CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

SOUTHEAST WRF LAKE FILTRATION SYSTEM

Prepared for
BOARD OF COUNTY COMMISSIONERS
COUNTY OF MANATEE, FLORIDA

WORK ASSIGNMENT NO. 7

BID DOCUMENTS

AUGUST 2012

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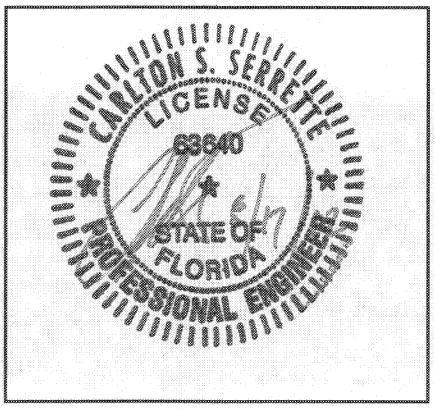
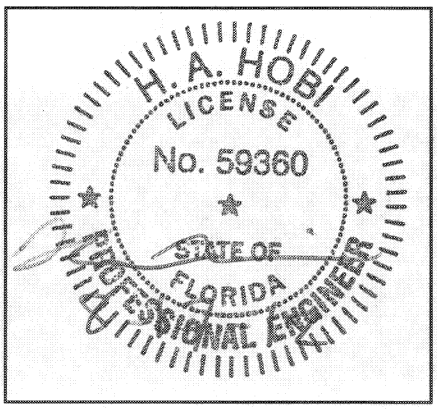
MANATEE COUNTY, FLORIDA

SOUTHEAST WRF LAKE FILTRATION SYSTEM

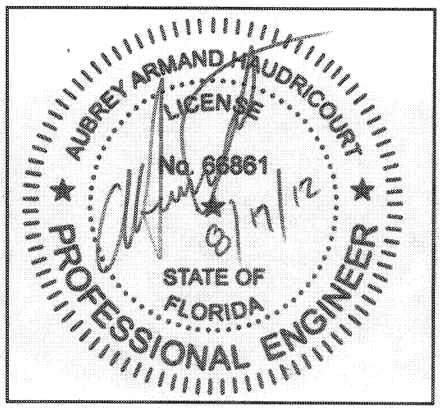
PROFESSIONAL SEAL AND SIGNATURE SHEET



Carlton Serrette, P.E.
Civil and Mechanical



H.A. Hobi, P.E.
Structural



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Electrical and Instrumentation

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SECTION 01005

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE AND INTENT

A. Description:
   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.

B. Work Included:
   1. The CONTRACTOR shall furnish all labor, superintendence, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, shop drawings, working drawings and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all required permits necessary for the work, other than those permits such as the Department of Environmental Protection, DEP permit and railroad permit which may have already been obtained. He 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 COUNTY, 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 incidental costs. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.
   2. The cost of incidental work described in these General 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.
   3. The CONTRACTOR shall be solely responsible for the adequacy of his workmanship, materials and equipment.

C. Public Utility Installations and Structures:
   1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto.
   2. The CONTRACTOR shall protect all installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means

approved by the COUNTY. All required protective devices and construction shall be provided by the CONTRACTOR at his expense. All existing public utilities damaged by the CONTRACTOR which are shown on the Plans or have been located in the field by the utility shall be repaired by the CONTRACTOR, at his expense, as approved by the COUNTY. No separate payment shall be made for such protection or repairs to public utility installations or structures.

3. Public utility installations or structures owned or controlled by the COUNTY or other governmental body, which are required by this contract to be removed, relocated, replaced or rebuilt by the CONTRACTOR not identified in any separate bid item 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.
4. Where public utility installations or structures owned or controlled by the COUNTY or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the COUNTY, 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 COUNTY, 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 in accordance with the General and Supplemental General Conditions.
5. The CONTRACTOR shall give written notice to COUNTY and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Sunshine State One-Call of Florida, Inc. Call Center ("Call Sunshine") and per all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).
6. 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 COUNTY.

1.2 PLANS AND SPECIFICATIONS

A. Plans:

1. When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

B. Copies Furnished to CONTRACTOR:
   1. The CONTRACTOR shall furnish each of the subcontractors, manufacturers, and material men such copies of the Contract Documents as may be required for their work. Additional copies of the Plans and Specifications, when requested, may be furnished to the CONTRACTOR at cost of reproduction.

C. Supplementary Drawings:
   1. When, in the opinion of the COUNTY, 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 COUNTY and five paper prints thereof will be given to the CONTRACTOR.

D. CONTRACTOR to Check Plans and Data:
   1. The CONTRACTOR shall verify all dimensions, quantities and details shown on the Plans, Supplementary Drawings, Schedules, Specifications or other data received from the COUNTY, and shall notify the COUNTY 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 COUNTY, should such errors or omissions be discovered. All schedules are given for the convenience of the COUNTY 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.

E. Specifications:
   1. The Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

F. Intent:

1. All work called for in the Specifications applicable to this Contract, but not shown on the Plans 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 Plans 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, and interpretation of these Specifications shall be made upon that basis.

3. The inclusion of the Related Requirements (or work specified elsewhere) in the General part of the specifications is only for the convenience of the CONTRACTOR, and shall not be interpreted as a complete list of related Specification Sections.

1.3 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. All transactions with the manufacturers or subcontractors shall be through the CONTRACTOR, unless the CONTRACTOR shall request, in writing to the COUNTY, that the manufacturer or subcontractor deal directly with the COUNTY. Any such transactions shall not in any way release the CONTRACTOR from his full responsibility under this Contract.

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

B. Delivery:

1. The CONTRACTOR shall deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete the work within the allotted time. 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

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.
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 rating data.

D. Installation of Equipment:
1. The CONTRACTOR shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.
2. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the COUNTY during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.
3. The CONTRACTOR shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the COUNTY and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.
4. The CONTRACTOR shall furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations.
5. Grout shall completely fill the space between the equipment base and the foundation. All metal surfaces coming in contact with concrete or grout shall receive a coat of coal tar epoxy equal to Koppers 300M or provide a 1/32-inch neophrene gasket between the metal surface and the concrete or grout.

E. Service of Manufacturer's Engineer:
1. The Contract prices for equipment shall include the cost of furnishing (as required by equipment specifications sections) 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. After the equipment is placed in permanent

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

1.4 INSPECTION AND TESTING

A. General:
   1. Inspection and testing of materials will be performed by the COUNTY unless otherwise specified.
   2. 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. Three (3) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the COUNTY as a prerequisite for the acceptance of any material or equipment.
   3. If, in the making of any test of any material or equipment, it is ascertained by the COUNTY that the material or equipment does not comply with the Contract, 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 COUNTY.
   4. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.
   5. The CONTRACTOR shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the COUNTY formally takes over the operation thereof.

B. Costs:
   1. All inspection and testing of materials furnished under this Contract will be performed by the COUNTY or duly authorized inspection engineers or inspections bureaus without cost to 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

COUNTY for compliance. The CONTRACTOR shall reimburse the COUNTY for the expenditures incurred in making such tests on materials and equipment which are rejected for non-compliance.

C. Inspections of Materials:

1. The CONTRACTOR shall give notice in writing to the COUNTY, at least two weeks in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture of preparation of materials. Upon receipt of such notice, the COUNTY will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or he will notify the CONTRACTOR that the inspection will be made at a point other than the point of manufacture, or he will notify the CONTRACTOR that inspection will be waived. The CONTRACTOR must comply with these provisions before shipping any material. Such inspection shall not release the CONTRACTOR from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

D. Certificate of Manufacture:

1. When inspection is waived or when the COUNTY so requires, the CONTRACTOR shall furnish to him authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. 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.

E. Shop Tests of Operating Equipment:

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. No such equipment shall be shipped to the work until the COUNTY notifies the CONTRACTOR, in writing, that the results of such tests are acceptable.
2. 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. Preliminary Field Tests:

1. As soon as conditions permit, the CONTRACTOR shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the CONTRACTOR shall, prior to the acceptance tests, make all changes, adjustments and replacements required. The furnishing CONTRACTOR shall assist in the preliminary field tests as applicable.

G. Final Field Tests:

1. Upon completion of the work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance 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 acceptance tests, at no additional cost to the COUNTY. The Supplier shall assist in the final field tests as applicable.

H. Failure of Tests:

1. Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the CONTRACTOR. The decision of the COUNTY as to whether or not the CONTRACTOR has fulfilled his obligations under the Contract shall be final and conclusive. If the CONTRACTOR fails to make these corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees of specified requirements, the COUNTY, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the CONTRACTOR to remove them from the site at his own expense.

2. In case the COUNTY rejects any materials and equipment, then the CONTRACTOR shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the COUNTY may, after the expiration of a period of thirty (30) calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the CONTRACTOR under his Contract.

I. Final Inspection:

1. During such final inspections, the work shall be clean and free from water. In no case will the final pay application be prepared until the CONTRACTOR has complied with all requirements set forth and the COUNTY has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Document.

1.5 TEMPORARY STRUCTURES

A. Temporary Fences:

1. If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the CONTRACTOR shall, at his own expense, if so ordered by the COUNTY, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The COUNTY shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

1.6 TEMPORARY SERVICES

A. First Aid:

1. The CONTRACTOR shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when people are employed on the work.

1.7 LINES AND GRADES

A. Grade:

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

B. Safeguarding Marks:

1. The CONTRACTOR shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or 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,

if required, shall bear the cost of reestablishing them if disturbed or destroyed.

C. Datum Plane:
   1. All elevations indicated or specified refer to the Mean Sea Level Datum of the NGVD 1929 Datum and/or NAVD 1988.

1.8 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility:
   1. The CONTRACTOR shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payments will be made therefore. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the COUNTY, additional work is deemed necessary to avoid interference with the work, payment therefore will be made as provided for in the General Conditions.
   2. CONTRACTOR is expressly advised that the protection of buildings, structures, tunnels, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the CONTRACTOR.
   3. CONTRACTOR shall, before starting operations, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the COUNTY. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the COUNTY.
   4. Prior to the beginning of any excavations, the CONTRACTOR shall advise the COUNTY of all buildings or structures on which he intends to perform work or which performance of the project work will affect.

B. Protection of Trees:

1. All trees and shrubs shall be adequately protected by the CONTRACTOR with boxes and otherwise and in accordance with ordinances governing the protection of trees. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the CONTRACTOR or his employees shall be replaced by him with new stock of similar size and age, at the proper season and at the sole expense of the CONTRACTOR.
2. Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.
3. The COUNTY may order the CONTRACTOR, for the convenience of the COUNTY, to remove trees along the line or trench excavation. If so ordered, the COUNTY will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

C. Lawn Areas:

1. Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed, and later replaced, or the area where sod has been removed shall be restored with new sod.

D. Restoration of Fences:

1. Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the CONTRACTOR and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the COUNTY. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific Item is provided therefore, as part of the overhead cost of the work, and no additional payment will be made therefore.

1.9 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights:

1. During the prosecution of the work, the CONTRACTOR shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The CONTRACTOR shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or

constitutes in any way a hazard to the public, in accordance with state and local requirements.

B. Smoke Prevention:
   1. A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires will be permitted.

C. Noise:
   1. The CONTRACTOR shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all engines or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The CONTRACTOR shall strictly observe all local regulations and ordinances covering noise control.

D. Access to Public Services:
   1. Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.

E. Dust prevention:
   1. The CONTRACTOR shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas sprinkled with water at all times.

1.10 CUTTING AND PATCHING

A. The CONTRACTOR shall do all cutting, fitting or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the COUNTY and in accordance with the Plans and Specifications. The work must be done by competent workmen skilled in the trade required by the restoration.

1.11 CLEANING

A. During Construction:
   1. During construction of the work, the CONTRACTOR shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the COUNTY, such material, debris, or rubbish constitutes a nuisance or is objectionable. The

CONTRACTOR shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops.

B. Final Cleaning:
   1. At the conclusion of the work, all equipment, tools, temporary structures and materials belonging to the CONTRACTOR shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.
   2. The CONTRACTOR shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished and new operating condition.

1.12 MISCELLANEOUS

A. Protection Against Siltation and Bank Erosion:
   1. The CONTRACTOR shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.
   2. The CONTRACTOR, at his own expense, shall remove any siltation deposits and correct any erosion problems as directed by the COUNTY which results from his construction operations.

B. Protection of Wetland Areas:
   1. The CONTRACTOR shall properly dispose of all surplus material, including soil, in accordance with Local, State and Federal regulations. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Florida Department of Environmental Protection or Southwest Florida Water Management District.

C. Existing Facilities:
   1. The work shall be so conducted to maintain existing facilities in operation insofar as is possible. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Special Provisions.

D. Use of Chemicals
   1. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS/REQUIREMENTS INCLUDED

A. Manatee COUNTY SEWRF currently filters lake water prior to distribution into the reclaimed water system with a pressure type filter. This project will replace the current filters with gravity disk filters. The work included in this contract consists of the items listed below:

1. Removal of the existing pressure-style filters, associated piping, and concrete pad
2. Installation of new gravity disk filters on new concrete pad with retaining wall. This new equipment will have the same approximate footprint as the existing system slated for demolition.
3. Installation of a new asphalt driveway to access filters
4. Construction of new submerged intake structures at South Lake No. 1, South Lake No. 2, and East Lake
5. Installation of 1 sodium hypochlorite storage tank in the existing chlorine building at the site
6. Installation of a new sodium hypochlorite metering pump skid (2 pumps) in the existing chlorine building at the site
7. Installation of a new, dedicated lift station to handle backwash waste from filters (lift station will pump to existing plant drain pump station, gravity drain to the existing plant drain pump station, or pump to existing Automatic Backwash Filters No. 1 and 2)
8. Installation of buried yard piping to connect filters to existing buried yard piping
9. Installation of associated electrical and controls components for above process improvements

B. The CONTRACTOR shall furnish all shop drawings, working drawings, labor, materials, equipment, tools, services and incidentals necessary to complete all work required by these Specifications and as shown on the Contract Drawings.

C. The CONTRACTOR shall perform the work complete, in place and ready for continuous service and shall include any repairs, replacements, and/or restoration required as a result of damages caused prior to acceptance by the COUNTY.

D. The CONTRACTOR shall furnish and install all materials, equipment and labor which is reasonably and properly inferable and necessary for the proper

completion of the work, whether specifically indicated in the Contract Documents or not.

1.2 CONTRACTS

A. Construct all the Work under a single contract.

1.3 WORK SEQUENCE

A. All work done under this Contract shall be done with a minimum of inconvenience to the users of the system or facility. The CONTRACTOR shall coordinate his work with private property owners such that existing utility services are maintained to all users to the maximum extent possible.

B. The CONTRACTOR shall, if necessary and feasible, construct the work in stages to accommodate the COUNTY's use of the premises during the construction period; coordinate the construction schedule and operations with the COUNTY's Representative.

