Kynar 500 resin, 1 mil thick with 0.5-mil clear coat and 30 percent reflective gloss when tested in accordance with ASTM D 523. A 20 year limited warranty against failure of the finish shall begin on the Date of Final Completion.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings to receive the work. Do not proceed until any unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work and in accordance with manufacturer’s recommendations to meet Performance Requirements

B. Erection Tolerances:

1. Maximum variation from plane or location shown on the approved shop drawings: 1/8 inch per 12 feet of length, but not exceeding 1/2 inch in any total building length or portion thereof (noncumulative).

2. Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line or separated by less than 3 inch: 1/16 inch (shop or field joints). This limiting condition shall prevail under both load and no load conditions.

3. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

C. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

3.04 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

D. Protect installed materials to prevent damage by other trades.

END OF SECTION