C. The CONTRACTOR shall, where feasible, construct the Work in stages to provide for public convenience and not close off public use of any facility until completion of construction to provide alternative usage.

1.4 CONSTRUCTION AREAS

A. The CONTRACTOR shall: Limit his use of the construction areas for work and for storage, to allow for:
   1. Work by other Contractors.
   2. COUNTY's Use.
   3. Public Use.

B. Coordinate use of work site under direction of COUNTY's Representative.

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

D. Move any stored products under the CONTRACTOR's control, which interfere with operations of the COUNTY or separate contractor.

E. Obtain and pay for the use of additional storage of work areas needed for CONTRACTOR operations.

1.5 COUNTY OCCUPANCY

A. It is assumed that portions of the Work will be completed prior to completion of the entire Work. Upon completion of construction of each individual facility,

including testing, if the COUNTY, at its sole discretion, desires to accept the individual facility, the CONTRACTOR will be issued a dated certificate of completion and acceptance for each individual facility. The COUNTY will assume ownership and begin operation of the individual facility on that date and the three-year guaranty period shall commence on that date. The COUNTY has the option of not accepting the entire work as a whole until it is completed, tested and approved by the COUNTY.

1.6 PARTIAL COUNTY OCCUPANCY

A. The CONTRACTOR shall schedule his operations for completion of portions of the Work, as designated, for the COUNTY's occupancy prior to substantial completion of the entire work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01015

CONTROL OF WORK

PART 1 - GENERAL

1.1 WORK PROGRESS

A. The CONTRACTOR shall furnish personnel and equipment which will be efficient, appropriate and adequately sized to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Contract. If at any time such personnel appears to the COUNTY to be inefficient, inappropriate, or insufficient for securing the quality of work required for producing the rate of progress aforesaid, 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 COUNTY to give such order shall in no way relieve the CONTRACTOR of his obligations to secure the quality of the work and rate of progress required.

1.2 PRIVATE LAND

A. The CONTRACTOR shall not enter or occupy private land outside of easements, except by permission of the affected property owner.

1.3 WORK LOCATIONS

A. Work shall be located substantially as indicated on the drawings, but the COUNTY reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons.

1.4 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded 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 pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the COUNTY may require special construction procedures such as limiting the length of open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.

B. The CONTRACTOR shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be barricaded and well lighted at all times when construction is not in progress.

1.5 DISTRIBUTION SYSTEMS AND SERVICES

A. The CONTRACTOR shall avoid interruptions to water, telephone, cable TV, sewer, gas, or other related utility services. He shall notify the COUNTY and the appropriate agency well in advance of any requirement for dewatering, isolating, or relocating a section of a utility, so that necessary arrangements may be made.

B. If it appears that utility service will be interrupted for an extended period, the COUNTY may order the CONTRACTOR to provide temporary service lines at the CONTRACTOR's expense. Inconvenience of the users shall be kept to the minimum, consistent with existing conditions. The safety and integrity of the systems are of prime importance in scheduling work.

1.6 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. The CONTRACTOR shall assume full responsibility for the protection of all buildings, structures and utilities, public or private, including poles, signs, services to building utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables and other similar facilities, whether or not they are shown on the Drawings. The CONTRACTOR shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the CONTRACTOR's operation shall be repaired by the CONTRACTOR at his expense.

B. The CONTRACTOR shall bear full responsibility for obtaining locations of all underground structures and utilities (including existing water services, drain lines and sewers). Services to buildings shall be maintained and all costs or charges resulting from damage thereto shall be paid by the CONTRACTOR.

C. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit prices established in the Bid.

D. If, in the opinion of the COUNTY, permanent relocation of a utility owned by the COUNTY is required, he may direct the CONTRACTOR, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work as classified in the General Conditions. If relocation of a privately owned utility is required, the COUNTY will notify the utility to

perform the work as expeditiously as possible. The CONTRACTOR shall fully cooperate with the COUNTY and utility and shall have no claim for delay due to such relocation. The CONTRACTOR shall notify public utility companies in writing at least 48 hours (excluding Saturdays, Sundays and legal holidays) before excavating near their utilities.

1.7 TEST PITS

A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR immediately after the utility location and the surface shall be restored in a manner equal or better than the original condition. No separate payment will be made.

1.8 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 equal or better to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the COUNTY.

B. All sidewalks which are disturbed by the CONTRACTOR's operations shall be restored to their original or better condition by the use of similar or comparable materials. All curbing shall be restored in a condition equal to the original construction and in accordance with the best modern practice.

C. Along the location of this work, all fences, walks, bushes, trees, shrubbery and other physical features shall be protected and restored in a thoroughly workmanlike manner unless otherwise shown on the drawings. Fences and other features removed by the CONTRACTOR shall be replaced in the location indicated by the COUNTY as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the CONTRACTOR shall be regraded and sodded to equal or exceed original conditions.

D. Trees close to the work which drawings do not specify to be removed, shall be boxed or otherwise protected against injury. The CONTRACTOR shall trim all branches that are liable to damage because of his operations, but in no case shall any tree be cut or removed without prior notification to the COUNTY. All injuries to bark, trunk, limbs and roots of trees shall be repaired by dressing, cutting and painting according to approved methods, using only approved tools and materials.

E. The protection, removal and replacement of existing physical features along the line of work shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit and/or lump sum prices established under the items in the Bid.

1.9 MAINTENANCE OF TRAFFIC

A. Open pits, trenches, unpaved streets, debris, or other obstructions due to construction that will prevent the normal flow of traffic during an extended construction stoppage, for any reason, shall be minimized. In the event an extended construction stoppage is found to be necessary, CONTRACTOR shall, at his own expense, provide normal traffic flow during extended construction stoppage. Extended stoppage will be defined by the COUNTY.

B. 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 roadways, erect wheel guards or fences, or take other safety measures which are satisfactory to the COUNTY.

C. Any changes to the traffic pattern require a Traffic Control Plan as detailed in section 01570 of this specification..

1.10 WATER FOR CONSTRUCTION PURPOSES

A. In locations where public water supply is available, the CONTRACTOR may purchase water for all construction purposes.

B. The CONTRACTOR shall be responsible for paying for all water tap fees incurred for the purpose of obtaining a potable water service or temporary use meter.

1.11 MAINTENANCE OF FLOW

A. The CONTRACTOR shall at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the COUNTY well in advance of the interruption of any flow.

1.12 CLEANUP

A. During the course of the work, the CONTRACTOR shall keep the site of his operations in as clean and neat a condition as is possible. He shall dispose of all residue resulting from the construction work and at the conclusion of the work, he

shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.

1.13 COOPERATION WITHIN THIS CONTRACT

A. All firms or person authorized to perform any work under this Contract shall cooperate with the General CONTRACTOR and his subcontractors or trades and shall assist in incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the COUNTY.

1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the CONTRACTOR at his own expense.

B. All structures shall be protected in a manner approved by the COUNTY. Should any of the floors or other parts of the structures 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 COUNTY. 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 warranty 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 COUNTY.

1.15 CONSTRUCTION WITHIN RIGHT-OF-WAY

A. Where pipe lines are installed within FDOT right-of-way, all excavation backfill and compaction for the purpose of reconstructing roadways and/or adjacent slopes contiguous thereto shall be in accordance with FDOT or Manatee County Standards and Specifications, whichever is applicable. CONTRACTOR shall satisfy the authorized representative of the FDOT with respect to proper safety

procedures, construction methods, required permitting, etc., within the FDOT right-of-way.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01030

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 PERMITS

A. Upon notice of award, the CONTRACTOR shall immediately apply for all applicable permits not previously obtained by the COUNTY to do the work from the appropriate governmental agency or agencies. No work shall commence until all applicable permits have been obtained and copies delivered to the COUNTY. The costs for obtaining all permits shall be borne by the CONTRACTOR.

1.2 CONNECTIONS TO EXISTING SYSTEM

A. The CONTRACTOR shall perform all work necessary to locate, excavate and prepare for connections to the existing systems all as shown on the Drawings or where directed by the COUNTY. The cost for this work and for the actual connection shall be included in the price bid for the project and shall not result in any additional cost to the COUNTY. The termination point for each contract shall be as shown on the Contract Drawings.

1.3 RELOCATIONS

A. The CONTRACTOR shall be responsible for the coordination of the relocation of structures, including but not limited to light poles, power poles, signs, sign poles, fences, piping, conduits and drains that interfere with the positioning of the work as set out on the Drawings. No relocation of the items under this Contract shall be done without approval from the COUNTY.

1.4 EXISTING UNDERGROUND PIPING, STRUCTURES AND UTILITIES

A. The attention of the CONTRACTOR is drawn to the fact that during excavation, the possibility exists of the CONTRACTOR encountering various utility lines not shown on the Drawings. The CONTRACTOR shall exercise extreme care before and during excavation to locate and flag these lines as to avoid damage to the existing lines.

B. It is the responsibility of the CONTRACTOR to ensure that all utility or other poles, the stability of which may be endangered by the close proximity of excavation, are temporarily stayed in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice.

C. The existing utility locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered. The CONTRACTOR shall be responsible for notifying the various utility companies to locate their respective utilities in advance of construction in conformance with all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).

D. The existing piping and utilities that interfere with new construction shall be rerouted as shown, specified, or required. Before any piping and utilities not shown on the Drawings are disturbed, the CONTRACTOR shall notify the COUNTY and shall provide suggestions on how best to resolve the issue.

E. The CONTRACTOR shall exercise care in any excavation to locate all existing piping and utilities. All utilities which do not interfere with complete work shall be carefully protected against damage. Any existing utilities damaged in any way by the CONTRACTOR shall be restored or replaced by the CONTRACTOR at his expense as directed by the COUNTY.

F. It is intended that wherever existing utilities such as water, sewer, gas, telephone, electrical, or other service lines must be crossed, deflection of the pipe within recommended limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated in the Drawings. However, when in the opinion of the COUNTY this procedure is not feasible, he may direct the use of fittings for a utilities crossing as detailed on the Drawings. No deflections will be allowed in gravity sanitary sewer lines or in existing storm sewer lines.

1.5 SUSPENSION OF WORK DUE TO WEATHER

A. Refer to FDOT Standards and Specifications Book, Section 8.

1.6 HURRICANE PREPAREDNESS PLAN

A. Within 30 days of the date of Notice to Proceed, the CONTRACTOR shall submit to the COUNTY a Hurricane Preparedness Plan. The plan should outline the necessary measures which the CONTRACTOR proposes to perform at no additional cost to the COUNTY in case of a hurricane warning.

B. In the event of inclement weather, or whenever COUNTY shall direct, CONTRACTOR shall insure that he and his Subcontractors shall carefully protect work and materials against damage or injury from the weather. If, in the opinion of the COUNTY, any portion of work or materials is damaged due to the failure on the part of the CONTRACTOR or Subcontractors to protect the work,

such work and materials shall be removed and replaced at the expense of the CONTRACTOR.

1.7 POWER SUPPLY

A. Electricity as may be required for construction and permanent power supply shall be secured and purchased by the CONTRACTOR.

1.8 SALVAGE

A. Any existing equipment or material, including, but not limited to, valves, pipes, fittings, couplings, etc., which is removed or replaced as a result of construction under this project may be designated as salvage by the COUNTY and if so shall be protected for a reasonable time until picked up by the COUNTY. Any equipment or material not worthy of salvaging, as directed by the COUNTY, shall be disposed of by the CONTRACTOR at no additional cost.

1.9 DEWATERING

A. The CONTRACTOR shall do all groundwater pumping necessary to prevent flotation of any part of the work during construction operations with his own equipment.

B. The CONTRACTOR shall pump out water and wastewater which may seep or leak into the excavations for the duration of the Contract and with his own equipment. He shall dispose of this water in an appropriate manner.

1.10 ADDITIONAL PROVISIONS

A. Before commencing work on any of the existing pipelines, structures or equipment, the CONTRACTOR shall notify the COUNTY, in writing, at least 10 calendar days in advance of the date he proposes to commence such work.

B. The CONTRACTOR shall provide, at his own expense, all necessary temporary facilities for access to and for protection of, all existing facilities. The COUNTY's personnel must have ready access at all times to the existing facilities. 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 COUNTY.

1.11 CONSTRUCTION CONDITIONS

A. The CONTRACTOR shall strictly adhere to the specific requirements of the governmental unit(s) and/or agency(ies) having jurisdiction over the work.

Wherever there is a difference in the requirements of a jurisdictional body and these Specifications, the more stringent shall apply.

1.12 PUBLIC NUISANCE

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

B. Sound levels must meet Manatee COUNTY Ordinance #87-34, (which amends Ordinance 81-3, The Manatee COUNTY Noise Control Ordinance). Sound levels in excess of such ordinance are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the COUNTY for excessive noise shall not relieve the CONTRACTOR of the other portions of this specification.

C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

1.13 WARRANTIES

A. All material supplied under these Specifications shall be warranted by the CONTRACTOR and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of COUNTY acceptance.

B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the COUNTY.

C. The manufacturer's warranty period shall run concurrently with the CONTRACTOR's warranty or guarantee period. No exception to this provision shall be allowed. The CONTRACTOR shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications.

D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of COUNTY acceptance, the CONTRACTOR shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the CONTRACTOR of the three-year warranty starting at the time of COUNTY acceptance of the equipment.

1.14 FUEL STORAGE & FILLING

A. If the CONTRACTOR is storing fuel on site, or doing his own fuel filling of portable equipment (other than hand-held equipment), he is responsible for any required response, clean-up or reporting required, at no additional cost to the COUNTY.

B. The CONTRACTOR shall prepare and submit a fuel storage / spill abatement plan prior to start of construction if required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01045

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the work or to:
   1. Make its several parts fit together properly.
   2. Uncover portions of the work to provide for installation of ill-timed work.
   3. Remove and replace defective work.
   4. Remove and replace work not conforming to requirements of Contract Documents.
   5. Provide penetrations of non-structural surfaces for installation of piping and electrical conduit.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.1 INSPECTION

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

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

C. Report unsatisfactory or questionable conditions to COUNTY. Do not proceed with work until COUNTY has provided further instructions.

3.2 PREPARATION

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

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

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

3.3 PERFORMANCE

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

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. Fit and adjust products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

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

E. Replace surfaces airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

++ END OF SECTION ++

SECTION 01050

FIELD ENGINEERING AND SURVEYING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall provide and pay for field surveying service required for the project.

B. The CONTRACTOR shall furnish and set all necessary stakes to establish the lines and grades as shown on the Contract Drawings and layout each portion of the Work of the Contract.

1.2 QUALIFICATION OF SURVEYOR AND ENGINEER

A. All construction staking shall be conducted by or under the supervision of a Florida Registered Professional Surveyor and Mapper. The CONTRACTOR shall be responsible for the layout of all such lines and grades, which will be subject to verification by the COUNTY.

1.3 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the Project are designated on the Contract Drawings.

B. Locate and protect all survey monumentation, property corners and project control points prior to starting work and preserve all permanent reference points during construction. All costs associated with the replacement of all survey monumentation, property corners and project control points shall be borne by the CONTRACTOR.

C. Make no changes or relocations without prior written notice to COUNTY.

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

E. Require surveyor to replace project control points which may be lost or destroyed.

F. Establish replacements based on original survey control.

1.4 PROJECT SURVEY REQUIREMENTS

A. The CONTRACTOR shall establish temporary bench marks as needed, referenced to data established by survey control points.

1.5 RECORDS

A. The CONTRACTOR shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings per Section 01720.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

B. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes established stricter standards.

C. Publication Date: The most recent publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.2 ABBREVIATIONS, NAMES AND ADDRESSES OR ORGANIZATIONS

A. Obtain copies of reference standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740

AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16th Street NW Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 179l Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
AWS	American Welding Society 2501 N.W. 7th Street Miami, FL 33125
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FDEP	Florida Department of Environmental Protection 3900 Commonwealth Blvd. Tallahassee, Florida 32399
FDOT	Florida Department of Transportation Standards Specifications for Road and Bridge Construction Maps & Publication Sales - Mail Station 12 605 Suwannee St.

Tallahassee, FL 32399-0450

FS — Federal Specification
General Services Administration Specifications and Consumer Information Distribution Section (WFSIS)
Washington Navy Yard, Bldg. 197
Washington, DC 20407

MCPW UTIL STD — Manatee County Utility Engineering
4410-B 66th St. W.
Bradenton, FL 34210

MLSFA — Metal Lath/Steel Framing Association
221 North LaSalle Street
Chicago, IL 60601

MMA — Monorail Manufacturer's Association
1326 Freeport Road
Pittsburgh, PA 15238

NAAMM — National Association of Architectural Metal Manufacturers
221 North LaSalle Street
Chicago, IL 60601

NEMA — National Electrical Manufacturer's Assoc.
2101 L Street N.W.
Washington, DC 20037

OHSA — Occupational Safety and Health Assoc.
5807 Breckenridge Pkwy., Suite A
Tampa, FL 33610-4249

PCA — Portland Cement Association
5420 Old Orchard Road
Skokie, IL 20076

PCI — Prestressed Concrete Institute
20 North Wacker Drive
Chicago, IL 60606

SDI — Steel Door Institute
712 Lakewood Center North
Cleveland, OH 44107

SMACNA — Sheet Metal and Air Conditioning Contractor's National

	Association 8224 Old Court House Road Vienna, VA 22180
SSPC	Steel Structures Painting Council 402 24th Street, Suite 600 Pittsburgh, PA 15213
SWFWMD	Southwest Florida Water Management District 2379 Broad Street Brooksville, FL 34604-6899
UL	Underwriter's Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01143

COORDINATION WITH COUNTY'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. 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.
   2. CONTRACTOR shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with COUNTY's operations during the Work.

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

C. Related Sections:
   1. Section 01005, General Requirements
   2. Section 01010, Summary of Work
   3. Section 01015, Control of Work
   4. Section 01030, Special Project Procedures
   5. Section 01045, Cutting and Patching.
   6. Section 01510, Temporary and Permanent Facilities

D. Except for shutdowns specified in this Section, perform the Work such that COUNTY's facility remains in continuous satisfactory 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.

E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the General Conditions and Supplementary Conditions, subject to the requirements in this Section.

F. CONTRACTOR has the option of providing additional temporary facilities 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; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

G. Coordinate shutdowns with COUNTY and ENGINEER. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on COUNTY's operations and processes.

H. Do not shut off or disconnect existing operating systems, unless accepted by COUNTY in writing. 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 COUNTY.

I. Bypassing:
   1. Diversion of flows around treatment processes is not allowed.

1.2 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.

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

2. 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. Provide notification at least 72 hours in advance of each shutdown.

1.3 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 that remain in operation.
   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. Comply with Section 01510, Temporary and Permanent Facilities.
   3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation 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. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by COUNTY. 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.
   5. COUNTY will assist CONTRACTOR in dewatering process tanks, basins, conduits, and other work areas to be dewatered for shutdowns. Maintain clean and dry work area by pumping and properly disposing of fluid that accumulates in work areas.
   6. Draining and Cleaning of Conduits, Tanks, and Basins:
      a. Unless otherwise specified, CONTRACTOR shall dewater process tanks, basins, conduits, and pipelines at beginning of each shutdown. Flush, wash down, and clean tanks, basins, pipelines, conduits, and other work areas.

b. CONTRACTOR shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by COUNTY. Unless otherwise specified or indicated, contents of pipes, tanks, basins, and conduits undergoing modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, piping, pumps, or other means provided by CONTRACTOR. Discharge of fluids across floors is not allowed.

c. If drainage point is not available on the piping or conduit to be drained, provide a wet tap using tapping saddle and valve or other method approved by ENGINEER. Uncontrolled spillage of contents of pipes or conduits is not allowed.

d. Spillage shall be brought to COUNTY's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall wash down spillage to floor drains or sumps and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by COUNTY, CONTRACTOR shall remove spillage by other method, such as vactor truck, acceptable to COUNTY.

1.4 TIE-INS

A. Table 01143-A in this Section lists connections by CONTRACTOR to existing facilities. Table 01143-A may not include all tie-ins required for the Work; CONTRACTOR shall perform tie-ins required to complete the Work. For tie-ins not included in Table 01143-A, obtain requirements for tie-ins from ENGINEER.

1.5 SHUTDOWNS

A. General:
   1. Terminology: A "shutdown" is when a portion of the normal operation of COUNTY's facility, whether equipment, systems, piping, 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 Part 3.2 of this Section. 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 Part 3.2. Coordinate requirements for such shutdowns with 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 COUNTY that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. In addition to requirements of this Section, conform to requirements of Division 1.

3.2 DETAILED SHUTDOWN REQUIREMENTS

A. Shutdown A:
   1. General:
      a. Affected Equipment Operating Prior to Shutdown: South Lake No. 1 Lift Station.
      b. Equipment Out of Service During Shutdown: South Lake No. 1 Lift Station.
      c. Impact on Other Equipment and Processes: South Lake No. 1 is currently out of service, so minimal impact.

d. Duration: 8 weeks.

2. Prior to Shutdown:
   a. Obtain ENGINEER's acceptance of proposed shutdown planning submittal and shutdown notification submittal.
   b. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.
   c. Assist COUNTY in preparing to take equipment, tanks, basins, and conduits temporarily out of service.
   d. Coordinate other tie-ins to be performed simultaneously.
   e. Install, check, and test the temporary pumping system.
3. During Shutdown:
   a. Dewater the construction area
   b. Demolish existing intake structure as required.
   c. Perform tie-in No. 1 per Table 01143-A.
   d. Install structures and equipment per drawings.
   e. Coordinate with COUNTY to return equipment and system to operation.
4. Following Shutdown:
   a. Verify functionality of equipment and system.
   b. Verify operation of new equipment and systems, and verify that joints in piping are watertight or gastight as applicable.
   c. Repair joints that are not watertight or gastight as applicable.
   d. Remove dewatering system.

B. Shutdown B:
1. General:
   a. Affected Equipment Operating Prior to Shutdown: South Lake No. 2 Lift Station.
   b. Equipment Out of Service During Shutdown: South Lake No. 2 Lift Station.
   c. Impact on Other Equipment and Processes: Will limit total flow from storage lakes to supplement reclaimed water supply.
   d. Duration: 8 weeks.
   e. Time: Shutdown shall be performed during low reclaimed water demand period.
2. Prior to Shutdown:
   a. Obtain ENGINEER's acceptance of proposed shutdown planning submittal and shutdown notification submittal.
   b. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.
   c. Assist COUNTY in preparing to take equipment, tanks, basins, and conduits temporarily out of service.
   d. Coordinate other tie-ins to be performed simultaneously.
   e. Install, check, and test the temporary pumping system.

3. During Shutdown:
    a. Install cofferdam system.
    b. Dewater the pond bottom inside cofferdam.
    c. Demolish existing intake structure as required.
    d. Perform tie-in No. 2 per Table 01143-A.
    e. Install structures and equipment per drawings.
    f. With COUNTY, return equipment and system to operation.
4. Following Shutdown:
    a. Verify functionality of equipment and system.
    b. Verify operation of new equipment and systems, and verify that joints in piping are watertight or gastight as applicable.
    c. Repair joints that are not watertight or gastight as applicable.
    d. Remove dewatering system.
    e. Remove cofferdam system.

C. Shutdown C:
1. General:
    a. Affected Equipment Operating Prior to Shutdown: East Lake Lift Station
    b. Equipment Out of Service During Shutdown: East Lake Lift Station
    c. Impact on Other Equipment and Processes: Will limit total flow from storage lakes to supplement reclaimed water supply
    d. Duration: 8 weeks
    e. Time: Shutdown shall be performed during low reclaimed water demand period.
2. Prior to Shutdown:
    a. Obtain ENGINEER's acceptance of proposed shutdown planning submittal and shutdown notification submittal.
    b. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.
    c. Assist COUNTY in preparing to take equipment, tanks, basins, and conduits temporarily out of service.
    d. Coordinate other tie-ins to be performed simultaneously.
    e. Install, check, and test the temporary pumping system.
3. During Shutdown:
    a. Install cofferdam system.
    b. Dewater the pond bottom inside cofferdam.
    c. Demolish existing intake structure as required.
    d. Perform tie-in No. 3 per Table 01143-A.
    e. Install structures and equipment per drawings.
    f. With COUNTY, return equipment and system to operation.
4. Following Shutdown:
    a. Verify functionality of equipment and system.

b. Verify operation of new equipment and systems, and verify that joints in piping are watertight or gastight as applicable.
c. Repair joints that are not watertight or gastight as applicable.
d. Remove dewatering system.
e. Remove cofferdam system.

D. Shutdown D:
1. General:
a. Affected Equipment Operating Prior to Shutdown: 36-inch Overflow between Chlorine Contact Chamber 1 and 2 wetwell and Chlorine Contact Chamber 3 and 4 wetwell.
b. Equipment Out of Service During Shutdown: 36-inch Overflow
c. Impact on Other Equipment and Processes: Will limit total flow from high service pumps with only Chlorine contact chamber 1/2 operating.
d. Duration: 10 hours
e. Time: Shutdown shall be performed during low reclaimed water demand period. Coordinate with COUNTY.
2. Prior to Shutdown:
a. Obtain ENGINEER's acceptance of proposed shutdown planning submittal and shutdown notification submittal.
b. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.
c. Assist COUNTY in preparing to take equipment, tanks, basins, and conduits temporarily out of service.
d. Coordinate other tie-ins to be performed simultaneously.
e. Install, check, and test the temporary pumping system.
3. During Shutdown:
a. Isolate 36-inch overflow line.
b. Dewater the pipe.
c. Perform tie-in No. 5 per Table 01143-A.
d. Install piping and equipment per drawings.
e. Coordinate with COUNTY to return equipment and system to operation.
4. Following Shutdown:
a. Verify functionality of equipment and system.
b. Verify operation of new equipment and systems, and verify that joints in piping are watertight.
c. Repair joints that are not watertight as applicable.
d. Remove dewatering system.

3.3 SCHEDULES

A. The schedules listed below, following the "End of Section" designation, are part of this Specification section:
   1. Table 01143-A, Schedule of Tie-ins.

TABLE 01143-A
SCHEDULE OF TIE-INS

Tie-In No.	New Line Size and Service	Existing (Connecting) Line Size & Service	Tie-In Building/Location	Remarks
1	24-inch, South Lake No. 1 Intake	24-inch South Lake No. 1 Intake	As shown	
2	24-inch, South Lake No. 2 Intake	24-inch South Lake No. 2 Intake	As shown	
3	24-inch, East Lake Intake	24-inch East Lake Intake	As shown	
4	30-inch, Storage Pond Water (SPW)	(2) 20-inch, SPW	As shown	Use existing valves to isolate both 20-inch lines. Drain both SPW lines prior to cutting into. Demolish existing pipe as shown. Connect coupling, tee, and valve.
5	36-inch, Lake Filter Effluent	36-inch, Overflow between Chlorine Contact Chamber 1/2 wetwell and Chlorine Contact Chamber 3/4 wetwell	As shown	Coordinate with COUNTY to isolate Overflow line. Drain Overflow pipe prior to cutting into. Connect coupling, tee, and valves. Use upstream valve to isolate new line.

+ + END OF SECTION + +

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SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SCOPE

A. The scope of this section of the Contract Documents is to further define the items included in each Bid Item in the Bid Form section of the Contract Documents. Payment will be made based on the specified items included in the description in this section for each bid item.

B. All contract prices included in the Bid Form section will be full compensation for all shop drawings, working drawings, labor, materials, tools, equipment and incidentals necessary to complete the construction as shown on the Drawings and/or as specified in the Contract Documents to be performed under this Contract. Actual quantities of each item bid on a unit price basis will be determined upon completion of the construction in the manner set up for each item in this section of the Specifications. Payment for all items listed in the Bid Form will constitute full compensation for all work shown and/or specified to be performed under this Contract.

1.2 WORK OUTSIDE AUTHORIZED LIMITS

A. No payment will be made for work constructed outside the authorized limits of work.

1.3 PAYMENT

A. Where payment for items is shown to be paid for on a lump sum basis, no separate payment will be made for any item of work required to complete the lump sum items. Lump sum contracts shall be complete, tested and fully operable prior to request for final payment. CONTRACTOR may be required to provide a break-down of the lump sum totals.

1.4 COSTS INCLUDED IN PAYMENT ITEMS

A. No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work. Final payments shall not be requested by the CONTRACTOR or made by the COUNTY until as-built (record) drawings have been submitted and approved by the COUNTY.
   1. Shop Drawings, Working Drawings.
   2. Clearing, grubbing and grading except as hereinafter specified.

3. Trench excavation, including necessary pavement removal and rock removal, except as otherwise specified.
4. Dewatering and disposal of surplus water.
5. Structural fill, backfill, grading, and related transport costs.
6. Replacement of unpaved roadways, and shrubbery plots.
7. Cleanup and miscellaneous work.
8. Foundation and borrow materials, except as hereinafter specified.
9. Testing and placing system in operation.
10. Any material and equipment required to be installed and utilized for the tests.
11. Pipe, structures, pavement replacement, asphalt and shell driveways and/or appurtenances included within the limits of lump sum work, unless otherwise shown.
12. Maintaining the existing quality of service during construction, including any required treatment or piping bypass.
13. Repair of damaged irrigation piping and sprinkler heads.
14. Maintaining access to treatment plant structures with barriers, lights, signage etc.
15. Maintaining or detouring of traffic.
16. Appurtenant work as required for a complete and operable system.
17. Seeding and hydromulching.
18. As-built Record Drawings.
19. Operation and maintenance materials and start up and training services.

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

1.5 BID ITEMS

BID ITEM NO. 1 – MOBILIZATION/DEMOBILIZATION

A. Measurement and payment for this Bid Item shall include full compensation for the required 100 percent (100%) Performance Bond, 100 Percent (100%) Payment Bond, all required insurance for the project and the CONTRACTOR's mobilization and demobilization costs as shown in the Bid Form. Mobilization includes, but is not limited to: preparation and movement of personnel, equipment, supplies and incidentals such as safety and sanitary supplies/ facilities. Demobilization includes, but is not limited to, the work of removing temporary facilities from the site.

B. Payment for mobilization/demobilization shall not exceed 10 percent (10%) of the total Contract cost unless the CONTRACTOR can prove to the COUNTY that his actual mobilization cost exceeds 10 percent (10%).

C. Partial payments for this Bid Item will be made in accordance with the following schedule:

Percent of Original Contract Amount:	Percent Allowable Payment of Mobilization/Demobilization Bid Item Price:
5	25
10	35
25	45
50	50
75	75
100	100

D. These payments will be subject to the standard retainage provided in the Contract. Payment of the retainage will be made after completion of the work and demobilization.

BID ITEM NO. 2 – LAKE GRAVITY DISC FILTERS

A. Payment of the applicable lump sum price shall be full compensation for furnishing all labor, materials and equipment necessary for the construction of the lake gravity disc filters including, but not limited to, removal of existing lake filter system and concrete pad; removal/relocation of existing piping as shown in drawings; yard piping, valves, meters and associated appurtenances; filtration system equipment; sodium hypochlorite storage and metering system equipment; backwash lift station and associated force mains and gravity drains; concrete; asphalt pavement; stormwater system and swale; site restoration; and all other appurtenant civil, mechanical, electrical and instrumentation work related to this lump sum pay item as presented in the Contract Documents.

BID ITEM NO 3. – LAKE INTAKES

A. Payment of the applicable lump sum price shall be full compensation for furnishing all labor, materials and equipment necessary for the construction of the lake intakes, including, but not limited to, removal and replacement of the existing lake intake structures; removal/relocation of existing piping as shown in drawings; coffer damns; yard piping, valves, associated fittings and

appurtenances; intake screens; concrete; site restoration; and all other appurtenant civil, mechanical, electrical and instrumentation work related to this lump sum pay item as presented in the Contract Documents.

BID ITEM NO 4. – DISCRETIONARY WORK

A. This payment item is for the OWNER's requested changes in the work pertaining to the SEWRF Lake Filtration System Replacement Work that requires authorization of the OWNER prior to the work being performed. This item is not to cover work outlined in the plans and/or specifications or for work incidental to the completion of the project as outlined herein, and shall only be used when directed by the OWNER.

B. Payment shall be made based on written authorization of the additional work. The authorization shall reflect the actual amounts agreed to by the CONTRACTOR and the OWNER.

C. Payment of the applicable negotiated lump sum price shall be full compensation for furnishing, but is not limited to, all plant, labor, materials and equipment necessary to perform work not covered under Bid Item No.1 and 2 and is considered outside of the original scope of work. All work performed under Bid Item No. 3 shall be submitted to the ENGINEER and the OWNER for review and approval.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01152

REQUESTS FOR PAYMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Submit Applications for Payment to the Project Manager or as directed at the preconstruction meeting, in accordance with the schedule established by Conditions of the Contract and Agreement between COUNTY and CONTRACTOR.

1.2 FORMAT AND DATA REQUIRED

A. Submit payment requests in the form provided by the COUNTY with itemized data typed in accordance with the Bid Form.

B. Provide construction photographs in accordance with Contract Documents.

1.3 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the COUNTY requires substantiating data, CONTRACTOR shall submit suitable information with a cover letter.

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

1.4 PREPARATION OF APPLICATION FOR FINAL PAYMENT

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

1.5 SUBMITTAL PROCEDURE

A. Submit applications for payment at the times stipulated in the Agreement.

B. Number: Three (3) copies of each application; all signed and certified by the CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01153

CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.1 DEFINITION

A. Change Order: Major change in contract scope or time that must be approved and executed by the Board before it becomes effective.

B. Administrative Change Adjustment: Minor change order under 10% of project cost or 20% time, does not have to be Board approved.

C. Field Directive Change: Change to contract quantity that does not require a change of scope or time extension.

1.2 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall promptly implement change order procedures:
   1. Provide full written data required to evaluate changes.
   2. Maintain detailed records of work done on a time-and-material/force account basis.
   3. Provide full documentation to COUNTY on request.

B. The CONTRACTOR shall designate a member of the CONTRACTOR's organization who:
   1. Is authorized to accept changes to the Work.
   2. Is responsible for informing others in the CONTRACTOR's employ of the authorized changes into the Work.

1.3 PRELIMINARY PROCEDURES

A. Project Manager may initiate changes by submitting a Request to CONTRACTOR. Request will include:
   1. Detailed description of the change, products, costs and location of the change in the Project.
   2. Supplementary or revised Drawings and Specifications.
   3. The projected time extension for making the change.
   4. A specified period of time during which the requested price will be considered valid.
   5. Such request is for information only and is not an instruction to execute the changes, nor to stop work in progress.

B. CONTRACTOR may initiate changes by submitting a written notice to the Project Manager, containing:
   1. Description of the proposed changes.
   2. Statement of the reason for making the changes.
   3. Statement of the effect on the Contract Sum and the Contract Time.
   4. Statement of the effect on the work of separate contractors.
   5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.4 FIELD DIRECTIVE CHANGE

A. In lieu of a Change Order, the Project Manager may issue a Field Directive change for the CONTRACTOR to proceed with additional work within the original intent of the Project.

B. Field Directive change will describe changes in the work, with attachments of backup information to define details of the change.

C. CONTRACTOR must sign and date the Field Directive change to indicate agreement with the terms therein.

1.5 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. Support each quotation for a lump sum proposal and for each unit price which has not previously been established, with sufficient substantiating data to allow the COUNTY to evaluate the quotation.

B. On request, provide additional data to support time and cost computations:
   1. Labor required.
   2. Equipment required.
   3. Products required.
      a. Recommended source of purchase and unit cost.
      b. Quantities required.
   4. Taxes, insurance and bonds.
   5. Credit for work deleted from Contract, similarly documented.
   6. Overhead and profit.
   7. Justification for any change in Contract Time.

C. Support each claim for additional costs and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal.
   1. Name of the COUNTY's authorized agent who ordered the work and date of the order.
   2. Date and time work was performed and by whom.
   3. Time record, summary of hours work and hourly rates paid.
   4. Receipts and invoices for:

a. Equipment used, listing dates and time of use.
b. Products used, listing of quantities.
c. Subcontracts.

1.6 PREPARATION OF CHANGE ORDERS

A. Project Manager will prepare each Change Order.

B. Change Order will describe changes in the Work, both additions and deletions, with attachments as necessary to define details of the change.

C. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.7 LUMP SUM/FIXED PRICE CHANGE ORDER

A. Project Manager initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by the CONTRACTOR, or requests from the COUNTY, or both.

B. Once the form has been completed, all copies should be sent to CONTRACTOR for approval. After approval by CONTRACTOR, all copies should be sent to COUNTY for approval. The COUNTY will distribute executed copies after approval by the Board of COUNTY Commissioners.

1.8 UNIT PRICE CHANGE ORDER

A. Contents of Change Orders will be based on, either:
1. COUNTY's definition of the scope of the required changes.
2. CONTRACTOR's Proposal for a change, as approved by the COUNTY.
3. Survey of completed work.

B. The amounts of the unit prices to be:
1. Those stated in the Agreement.
2. Those mutually agreed upon between COUNTY and CONTRACTOR.

1.9 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE AUTHORIZATION

A. At completion of the change, CONTRACTOR shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.

B. COUNTY will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.

C. COUNTY will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.

D. COUNTY and CONTRACTOR will sign and date the Change Order to indicate their agreement therewith.

1.10 CORRELATION WITH CONTRACTOR'S SUBMITTALS

A. Periodically revise Schedule of Values and Application for Payment forms to record each change as a separate item of work, and to record the adjusted Contract Sum.

B. Periodically revise the Construction Schedule to reflect each change in Contract Time. Revise sub schedules to show changes for other items of work affected by the changes.

C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The COUNTY shall schedule the pre-construction meeting, periodic progress meetings and special meetings, if required, throughout progress of work.

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

C. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.2 PRE-CONSTRUCTION MEETING

A. Attendance:
   1. COUNTYENGINEER.
   2. COUNTY's Project Manager
   3. CONTRACTOR.
   4. Resident Project Representative.
   5. Related Labor Contractor's Superintendent.
   6. Major Subcontractors.
   7. Major Suppliers.
   8. Others as appropriate.

B. Suggested Agenda:
   1. Distribution and discussion of:
      a. List of major subcontractors.
      b. Projected Construction Schedules.
      c. Coordination of Utilities
   2. Critical work sequencing.
   3. Project Coordination.
      a. Designation of responsible personnel.
      b. Emergency contact persons with phone numbers.
   4. Procedures and processing of:
      a. Field decisions.
      b. Submittals.
      c. Change Orders.
      d. Applications for Payment.
   5. Procedures for maintaining Record Documents.
   6. Use of premises:

a. Office, work and storage areas.
b. COUNTY's REQUIREMENTS.

7. Temporary utilities.
8. Housekeeping procedures.
9. Liquidated damages.
10. Equal Opportunity Requirements.
11. Laboratory testing.
12. Project / Job meetings: Progress meeting, other special topics as needed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01310

CONSTRUCTION SCHEDULE AND PROJECT RESTRAINTS

PART 1 - GENERAL

1.1 GENERAL

A. Construction under this contract must be coordinated with the COUNTY and accomplished in a logical order to maintain utilization and flow through existing facilities and public properties and rights-of-way and to allow construction to be completed within the time allowed by Contract Documents and in the manner set forth in the Contract.

1.2 CONSTRUCTION SCHEDULING GENERAL PROVISIONS

A. No work shall be done between 7:00 p.m. and 7:00 a.m. nor on weekends or legal holidays without written permission of the COUNTY. However, emergency work may be done without prior permission.

B. Night work may be established by the CONTRACTOR as regular procedure with the written permission of the COUNTY. Such permission, however, may be revoked at any time by the COUNTY if the CONTRACTOR fails to maintain adequate equipment and supervision for the proper execution and control of the work at night.

C. Due to potential health hazards and requirements of the State of Florida and the U.S. Environmental Protection Agency, existing facilities must be maintained in operation.

D. The CONTRACTOR shall be fully responsible for providing all temporary piping, plumbing, electrical hook-ups, lighting, temporary structure, or other materials, equipment and systems required to maintain the existing facility's operations. All details of temporary piping and temporary construction are not necessarily shown on the Drawings or covered in the Specifications. However, this does not relieve the CONTRACTOR of the responsibility to insure that construction will not interrupt proper facility operations.

E. The CONTRACTOR shall designate an authorized representative of his firm who shall be responsible for development and maintenance of the schedule and of progress and payment reports. This representative of the CONTRACTOR shall have direct project control and complete authority to act on behalf of the CONTRACTOR in fulfilling the commitments of the CONTRACTOR's schedule.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The CONTRACTOR shall submit a critical path schedule as described herein.

B. The planning, scheduling, management and execution of the work is the sole responsibility of the CONTRACTOR. The progress schedule requirement is established to allow COUNTY to review CONTRACTOR's planning, scheduling, management and execution of the work; to assist COUNTY in evaluating work progress and make progress payments and to allow other contractors to cooperate and coordinate their activities with those of the CONTRACTOR.

2.2 FORM OF SCHEDULES

A. Prepare schedules using the latest version of Microsoft Project, or other COUNTY approved software, in the form of a horizontal bar chart diagram. The diagram shall be time-scaled and sequenced by work areas. Horizontal time scale shall identify the first work day of each week.

B. Activities shall be at least as detailed as the Schedule of Values. Activity durations shall be in whole working days. In addition, man-days shall be shown for each activity or tabulated in an accompanying report.

C. Diagrams shall be neat and legible and submitted on sheets at least 8-1/2 inches by 11 inches suitable for reproduction. Scale and spacing shall allow space for notations and future revisions.

2.3 CONTENT OF SCHEDULES

A. Each monthly schedule shall be based on data as of the last day of the current pay period.

B. Description for each activity shall be brief, but convey the scope of work described.

C. Activities shall identify all items of work that must be accomplished to achieve substantial completion, such as items pertaining to CONTRACTOR's installation and testing activities; items pertaining to the approval of regulatory agencies; CONTRACTOR's time required for submittals, fabrication and deliveries; the time required by COUNTY to review all submittals as set forth in the Contract Documents; items of work required of COUNTY to support pre-operational, startup and final testing; time required for the relocation of utilities. Activities shall also identify interface milestones with the work of other contractors performing work under separate contracts with COUNTY.

D. Schedules shall show the complete sequence of construction by activities. Dates for beginning and completion of each activity shall be indicated as well as projected percentage of completion for each activity as of the first day of each month.

E. Submittal schedule for shop drawing review, product data, and samples shall show the date of CONTRACTOR submittal and the date approved submittals will be required by the COUNTY, consistent with the time frames established in the Specifications.

F. For Contract change orders granting time extensions, the impact on the Contract date(s) shall equal the calendar-day total time extension specified for the applicable work in the Contract change orders.

G. For actual delays, add activities prior to each delayed activity on the appropriate critical path(s). Data on the added activities of this type shall portray all steps leading to the delay and shall further include the following: separate activity identification, activity description indicating cause of the delay, activity duration consistent with whichever set of dates below applies, the actual start and finish dates of the delay or, if the delay is not finished, the actual start date and estimated completion date.

H. For potential delays, add an activity prior to each potentially delayed activity on the appropriate critical path(s). Data for added activities of this type shall include alternatives available to mitigate the delay including acceleration alternatives and further show the following: separate activity identification, activity description indicating cause of the potential delay and activity duration equal to zero work days.

2.4 SUPPORTING NARRATIVE

A. Status and scheduling reports identified below shall contain a narrative to document the project status, to explain the basis of CONTRACTOR's determination of durations, describe the Contract conditions and restraints incorporated into the schedule and provide an analysis pertaining to potential problems and practical steps to mitigate them.

B. The narrative shall specifically include:
   1. Actual completion dates for activities completed during the monthly report period and actual start dates for activities commenced during the monthly report period.
   2. Anticipated start dates for activities scheduled to commence during the following monthly report period.
   3. Changes in the duration of any activity and minor logic changes.

4. The progress along the critical path in terms of days ahead or behind the Contract date.
5. If the Monthly Status Report indicates an avoidable delay to the Contract completion date or interim completion dates as specified in the Agreement, CONTRACTOR shall identify the problem, cause and the activities affected and provide an explanation of the proposed corrective action to meet the milestone dates involved or to mitigate further delays.
6. If the delay is thought to be unavoidable, the CONTRACTOR shall identify the problem, cause, duration, specific activities affected and restraints of each activity.
7. The narrative shall also discuss all change order activities whether included or not in the revised/current schedule of legal status. Newly introduced change order work activities and the CPM path(s) that they affect, must be specifically identified. All change order work activities added to the schedule shall conform with the sequencing and Contract Time requirements of the applicable Change Order.
8. Original Contract date(s) shall not be changed except by Contract change order. A revision need not be submitted when the foregoing situations arise unless required by COUNTY. Review of a report containing added activities will not be construed to be concurrence with the duration or restraints for such added activities; instead the corresponding data as ultimately incorporated into the applicable Contract change order shall govern.
9. Should COUNTY require additional data, this information shall be supplied by CONTRACTOR within 10 calendar days.

2.5 SUBMITTALS

A. CONTRACTOR shall submit estimated and preliminary progress schedules (as identified in the Terms and Conditions of the Contract and the General Conditions), monthly status reports, a start-up schedule and an as-built schedule report all as specified herein.

B. All schedules, including estimated and preliminary schedules, shall be in conformance with the Contract Documents.

C. The finalized progress schedule discussed in the Contract Documents shall be the first monthly status report and as such shall be in conformance with all applicable specifications contained herein.

D. Monthly Status Report submittals shall include a time-scaled (days after notice to proceed) diagram showing all contract activities and supporting narrative. The initial detailed schedule shall use the notice to proceed as the start date. The finalized schedule, if concurred with by COUNTY, shall be the work plan to be used by the CONTRACTOR for planning, scheduling, managing and executing the work.

E. The schedule diagram shall be formatted as above. The diagram shall include (1) all detailed activities included in the preliminary and estimated schedule submittals, (2) calendar days prior to substantial completion, (3) summary activities for the remaining days. The critical path activities shall be identified, including critical paths for interim dates, if possible.

F. The CONTRACTOR shall submit progress schedules with each application for payment.

2.6 MONTHLY STATUS REPORTS

A. CONTRACTOR shall submit detailed schedule status reports on a monthly basis with the Application for Payment. The first such status report shall be submitted with the first Application for Payment and include data as of the last day of the pay period. The Monthly Report shall include a "marked-up" copy of the latest detailed schedule of legal status and a supporting narrative including updated information as described above. The Monthly Report will be reviewed by COUNTY and CONTRACTOR at a monthly schedule meeting and CONTRACTOR will address COUNTY's comments on the subsequent monthly report. Monthly status reports shall be the basis for evaluating CONTRACTOR's progress.

B. The "marked-up" diagram shall show, for the latest detailed schedule of legal status, percentages of completion for all activities, actual start and finish dates and remaining durations, as appropriate. Activities not previously included in the latest detailed schedule of legal status shall be added, except that contractual dates will not be changed except by change order. Review of a marked-up diagram by COUNTY will not be construed to constitute concurrence with the time frames, duration, or sequencing for such added activities; instead the corresponding data as ultimately incorporated into an appropriate change order shall govern.

2.7 STARTUP SCHEDULE

A. At least 60 calendar days prior to the date of substantial completion, CONTRACTOR shall submit a time-scaled (days after notice to proceed) diagram detailing the work to take place in the period between 60 days prior to substantial completion, together with a supporting narrative. COUNTY shall have 10 calendar days after receipt of the submittal to respond. Upon receipt of COUNTY's comments, CONTRACTOR shall make the necessary revisions and submit the revised schedule within 10 calendar days. The resubmittal, if concurred with by COUNTY, shall be the Work Plan to be used by CONTRACTOR for planning, managing, scheduling and executing the remaining work leading to substantial completion.

B. The time-scaled diagram shall use the latest schedule of legal status for those activities completed ahead of the last 60 calendar days prior to substantial completion and detailed activities for the remaining 60-day period within the time frames outlined in the latest schedule of legal status.

C. CONTRACTOR will be required to continue the requirement for monthly reports, as outlined above. In preparing this report, CONTRACTOR must assure that the schedule is consistent with the progress noted in the startup schedule.

2.8 REVISIONS

A. All revised Schedule Submittals shall be made in the same form and detail as the initial submittal and shall be accompanied by an explanation of the reasons for such revisions, all of which shall be subject to review and concurrence by COUNTY. The revision shall incorporate all previously made changes to reflect current as-built conditions. Minor changes to the approved submittal may be approved at monthly meetings; a minor change is not considered a revision in the context of this paragraph.

B. A revised schedule submittal shall be submitted for review when required by COUNTY.

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01340

SHOP DRAWINGS, PROJECT DATA AND SAMPLES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall submit to the COUNTY for review and approval: working drawings, shop drawings, test reports and 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 working drawings, shop drawings, data and samples for materials and equipment specified elsewhere in the Specifications and in the Contract Drawings.

B. The CONTRACTOR is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the COUNTY. This log should include the following items:
   1. Submittal description and number assigned.
   2. Date to COUNTY.
   3. Date returned to CONTRACTOR (from COUNTY).
   4. Status of Submittal (No exceptions taken, returned for confirmation or resubmittal, rejected).
   5. Date of Resubmittal and Return (as applicable).
   6. Date material released (for fabrication).
   7. Projected date of fabrication.
   8. Projected date of delivery to site.
   9. Projected date and required lead time so that product installation does not delay contact.
   10. Status of O&M manuals submitted.

1.2 CONTRACTOR'S RESPONSIBILITY

A. It is the duty of the CONTRACTOR to check all drawings, data and samples prepared by or for him before submitting them to the COUNTY for review. Each and every copy of the Drawings and data shall bear CONTRACTOR's stamp showing that they have been so checked. Shop drawings submitted to the COUNTY 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.

B. Determine and verify:
   1. Field measurements.
   2. Field construction criteria.
   3. Catalog numbers and similar data.
   4. Conformance with Specifications and indicate all variances from the Specifications.

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

D. The CONTRACTOR shall not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the COUNTY, with No Exceptions Taken or Approved As Noted.

E. The CONTRACTOR shall submit to the COUNTY all drawings and schedules sufficiently in advance of construction requirements to provide no less than twenty-one (21) calendar days for checking and appropriate action from the time the COUNTY receives them.

F. All material & product submittals, other than samples, may be transmitted electronically as a pdf file. All returns to the CONTRACTOR will be as a pdf file only unless specifically requested otherwise.

G. The CONTRACTOR shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by COUNTY of the necessary Shop Drawings.

1.3 COUNTY'S REVIEW OF SHOP DRAWINGS AND WORKING DRAWINGS

A. The COUNTY's review of drawings, data and samples submitted by the CONTRACTOR shall cover only general conformity to the Specifications, external connections and dimensions which affect the installation.

B. The review of drawings and schedules shall be general and shall not be construed:
   1. As permitting any departure from the Contract requirements.
   2. As relieving the CONTRACTOR of responsibility for any errors, including details, dimensions and materials.
   3. As approving departures from details furnished by the COUNTY, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the COUNTY finds to be in the interest of the COUNTY and to be so minor as not to involve a change in Contract Price or time for performance, the COUNTY may return the reviewed drawings without noting any exception.

D. When reviewed by the COUNTY, each of the Shop and Working Drawings shall be identified as having received such review being so stamped and dated. Shop Drawings stamped "REJECTED" and with required corrections shown shall be returned to the CONTRACTOR for correction and resubmittal.

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

F. If the CONTRACTOR considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the CONTRACTOR shall give written notice thereof to the COUNTY.

G. The COUNTY shall review a submittal/resubmittal a maximum of three (3) times after which cost of review shall be borne by the CONTRACTOR. The cost of engineering shall be equal to the COUNTY's actual payroll cost.

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

I. No partial submittals shall be reviewed. Incomplete submittals shall be returned to the CONTRACTOR and shall be considered not approved until resubmitted.

1.4 SHOP DRAWINGS

A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean CONTRACTOR's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, drawings, setting drawings, schedule drawings, manufacturer's scale drawings and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above.

B. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the COUNTY and shall

bear the CONTRACTOR's stamp of approval and original signature as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval and original signature shall be returned to the CONTRACTOR for resubmission.

C. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:
   1. Number and title of the drawing.
   2. Date of Drawing or revision.
   3. Name of project building or facility.
   4. Name of contractor and subcontractor submitting drawing.
   5. Clear identification of contents and location of the work.
   6. Specification title and number.

D. 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 of executing the work in accordance with the Contract, even though such drawings have been reviewed.

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

F. 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.

G. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the COUNTY along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and have been in operation for a period of at least one (1) year.

H. Only the COUNTY will utilize the color "red" in marking shop drawing submittals.

1.5 WORKING DRAWINGS

A. When used in the Contract Documents, the term "working drawings" shall be considered to mean the CONTRACTOR's fabrication and erection drawings for structures such as roof trusses, steelwork, precast concrete elements, bulkheads,

support of open cut excavation, support of utilities, groundwater control systems, forming and false work; underpinning; and for such other work as may be required for construction of the project.

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

C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the COUNTY, 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 of error are assumed by the CONTRACTOR; the COUNTY and ENGINEER shall not have responsibility therefor.

1.6 SAMPLES

A. The CONTRACTOR shall furnish, for the review of the COUNTY, samples required by the Contract Documents or requested by the COUNTY. Samples shall be delivered to the COUNTY as specified or directed. The CONTRACTOR shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until reviewed by the COUNTY.

B. Samples shall be of sufficient size and quantity to clearly illustrate:
   1. Functional characteristics of the product, with integrally related parts and attachment devices.
   2. Full range of color, texture and pattern.
   3. A minimum of two samples of each item shall be submitted.

C. Each sample shall have a label indicating:
   1. Name of product.
   2. Name of Contractor and Subcontractor.
   3. Material or equipment represented.
   4. Place of origin.
   5. Name of Producer and Brand (if any).
   6. Location in project.
      (Samples of finished materials shall have additional markings that will identify them under the finished schedules.)
   7. Reference specification paragraph.

D. The CONTRACTOR shall prepare a transmittal letter in triplicate for each shipment of samples containing the information required above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the COUNTY. Review of a sample shall be only for the characteristics or use named in such and shall not be construed to change or modify any Contract requirements.

E. Reviewed samples not destroyed in testing shall be sent to the COUNTY or stored at the site of the work. Reviewed samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the reviewed samples. If requested at the time of submission, samples which failed testing or were rejected shall be returned to the CONTRACTOR at his expense.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall submit to the COUNTY a Schedule of Values allocated to the various portions of the work, within 10 days after date of Notice to Proceed.

B. Upon request of the COUNTY, the CONTRACTOR shall support the values with data which will substantiate their correctness.

C. The Schedule of Values shall be used only as the basis for the CONTRACTOR's Applications for Payment.

1.2 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Schedule of Values will be considered for approval by COUNTY upon CONTRACTOR's request. Identify schedule with:
   1. Title of Project and location.
   2. Project number.
   3. Name and address of Contractor.
   4. Contract designation.
   5. Date of submission.

B. Schedule of Values shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. Follow the table of contents for the Contract Document as the format for listing component items for structures:
   1. Identify each line item with the number and title of the respective major section of the specification.
   2. For each line item, list sub values of major products or operations under item.

D. Follow the bid sheets included in this Contract Documents as the format for listing component items for pipe lines.

E. The sum of all values listed in the schedule shall equal the total Contract sum.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall employ a competent photographer to take construction record photographs or perform video, recording including furnishing all labor, materials, equipment and incidentals necessary to obtain photographs and/or video recordings of all construction areas.

B. Preconstruction record information shall consist of video recordings on digital video disks (DVD).

C. Construction progress information shall consist of photographs and digital photographs on a recordable compact disc (CD-R).

1.2 QUALIFICATIONS

A. All photography shall be done by a competent camera operator who is fully experienced and qualified with the specified equipment.

B. For the video recording, the audio portion should be done by a person qualified and knowledgeable in the specifics of the Contract, who shall speak with clarity and diction so as to be easily understood.

1.3 PROJECT PHOTOGRAPHS

A. Provide one print of each photograph with each pay application.

B. Provide one recordable compact disc with digital photographs with each pay application.

C. Negatives:
   1. All negatives shall remain the property of photographer.
   2. The CONTRACTOR shall require that photographer maintain negatives or protected digital files for a period of two years from date of substantial completion of the project.
   3. Photographer shall agree to furnish additional prints to COUNTY at commercial rates applicable at time of purchase. Photographer shall also agree to participate as required in any litigation requiring the photographer as an expert witness.

D. The CONTRACTOR shall pay all costs associated with the required photography and prints. Any parties requiring additional photography or prints shall pay the photographer directly.

E. All project photographs shall be a single weight, color image. All finishes shall be smooth surface and glossy and all prints shall be 8 inches x 10 inches.

F. Each print shall have clearly marked on the back, the name of the project, the orientation of view, the date and time of exposure, name and address of the photographer and the photographers numbered identification of exposure.

G. All project photographs shall be taken from locations to adequately illustrate conditions prior to construction, or conditions of construction and state of progress. The CONTRACTOR shall consult with the COUNTY at each period of photography for instructions concerning views required.

1.4 VIDEO RECORDINGS

A. Video, recording shall be done along all routes that are scheduled for construction. Video, recording shall include full, recording of both sides of all streets and the entire width of easements plus 10 feet on each side on which construction is to be performed. All video recording shall be in full color.

B. A complete view, in sufficient detail with audio description of the exact location shall be provided.

C. The engineering plans shall be used as a reference for stationing in the audio portion of the recordings for easy location identification.

D. Two complete sets of video recordings shall be delivered to the COUNTY on digital video disks (DVD) for the permanent and exclusive use of the COUNTY prior to the start of any construction on the project.

E. All video recordings shall contain the name of the project, the date and time of the video, recording, the name and address of the photographer and any other identifying information required.

F. Construction shall not start until preconstruction video recordings are completed, submitted and accepted by the COUNTY. In addition, no progress payments shall be made until the preconstruction video recordings are accepted by the COUNTY.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. COUNTY shall employ and pay for the services of an independent testing laboratory to perform testing specifically indicated on the Contract Documents or called out in the Specifications. COUNTY may elect to have materials and equipment tested for conformity with the Contract Documents at any time.
   1. CONTRACTOR shall cooperate fully with the laboratory to facilitate the execution of its required services.
   2. Employment of the laboratory shall in no way relieve the CONTRACTOR's obligations to perform the work of the Contract.

1.2 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:
   1. Release, revoke, alter or enlarge on requirements of Contract Documents.
   2. Approve or accept any portion of the Work.
   3. Perform any duties of the CONTRACTOR.

1.3 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel; provide access to Work and/or to Manufacturer's operations.

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

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material 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 manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The COUNTY 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 COUNTY shall be allowed on account of such testing and certification.

E. Furnish incidental labor and facilities:
   1. To provide access to work to be tested.
   2. To obtain and handle samples at the project site or at the source of the product to be tested.
   3. To facilitate inspections and tests.
   4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
   1. When tests or inspections cannot be performed due to insufficient notice, CONTRACTOR shall reimburse COUNTY for laboratory personnel and travel expenses incurred due to CONTRACTOR's negligence.

G. 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 and as approved by the COUNTY.

H. If the test results indicate the material or equipment complies with the Contract Documents, the COUNTY 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 testing firm or the total of such costs shall be deducted from any payments due the CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01510

TEMPORARY AND PERMANENT UTILITIES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall be responsible for furnishing all requisite temporary utilities, i.e., power, water, sanitation, etc. The CONTRACTOR shall obtain and pay for all permits required as well as pay for all temporary usages. The CONTRACTOR shall remove all temporary facilities upon completion of work.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with National Electric Code.

B. Comply with Federal, State and Local codes and regulations and with utility company requirements.

C. Comply with COUNTY Health Department regulations.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Materials for temporary utilities may be "used". Materials for electrical utilities shall be adequate in capacity for the required usage, shall not create unsafe conditions and shall not violate requirements of applicable codes and standards.

2.2 TEMPORARY ELECTRICITY AND LIGHTING

A. Arrange with the applicable utility company for temporary power supply. Provide service required for temporary power and lighting and pay all costs for permits, service and for power used.

2.3 TEMPORARY WATER

A. The CONTRACTOR shall arrange with Manatee County Utilities Customer Service office to provide water for construction purposes, i.e., meter, pay all costs for installation, maintenance and removal, and service charges for water used.

B. The CONTRACTOR shall protect piping and fitting against freezing.

2.4 TEMPORARY SANITARY FACILITIES

A. The CONTRACTOR shall provide sanitary facilities in compliance with all laws and regulations.

B. The CONTRACTOR shall service, clean and maintain facilities and enclosures.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall maintain and operate systems to assure continuous service.

B. The CONTRACTOR shall modify and extend systems as work progress requires.

3.2 REMOVAL

A. The CONTRACTOR shall completely remove temporary materials and equipment when their use is no longer required.

B. The CONTRACTOR shall clean and repair damage caused by temporary installations or use of temporary facilities.

+ + END OF SECTION + +

SECTION 01570

TRAFFIC REGULATIONS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The CONTRACTOR shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the CONTRACTOR and which interfere with the driving or walking public.

B. The CONTRACTOR shall remove temporary equipment and facilities when no longer required, restore grounds to original or to specified conditions.

1.2 TRAFFIC CONTROL

A. The necessary traffic control shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, markings, barricades, channelization and hand signaling devices. The CONTRACTOR shall be responsible for installation and maintenance of all devices and detour routes and signage for the duration of the construction period. The CONTRACTOR shall utilize the appropriate traffic plan from the FDOT Maintenance of Traffic Standards, Series 600 of the FDOT Roadway & Traffic Design Standards, Latest Edition.

B. Should there be the necessity to close any portion of a roadway carrying vehicles or pedestrians, the CONTRACTOR shall submit a Traffic Control Plan (TCP) at least 5 days before a partial or full day closure, and at least 8 days before a multi-day closure. TCP shall be submitted, along with a copy of their accreditation, by a certified IMSA or ATSA Traffic Control Specialist.
   1. At no time will more than one (1) lane of a roadway be closed to vehicles and pedestrians without an approved road closure from the COUNTY Transportation Department. With any such closings, adequate provision shall be made for the safe expeditious movement of each.
   2. All traffic control signs must be in place and inspected at least 1 day in advance of the closure. Multi-day closures notification signs shall be in place al least 3 days in advance of the closure. All signs must be covered when no in effect, and checked twice a day by the Worksite Traffic Supervisor when they are in effect.

C. The CONTRACTOR shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal preconstruction traffic control scheme. Any such actions shall be performed by the CONTRACTOR under the supervision and in accordance with the instructions of the applicable highway department unless otherwise specified.

D. The CONTRACTOR will consult with the COUNTY immediately on any vehicular or pedestrian safety or efficiency problem incurred as a result of construction of the project.

E. The CONTRACTOR shall provide ready access to businesses and homes in the project area during construction. The CONTRACTOR shall be responsible for coordinating this work with affected homeowners.

F. When conditions require the temporary installation of signs, pavement markings and traffic barriers for the protection or workers and traffic, the entire array of such devices shall be depicted on working drawings for each separate stage of work. These drawings shall be submitted to the COUNTY for review and approval prior to commencement of work on the site.

G. Precast concrete traffic barriers shall be placed adjacent to trenches and other excavations deeper than six inches below the adjacent pavement surface.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Furnish, install and maintain COUNTY project identification signs.

B. Remove signs on completion of construction.

C. Allow no other signs to be displayed except for traffic control and safety.

1.2 PROJECT IDENTIFICATION SIGN (COUNTY)

A. One painted sign, of not less than 32 square feet (3 square meters) area, with painted graphic content to include:
   1. Title of Project.
   2. Name of COUNTY.
   3. Names and titles of authorities as directed by COUNTY.
   4. Prime Contractor.

B. Graphic design, style of lettering and colors: As approved by the COUNTY.

C. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the COUNTY.

1.3 INFORMATIONAL SIGNS

A. Painted signs with painted lettering, or standard products.
   1. Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.
   2. Colors: as required by regulatory agencies, otherwise of uniform colors throughout project.

B. Erect at appropriate locations to provide required information.

1.4 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.

1.5 PUBLIC NOTIFICATION

A. Door Hangers: The CONTRACTOR shall generate and distribute door hangers to all residents who will be impacted by project construction.
   1. Residents impacted include anyone who resides inside, or within 500 feet of project limits of construction.

B. Door Hangers shall be distributed prior to start of construction of the project. Hangers shall be affixed to doors of residents via elastic bands or tape.

EXAMPLE:

PLEASE PARDON THE INCONVENIENCE WHILE THE ROADWAY IS BEING RECONSTRUCTED IN YOUR NEIGHBORHOOD

This project consists of utility improvements and the reconstruction of ??? Boulevard from U.S. ??? to ??? Street West. The project is expected to begin in August, 20XX and be completed in July 20XX.

Location Map

WE HOPE TO KEEP ANY INCONVENIENCE TO A MINIMUM. HOWEVER, IF YOU HAVE ANY PROBLEMS, PLEASE CONTACT THE FOLLOWING:

C. Contractor
Contractor Address
Contractor Phone (Site Phone)

Project Manager
PM Address
PM Phone No. & Ext.

D. Project Inspector
Inspector Phone Number

AFTER HOURS EMERGENCY NUMBER – (941) 747-HELP
THANK YOU FOR YOUR UNDERSTANDING AND PATIENCE
MANATEE COUNTY GOVERNMENT – PROJECT MANAGEMENT DEPT.

PART 2 - PRODUCTS

2.1 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition structurally adequate to work 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 the Contract Documents.

PART 3 - EXECUTION

3.1 PROJECT IDENTIFICATION SIGN

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

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

3.2 MAINTENANCE

A. The CONTRACTOR shall maintain signs and supports in a neat, clean condition; repair damages to structures, framing or sign.

3.3 REMOVAL

A. The CONTRACTOR shall remove signs, framing, supports and foundations at completion of project.

++ END OF SECTION ++

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SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

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

1.2 MANUFACTURER'S INSTRUCTIONS

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 two copies to COUNTY. Maintain one set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with COUNTY prior to proceeding. Do not proceed with work without clear instructions.

1.3 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules,

coordinate to avoid conflict with work and conditions at the site.

1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.

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

1.4 SUBSTITUTIONS AND PRODUCT OPTIONS

A. CONTRACTOR's Options:

1. For products specified only by reference standard, select any product meeting that standard.
2. For products specified by naming one or more products or manufacturers and "or equal", CONTRACTOR must submit a request to Engineer for substitutions of any product or manufacturer not specifically named, Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a change order or an approved shop drawing. COUNTY may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute. CONTRACTOR shall reimburse COUNTY for the charges of Engineer and Engineer's Consultants for evaluation each proposed substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the work while the substituting was undergoing review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01620

STORAGE AND PROTECTION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Provide secure storage and protection for products to be incorporated into the work and maintenance and protection for products after installation and until completion of Work.

1.2 STORAGE

A. Store products immediately on delivery and protect until installed in the Work, in accord with manufacturer's instructions, with seals and labels intact and legible.

B. Exterior Storage
   1. Provide substantial platform, blocking or skids to support fabricated products above ground to prevent soiling or staining.
      a. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
      b. Prevent mixing of refuse or chemically injurious materials or liquids.

C. Arrange storage in manner to provide easy access for inspection.

1.3 MAINTENANCE OF STORAGE

A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:
   1. State of storage facilities is adequate to provide required conditions.
   2. Required environmental conditions are maintained on continuing basis.
   3. Surfaces of products exposed to elements are not adversely affected. Any weathering of products, coatings and finishes is not acceptable under requirements of these Contract Documents.

B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.
   1. Equipment shall not be shipped until approved by the COUNTY. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be

delivered to the site more than one month prior to installation without written authorization from the COUNTY.

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 COUNTY 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. 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 load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.
5. Lubricants shall be changed upon completion of installation and as frequently as required, thereafter during the period between installation and acceptance.
6. 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 guaranty 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.

1.4 PROTECTION AFTER INSTALLATION

A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.

B. Control traffic to prevent damage to equipment and surfaces.

C. Provide coverings to protect finished surfaces from damage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

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

1.2 SUBSTANTIAL COMPLETION

A. The CONTRACTOR shall submit the following items when the CONTRACTOR considers the work to be substantially complete:
   1. A written notice that the work, or designated portion thereof, is substantially complete.
   2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the COUNTY shall make an inspection to determine the status of completion.

C. Project record documents and operations and maintenance manuals must be submitted before the project shall be considered substantially complete.

D. If the COUNTY determines that the work is not substantially complete:
   1. The COUNTY shall notify the CONTRACTOR in writing, stating the reasons.
   2. The CONTRACTOR shall remedy the deficiencies in the work and send a second written notice of substantial completion to the COUNTY.
   3. The COUNTY shall reinspect the work.

E. When the COUNTY finds that the work is substantially complete:
   1. The ENGINEER shall prepare and deliver to the COUNTY a tentative Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a tentative list of the items to be completed or corrected before final payment.
   2. The ENGINEER shall consider any objections made by the COUNTY as provided in Conditions of the Contract. When the ENGINEER considers the work substantially complete, he will execute and deliver to the COUNTY a definite Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a revised tentative list of items to be completed or corrected.

1.3 FINAL INSPECTION

A. When the CONTRACTOR considered the work to be complete, he shall submit written certification stating that:
   1. The Contract Documents have been reviewed.
   2. The work has been inspected for compliance with Contract Documents.
   3. The work has been completed in accordance with Contract Documents.
   4. The equipment and systems have been tested in the presence of the COUNTY's representative and are operational.
   5. The work is completed and ready for final inspection.

B. The COUNTY shall make an inspection to verify the status of completion after receipt of such certification.

C. If the COUNTY determines that the work is incomplete or defective:
   1. The COUNTY shall promptly notify the CONTRACTOR in writing, listing the incomplete or defective work.
   2. The CONTRACTOR shall take immediate steps to remedy the stated deficiencies and send a second written certification to COUNTY that the work is complete.
   3. The COUNTY shall reinspect the work.

D. Upon finding the work to be acceptable under the Contract Documents, the COUNTY shall request the CONTRACTOR to make closeout submittals.

E. For each additional inspection beyond a total of three (3) inspections for substantial and final completion due to the incompleteness of the work, the CONTRACTOR shall reimburse the COUNTY's fees.

1.4 CONTRACTOR'S CLOSEOUT SUBMITTALS TO COUNTY

A. Project Record Documents (prior to substantial completion).

B. Operation and maintenance manuals (prior to substantial completion).

C. Warranties and Bonds.

D. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.

E. Certification letter from Florida Department of Transportation and Manatee County Department of Transportation, as applicable.

F. Certificate of Insurance for Products and Completed Operations.

G. Final Reconciliation, Warranty Period Declaration, and Contractor's Affidavit (Manatee County Project Management Form PMD-9).

1.5 FINAL ADJUSTMENT OF ACCOUNTS

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

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
      b. Unit Prices
      c. Penalties and Bonuses
      d. Deductions for Liquidated Damages
      e. Other Adjustments
   3. Total Contract Sum, as adjusted.
   4. Previous payments.
   5. Sum remaining due.

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

1.6 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 ++

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SECTION 01710

CLEANING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Execute cleaning during progress of the work and at completion of the work, as required by the General Conditions.

1.2 DISPOSAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 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

3.1 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste materials, rubbish and wind-blown debris, resulting from construction operations.

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 and dispose

of at legal disposal areas away from the site.

3.2 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.3 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

C. Prior to final completion or COUNTY 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

1.1 REQUIREMENTS INCLUDED

A. CONTRACTOR shall maintain at the site for the COUNTY one record copy of:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. COUNTY's field orders or written instructions.
   6. Approved shop drawings, working drawings and samples.
   7. Field test records.
   8. Construction photographs.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in CONTRACTOR's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI format.

C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by the COUNTY.

1.3 MARKING DEVICES

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

1.4 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.

C. Do not conceal any work until required information is recorded.

D. Drawings; Legibly mark to record actual construction:

1. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc. Locations of drainage ditches, swales, water lines and force mains shall be shown every 200 feet (measured along the centerline) or alternate lot lines, whichever is closer. Dimensions at these locations shall indicate distance from centerline of right-of-way to the facility.
2. Field changes of dimension and detail.
3. Changes made by Field Order or by Change Order.
4. Details not on original contract drawings.
5. Equipment and piping relocations.
6. Locations of all valves, fire hydrants, manholes, water and sewer services, water and force main fittings, underdrain cleanouts, catch basins, junction boxes and any other structures located in the right-of-way or easement, shall be located by elevation and by station and offset based on intersection P.I.'s and centerline of right-of-way. For facilities located on private roads, the dimensioning shall be from centerline of paving or another readily visible baseline.
7. Elevations shall be provided for all manhole rim and inverts; junction box rim and inverts; catch basin rim and inverts; and baffle, weir and invert elevations in control structures. Elevations shall also be provided at the PVI's and at every other lot line or 200 feet, whichever is less, of drainage swales and ditches. Bench marks and elevation datum shall be indicated.
8. Slopes for pipes and ditches shall be recalculated, based on actual field measured distances, elevations, pipe sizes, and type shown. Cross section of drainage ditches and swales shall be verified.
9. Centerline of roads shall be tied to right-of-way lines. Elevation of roadway centerline shall be given at PVI's and at all intersections.
10. Record drawings shall show bearings and distances for all right-of-way and easement lines, and property corners.
11. Sidewalks, fences and walls, if installed at the time of initial record drawing submittal, shall be located every 200 feet or alternate lot lines, whichever is closer. Dimensions shall include distance from the right-of-way line and the back of curb and lot line or easement line.
12. Sanitary sewer mainline wyes shall be located from the downstream manhole. These dimensions shall be provided by on-site inspections or televiewing of the sewer following installation.
13. Elevations shall be provided on the top of operating nuts for all water and force main valves.
14. Allowable tolerance shall be ± 6.0 inches for horizontal dimensions. Vertical dimensions such as the difference in elevations between manhole inverts shall have an allowable tolerance of ± 1/8 inch per 50 feet (or part thereof) of horizontal distance up to a maximum tolerance of ± 2 inch.

15. Properly prepared record drawings on mylar, together with two copies, shall be certified by a design professional (Engineer and/or Surveyor registered in the State of Florida), employed by the CONTRACTOR, and submitted to the COUNTY.

E. Specifications and Addenda; Legibly mark each Section to record:
   1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
   2. Changes made by field order or by change order.

F. Shop Drawings (after final review and approval):
   1. Five sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

1.5 SUBMITTAL

A. Prior to substantial completion and prior to starting the bacteria testing of water lines, deliver signed and sealed Record Documents and Record Drawings to the COUNTY. These will be reviewed and verified by the inspector. If there are any required changes or additions, these shall be completed and the entire signed and sealed set resubmitted prior to final pay application.

B. The CONTRACTOR shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings. Record drawings shall be certified by the professional(s) (Engineer or Surveyor licensed in Florida), as stipulated by the Land Development Ordinance and submitted on signed and sealed paper drawings, signed and dated mylar drawings together with an AutoCAD version on a recordable compact disk (CD).

C. The CD shall contain media in AutoCad Version 2004 or later, or in any other CAD program compatible with AutoCad in DWG or DXF form. All fonts, line types, shape files or other pertinent information used in the drawing and not normally included in AutoCad shall be included on the media with a text file or attached noted as to its relevance and use.

D. Accompany submittal with transmittal letter, containing:
   1. Date.
   2. Project title and number.
   3. CONTRACTOR's name and address.
   4. Title and number of each Record Document.
   5. Signature of CONTRACTOR or his authorized representative.

Note: The data required to properly prepare these record drawings shall be obtained at the site, at no cost to the COUNTY by the responsible design professional or his/her duly appointed representative. The appointed representative shall be a qualified employee of the responsible design professional

or a qualified inspector retained by the responsible design professional on a project-by-project basis.

PART 2 - STANDARDS

2.1 MINIMUM RECORD DRAWING STANDARDS FOR ALL RECORD DRAWINGS SUBMITTED TO MANATEE COUNTY

A. Record drawings shall be submitted to at least the level of detail in the contract documents. It is anticipated that the original contract documents shall serve as at least a background for all record information. Original drawings in CAD format may be requested of the COUNTY.

B. Drawings shall meet the criteria of paragraph 1.04 D above.

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

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

Prepare operating and maintenance data as specified in this and as referenced in other pertinent sections of Specifications.

B. Instruct COUNTY's personnel in maintenance of products and equipment and systems.

C. Provide three (3) sets of operating and maintenance manuals for each piece of equipment provided within this Contract.

1.2 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by COUNTY's personnel.

B. Format:
   1. Size: 8-1/2 inch x 11 inch.
   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. Fold larger drawings to size of text pages.
   5. Provide fly-leaf for each separate product or each piece of operating equipment.
      a. Provide typed description of product and major component parts of equipment.
      b. Provide indexed tabs.
   6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
      a. Title of Project.
      b. Identity of separate structures as applicable.
      c. Identity of general subject matter covered in the manual.

C. Binders:
   1. Commercial quality three-ring binders with durable and cleanable plastic covers.
   2. Maximum ring size: 1 inch.
   3. When multiple binders are used, correlate the data into related consistent groupings.

1.3 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit three copies of complete manual in final form.

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.
   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 lubricating schedule.
      a. List of lubricants 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. List of predicted 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.

C. Content, for each electric and electronic system, 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 of 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 manufacture's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
8. Prepare and include additional data when the need for such data becomes apparent during instruction of COUNTY's personnel.

D. Prepare and include additional data when the need for such data becomes apparent during instruction on COUNTY's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.4 SUBMITTAL SCHEDULE

A. Submit one copy of completed data in final form fifteen days prior to substantial completion.
   1. Copy will be returned after substantial completion, with comments (if any).

B. Submit two copies of approved data in final form. Final acceptance will not be provided until the completed manual is received and approved.

1.5 INSTRUCTION OF COUNTY'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct COUNTY'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.

1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to COUNTY for review and transmittal.

1.2 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 each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
   1. Product or 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 COUNTY's personnel:
      a. Proper procedure in case of failure.
      b. Instances which might affect the validity of warranty or bond.
   7. CONTRACTOR, name of responsible principal, address and telephone number.

1.3 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:
   1. Size 8-1/2 inch x 11 inch punched sheets for standard 3-ring binder. 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-ring, with durable and cleanable plastic covers.

1.4 TIME OF SUBMITTALS

A. Make submittals within ten days after date of substantial completion and prior to final request for payment.

B. For items of work, where acceptance is delayed materially beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.5 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in respective sections of Specifications.

B. Approval by the COUNTY of all documents required under this section is a pre-requisite to requesting a final inspection and final payment

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01751

STARTING AND PLACING EQUIPMENT IN OPERATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall start-up and place all equipment into successful operation according to manufacturer's written instructions and as instructed by manufacturer's field representative. CONTRACTOR shall provide all material, labor, tools, equipment, chemicals, lubricants, and expendables required to pre-commission the equipment prior to start-up.

B. No system or subsystem shall be started up for continuous operation unless all components of that system or subsystem, including instrumentation, have been tested and proven to be operable as intended by the Contract Documents.

C. CONTRACTOR'S General Activities Include:
   1. Cleaning.
   2. Removing temporary protective coatings.
   3. Flushing and replacing greases and lubricants, where required by manufacturer.
   4. Lubrication.
   5. Check shaft and coupling alignments and reset where required.
   6. Check and set motor, pump and other equipment rotation, safety interlocks, and belt tensions.
   7. Check and correct if necessary leveling plates, grout, bearing plates, anchor bolts, fasteners, and alignment of piping which may put stress on pumping equipment connected to it.
   8. All adjustments required.
   9. Provide chemicals and lubricants and all other required operating fluids as approved by the Vendors
   10. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.

D. Not Used.

E. Not Used.

F. CONTRACTOR shall coordinate with individual equipment/material suppliers on proper start up and testing protocol and to provide sufficient personnel for equipment

start-up. Equipment/Material supplier's representatives shall be present during initial start-up and operation, unless otherwise acceptable to COUNTY.

G. Start-up of either the heating or air conditioning systems is dependent upon the time of year that the plant start-up is initiated. CONTRACTOR shall be required to return at the beginning of the next heating or air conditioning season (whichever is applicable) to start the appropriate system.

H. No system, unit process or any piece of equipment shall be started up for continuous operation without the approved Operation and Maintenance Manuals being turned over to the COUNTY, unless agreed in writing.

I. Training shall be provided prior to turning the operation of a system, unit process or piece of equipment over to the COUNTY. Training shall be scheduled for each plant staff work shift accordingly. Training shall conform to the requirements of Section 01821, Instruction of Operations and Maintenance Personnel.

J. Not Used

1.2 MINIMUM PRE COMMISSIONING REQUIREMENTS

A. Bearings and Shafting:
1. Inspect for cleanliness, and clean and remove all foreign materials.
2. Verify alignment.
3. Replace defective bearings and those, which run rough or noisy.
4. Grease as necessary and in accord with manufacturer's recommendations.

B. Drives:
1. Adjust tension in V-belt drives, and adjust varipitch sheaves and drives for proper equipment speed.
2. Adjust drives for alignment of sheaves and V-belts.
3. Clean and remove foreign materials before starting operation.

C. Motors:
1. Check each motor for comparison to amperage nameplate value.
2. Correct conditions which produce excessive current flow and exist due to equipment malfunction.

D. Pumps:
1. Check glands and seals for cleanliness and adjustment before running pump.
2. Inspect shaft sleeves for scoring.
3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.

4. Verify that piping system is free of dirt and scale before circulating liquid through the pump.

E. Valves:
   1. Inspect both hand and automatic control valves, and clean bonnets and stems.
   2. Tighten packing glands to assure no leakage, but permit valve stems to operate without galling.
   3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
   4. Replace packing on any valve that continues to leak.
   5. Remove and repair bonnets that leak.
   6. Coat packing gland threads and valve stems with a surface preparation of "Moly-Cote" or "Fel-Pro" after cleaning.

F. Verify that control valve seats are free from foreign material and are properly positioned for intended service.

G. Tighten flanges and all other pipe joints after system has been placed in operation.
   1. Replace gaskets, which show any sign of leakage after tightening.

H. Inspect all joints for leakage:
   1. Promptly remake each joint that appears to be faulty; do not wait for rust to form.
   2. Clean threads on both parts, and apply compound and remake joints.

I. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats and headers in fluid system to assure freedom from foreign materials.

J. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.

K. Set and calibrate draft gages of air filters and other equipment.

L. Inspect fan wheels for clearance and balance.
   1. Provide factory-authorized personnel for adjustment when needed.

M. Check each electrical control circuit to assure that operation complies with these Specifications and requirements and to provide desired performance.

N. Inspect each pressure gage and thermometer for calibration.
   1. Replace items which are defaced, broken, or which read incorrectly.

O. Repair damaged insulation.

P. Vent gasses trapped in any part of systems.
   1. Verify that liquids are drained from all parts of gas or air systems.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01821

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 - GENERAL

1.1 SCOPE

A. CONTRACTOR shall furnish services of Manufacturer's operation and maintenance training specialists to instruct COUNTY's personnel in recommended operation and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.

B. The qualifications of specialists shall be subject to approval by ENGINEER.

C. CONTRACTOR shall coordinate these services at times acceptable to COUNTY, with start-up and initial operations in a manner acceptable to COUNTY and with the requirements of the specific equipment Sections.

D. Manufacturer shall provide a combination of classroom and field training. All training shall be conducted at the plant site unless otherwise stated in the equipment Sections.

E. Manufacturer shall allow any and all training sessions to be videotaped by COUNTY.

F. Refer to individual equipment Sections for additional requirements for Manufacturer's field and test data.

G. Instruction of COUNTY'S personnel shall commence only after the equipment has been started and acceptance tests performed.

1.2 SUBMITTALS

A. Submit for approval the following:
   1. Proposed Lesson Plan for each scheduled instruction 60 days prior to commencement of training.
   2. Credentials of Manufacturer's designated operations and maintenance instructor. Credentials shall include a brief resume and specific details of the instructor's experience pertaining to operation of, maintenance of, and training for the equipment specified.

1.3 INSTRUCTION LESSON PLAN

A. Manufacturer's proposed Lesson Plan shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed Lesson Plan. "Hands-On" demonstrations planned for the instruction shall be described in the Lesson Plan. Indicate the estimated duration of each segment of the Lesson Plan.

B. Instruction Lesson Plan shall include the following as a minimum:
   1. Equipment Operation:
      a. Describe equipment's operating (process) function.
      b. Describe equipment's fundamental operating principals and dynamics.
      c. Identify equipment's mechanical, electrical and electronic components and features.
      d. Identify all support equipment associated with the operation of subject equipment (e.g., air intake filters, valve actuators, motors).
      e. Recommend standard operating procedures to cover start-up, routine monitoring and shutdown of the equipment.
   2. Detailed Component Description:
      a. Identify and describe in detail each component's function.
      b. Where applicable, group related components into subsystems. Describe subsystem functions and their interaction with other subsystems.
      c. Identify and describe in detail equipment safeties and control interlocks.
   3. Equipment Preventive Maintenance (PM):
      a. Describe PM inspection procedures required to:
         1) Perform an inspection of the equipment in operation.
         2) Spot potential trouble symptoms and anticipate breakdowns.
         3) Forecast maintenance requirements (predictive maintenance).
      b. Define the recommended PM intervals for each component.
      c. Provide lubricant and replacement part recommendations and limitations.
      d. Describe appropriate cleaning practices and recommend intervals.
      e. Identify and describe the use of special tools required for maintenance of the equipment.
      f. Describe component removal/installation and disassembly/ assembly procedures.
      g. Perform at least two "hand-on" demonstrations of preventive maintenance procedures.
      h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
      i. Define recommended torquing, mounting, calibration and/or alignment procedures and settings, as appropriate.
      j. Describe recommended procedures to check/test equipment following a corrective repair.

4. Equipment Troubleshooting:
   a. Define recommended systematic troubleshooting procedures.
   b. Provide component specific troubleshooting checklists.
   c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

1.4 TRAINING AIDS

A. The Manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts. Other appropriate training aids are:
   1. Audio-Visual Aids (e.g., films, slides, videotapes, overhead transparencies, posters, blueprints, diagrams, catalogue sheets).
   2. Equipment cutaways and samples (e.g., spare parts and damaged equipment).
   3. Tools (e.g., repair tools, customized tools, measuring and calibrating instruments).

B. The Manufacturer's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are encouraged. Handouts planned for the instruction shall be attached with the manufacturer's proposed Lesson Plan.

1.5 "HANDS-ON" DEMONSTRATIONS

A. The Manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of the equipment for each scheduled group. The proposed "hands-on" demonstrations should be described in the manufacturer's proposed Lesson Plan.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 02064

SECTION 02064

MODIFICATIONS TO EXISTING STRUCTURES, PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to modify, alter and/or convert existing structures as shown or specified and as required for the installation of piping, mechanical equipment and appurtenances. Existing piping and equipment shall be removed and dismantled as necessary for the performance of facility alterations in accordance with the requirements herein specified.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall cut, repair, reuse, excavate, demolish or otherwise remove parts of the existing structures or appurtenances, as indicated on the Contract Drawings, herein specified, or necessary to permit completion of the work under this Contract. The Contractor shall dispose of surplus materials resulting from the above work in an approved manner. The work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.

B. The Contractor shall dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, the contractor shall cut existing pipelines for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removed shall be cut off one inch below the concrete surface. Surface shall be finished as specified in the Contract Documents.

C. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including a new valve, shall be installed. Pipe anchorage, if required, is part of the installation shall also be installed as directed by the COUNTY.

D. No existing structure, equipment, or appurtenance shall be shifted, cut, removed, or otherwise altered except with the express approval of and to the extent

approved by the COUNTY.

E. When removing materials or portions of existing utility pipelines and/or structures or when making openings in walls and partitions, the Contractor shall take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, and not to damage the structures or contents by falling or flying debris. Unless otherwise permitted, line drilling will be required in cutting existing concrete.

F. Materials and equipment removed in the course of making alterations and additions shall remain the property of the COUNTY, except that items not salvageable, as determined by the COUNTY, shall become the property of the Contractor to be disposed of by him off the work site at his own place of disposal. Operating equipment shall be thoroughly cleaned, lubricated, and greased for protection during prolonged storage.

G. All alterations to existing utility pipes and structures shall be done at such time and in such manner as to comply with the approved time schedule. So far as possible before any part of the work is started, all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delay.

H. All workmanship and new materials involved in constructing the alterations shall conform to the General Conditionsfor the classes of work insofar as such specifications are applicable.

I. All cutting of existing concrete or other material to provide suitable bonding to new work shall be done in a manner to meet the requirements of the respective section of these Specifications covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the Resident Project Representative.

J. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.

K. Non-shrink grout shall be used for setting wall castings, sleeves, leveling pump bases, doweling anchors into existing concrete and elsewhere as shown.

L. Where necessary or required for the purpose of making connections, the Contractor shall cut existing pipelines in a manner to provide an approved joint. Where required, he shall use flanges, or provide Dresser Couplings, all as required.

M. The Contractor shall provide flumes, hoses, piping and other related items to divert or provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the work under this

Contract.

N. Care shall be taken not to damage any part of existing buildings or foundations or outside structures.

3.2 CONNECTING TO EXISTING PIPING AND EQUIPMENT

A. The Contractor shall verify exact location, material, alignment, joint, etc. of existing piping and equipment prior to making the connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection. A Manatee County representative must be present for all tie-ins for a visual inspection.

3.3 REMOVAL AND ABANDONMENT OF ASBESTOS CEMENT PIPE AND APPURTENANCES

A. All work associated with the removal or abandonment of existing asbestos cement pipe and appurtenances shall be performed by a licensed asbestos abatement contractor or subcontractor registered in the State of Florida. After removal of the facilities, all trenches shall be backfilled in accordance with the Contract Documents. The cost of disposing of the removed materials shall be borne by the Contractor.

B. The asbestos abatement contractor or subcontractor shall contact the appropriate regulatory agencies prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices. The Contractor shall be responsible for all fees associated with permits, licenses and notices to the governing regulatory agencies. An asbestos manifest form must accompany each and every shipment of such pipe or pipe material waste to the Manatee County Lena Road Landfill. Prior to each shipment, a minimum of 24 hours notice to the Landfill field office (Phone #748-5543) is required.

C. All work associated with removal or abandonment of asbestos cement pipe and appurtenances shall be performed in accordance with the standards listed below and all other applicable local, State, or Federal standards.
   1. Florida Administrative Code, Chapter 62-257, "Asbestos Program".
   2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR, Part 61, Subpart M, latest revision.
   3. Occupational Safety and Health Act, 29 CFR, 1910.1001 – Asbestos.
   4. Title 40 CFR, Part 763, Asbestos.
   5. Florida Statute Title XXXII, Chapter 469, Asbestos Abatement.

3.4 IN-PLACE GROUTING OF EXISTING PIPE

A. Where water and wastewater utility pipes are to be abandoned in place, they shall

be filled with a sand/cement grout as specified herein. When such pipes are constructed with asbestos cement materials, the abandonment activities shall be performed by a licensed asbestos abatement contractor as specified in these Specifications.

B. Grout shall be injected within the pipe sections indicated on the Drawings. The ends of these sections shall be capped and/or plugged. The grouting program shall consist of pumping sand-cement grout with suitable chemical additives at pressures necessary to fill the pipe sections shown on the Drawings to prevent the potential for future collapse.

C. The pump used for grouting should be a continuous flow, positive displacement model with a pugmill type mixing vat having a minimum shaft speed of 60 rpm and incorporated as an integral part of the equipment. Alternate equipment may be used subject to the approval of the COUNTY. The rate of pumping shall not exceed six (6) cubic feet per minute. The pumping pressures shall be in the range of 100 to 150 psi.

D. The Contractor shall provide standpipes and/or additional means of visual inspection as required by the COUNTY to determine if adequate grout material has filled the entire pipe section(s). The Contractor shall make necessary provisions for the COUNTY's representative to monitor all grouting operations.

E. All pipe to be abandoned shall be capped or plugged with a fitting or material that will prevent soil or other material from entering the pipe. All caps and plugs shall be subject to approval by the COUNTY.

++ END OF SECTION ++

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section covers clearing, grubbing and stripping of the project site and/or along the pipeline route.

B. The CONTRACTOR shall clear and grub all of the area within the limits of construction or as required, which includes, but is not limited to utility easements. The width of the area to be cleared shall be reviewed by the COUNTY prior to the beginning of any clearing.

C. The CONTRACTOR's attention is directed to any Soil Erosion and Sediment Control Ordinances in force in Manatee County. The CONTRACTOR shall comply with all applicable sections of these ordinances.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING

A. The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, trees shall be preserved as hereinafter specified unless otherwise designated by the COUNTY. 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 the safety of employees and others. Soil erosion control devices such as hay bales and silt fences shall be installed to satisfy all Federal, State and COUNTY requirements.

3.2 GRUBBING

A. 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 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.

3.3 STRIPPING

A. In areas so designated, topsoil shall be stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. The COUNTY shall have the option to receive all excess topsoil materials. The CONTRACTOR shall pay all equipment and labor cost to deliver excess top soil material to a remote site chosen by the COUNTY within a five mile radius of the construction site. Should COUNTY not choose to receive any or all excess topsoil materials, the CONTRACTOR shall dispose of said material at no additional cost to COUNTY.

3.4 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

A. The CONTRACTOR shall dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris off site. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be considered a subsidiary obligation of the CONTRACTOR; the cost of which shall be included in the prices bid for the various classes of work.

3.5 PRESERVATION OF TREES

A. Those trees which are not designated for removal by the COUNTY shall be carefully protected from damage. The CONTRACTOR shall erect such barricades, guards and enclosures as may be considered necessary by him for the protection of the trees during all construction operation.

3.6 PRESERVATION OF DEVELOPED PRIVATE PROPERTY

A. The CONTRACTOR shall exercise extreme care to avoid unnecessary disturbance of developed private property adjacent to proposed project site. Trees, shrubbery, gardens, lawns and other landscaping, which are not designated by the COUNTY to be removed, shall be replaced and replanted to restore the construction easement to the condition existing prior to construction.

B. All soil preservation procedures and replanting operations shall be under the supervision of a nursery representative experienced in such operations.

C. Improvements to the land such as fences, walls, outbuildings and other structures which of necessity must be removed, shall be replaced with equal quality materials and workmanship.

D. The CONTRACTOR shall clean up the construction site across developed private property directly after construction is completed upon approval of the COUNTY.

3.7 PRESERVATION OF PUBLIC PROPERTY

A. The appropriate paragraphs of these Specifications shall apply to the preservation and restoration of public lands, parks, rights-of-way, easements and all other damaged areas. This includes, but is not limited to the trimming of trees damaged by CONTRACTOR's equipment.

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SECTION 02220

EXCAVATION, BACKFILL, FILL AND GRADING FOR STRUCTURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Structural excavation shall consist of the removal of material for the construction of foundations for structures and other excavation designated on the drawings or in these specifications.

B. Structural excavation and backfill shall consist of furnishing material, if necessary and placing and compacting backfill material around structures to the lines and grades designated on the drawings, as specified or directed by the COUNTY.

C. Structural excavation and backfill shall include the furnishing of all materials, equipment and other facilities which may be necessary to perform the excavations, place and compact the backfill, install sheeting and bracing, and carry out any necessary dewatering. It shall also include the wasting or disposal of surplus excavated material in a manner and in locations approved by the COUNTY.

D. The CONTRACTOR is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the COUNTY. This includes, but is not limited to, protecting the root systems and adjusting grades as necessary for tree/root protection.

1. 2 QUALITY ASSURANCE

A. Testing Agency:
   1. In place soil compaction tests shall be performed by a qualified testing laboratory.
   2. Compaction tests shall be taken every 500 feet, except in the road crossings or road shoulders. Tests are to be taken according to current FDOT Standards.

B. Reference Standards:
   1. American Society for Testing and Materials (ASTM):
      a. ASTM D1557, Moisture-Density Relations of Soils Using 10-lb. (4.5-kg) Rammer and 18-in. (457-mm) Drop.

1.3 JOB CONDITIONS

A. The CONTRACTOR shall provide, operate and maintain all necessary pumps, discharge lines, well points, etc., in sufficient number and capacity to keep all excavation, bases, pits, etc., free from seepage, standing or running water at all times throughout the period of construction.

B. The CONTRACTOR shall assume all responsibility for the security of the excavation required, employing bracing, lining or other accepted means necessary to accomplish same.

C. Excavated areas shall be cleared of all debris, water, slush, muck, clay and soft or loose earth and shall be conditioned to the entire satisfaction of the COUNTY.

D. All excavated material unsuitable for use or which will not be used shall be disposed of in a manner consistent with State and County regulation.

E. All unsuitable organic materials, roots, logs, etc., found during excavation shall be removed by the CONTRACTOR and the trench shall be refilled with suitable material.

PART 2 - PRODUCTS

2.1 MATERIAL FOR CONTROLLED FILL

A. Composition: Only approved material free from organic matter and lumps of clay, shall be used for backfill. Excavated earth free from debris or organic material may be used for backfilling foundations or fill.

B. Crushed stone and shell shall meet or exceed current FDOT Standards.

2.2 UNSUITABLE MATERIAL

A. Unsuitable material shall be defined as highly organic soil per ASTM D2487 Group PT. This includes, but is not limited to, such items as topsoil, roots, vegetable matter, trash, debris, and clays that cannot be dried sufficiently to obtain specified compaction.

PART 3 - EXECUTION

3.1 INSPECTION

A. The CONTRACTOR shall verify that work preceding the affected work of this Section has been satisfactorily completed.

B. Conditions adversely affecting the work of this Section shall be corrected to the satisfaction of the COUNTY.

3.2 REMOVAL OF UNSUITABLE MATERIALS

A. The CONTRACTOR shall remove unsuitable material from within the limits of the Work.

B. Materials meeting requirements for controlled fill shall be stockpiled as necessary and in such a manner satisfactory to the COUNTY.

C. All material excavated shall be placed so as to minimize interference with public travel and to permit proper access for inspection of the work.

3.3 EXCAVATION

A. When concrete or shell subbase footing is to rest on an excavated surface, care shall be taken not to disturb the natural soil. Final removal and replacement of the foundation material and subbase compaction to grade shall not be made until just before the concrete or masonry is placed.

B. When any structural excavation is completed, the CONTRACTOR shall notify the COUNTY who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the COUNTY.

C. The elevations of the footing bottom and the base slab as shown on the Drawings, shall be considered as approximate and the COUNTY may order in writing, such changes in dimensions or elevations of the footings and slab base as necessary to secure satisfactory foundations.

D. All excavation shall be made within an area bounded by lines five feet outside and parallel to the exterior walls of the structure to allow for correct forming, shoring and inspection of foundation work. Pouring of concrete against earth side walls shall not be permitted.

E. If the ground is excavated below the grade called for by the Drawings or becomes unstable due to the CONTRACTOR's carelessness or operations, the ground shall be excavated to undisturbed native soil before continuing concreting operations.

F. If in the opinion of the COUNTY, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the COUNTY and if so directed, replaced by crushed stone or washed shell.

3.4 STRUCTURAL BACKFILL

A. Structural backfill shall not be placed until the footings or other portions of the structure or facility have been inspected by the COUNTY and approved for backfilling.

B. A minimum of 1-1/2" layer of lean concrete shall be placed as a working mat for the concrete base slabs and footings if required by the COUNTY.

C. Fill shall be placed in uniform layers not more than 6" to 8" thick and compacted to a minimum of 98 percent of the modified Protctor maximum dry density (ASTM D1557) or as directed by the COUNTY. The CONTRACTOR shall securely tamp the backfill with pneumatic rammer around all wall foundations. The method of compaction shall be satisfactory to the COUNTY.

D. Compaction of structural backfill by ponding and jetting is not permitted. COUNTYCOUNTY

E. Surplus material not used on-site shall be removed and disposed of off-site by the CONTRACTOR. In no case shall surplus material be deposited on adjacent lands. Fill used for grading shall be placed in layers not to exceed 12 inches in thickness and shall be compacted to a density equal or greater to that of the surrounding natural ground.

3.5 BACKFILLING AROUND STRUCTURES

A. Structural fill is specified for use as backfill against the exterior walls of the structures. Fill shall be placed in layers having a maximum thickness of eight (8) inches in loose state. All structural fill should be compacted to a minimum of 98 percent of the modified Protctor maximum dry density (ASTM D1557). If compaction is by rolling or ramming, material shall have moisture content within 2 percentage points of the optimum indicated by the modified Proctor test (ASTM D-1557).

B. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. A variation of two (2) feet in elevation will be the maximum allowable. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength. Backfilling shall be subjected to approval by the COUNTY.

C. In locations where pipes pass through building walls, the CONTRACTOR shall take the following precautions to consolidate the refill up to an elevation of at least one foot above the bottom of the pipes:
   1. Place structural fill in such areas for a distance of not less than three feet either side of the center line of the pipe in level layers not exceeding 6-inches in depth.

2. Wet each layer to the extent directed and thoroughly compact each layer to a minimum of 98 percent of the modified Protctor maximum dry density (ASTM D1557), using a power tamper. COUNTY
3. Structural fill shall be of the quality specified under Part 2 of this Section.

D. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan. No soft spots or uncompacted areas shall be allowed in the work.

E. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

3.6 FIELD QUALITY CONTROL

A. The density of soil in place shall be a minimum of 98 percent in accordance with modified Proctor test (ASTM D-1557)..

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SECTION 02221

TRENCHING, BEDDING AND BACKFILL FOR PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, grading, trench protection or other related work required to complete the piping work shown on the Drawings and specified herein. The work shall include, but not be limited to: vaults; duct conduit; pipe; roadways and paving; backfilling; required fill or borrow operations; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and dewatering.

B. Prior to commencing work on the intake structures, the CONTRACTOR shall hire at his own expense a geotechnical engineer registered in the state of Florida to perform a subsurface geotechnical investigation at each intake structure site and issue a geotechnical report listing findings, subsurface conditions, coffer dam design criteria, dewatering and excavation instructions and recommendation. CONTRACTOR shall review test borings, take into consideration all conditions that may affect his work, follow all instructions and implement all recommendations give by the geotechnical engineer.

C. The CONTRACTOR is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the COUNTY. This includes, but is not limited to protecting the root systems and adjusting grades as necessary for tree/root protection.

1.2 PROTECTION

A. Sheeting and Bracing in Excavations:
   1. In connection with construction of underground and underwater structures, the CONTRACTOR shall properly construct and maintain cofferdams. These shall consist of: sheeting and bracing as required for water diversion and/or to support the sides of excavations. Also, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing yard pipe and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

2. Trench sheeting for pipes: no sheeting is to be withdrawn if driven below, mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe unless otherwise directed by the COUNTY. During the progress of the work, the COUNTY may direct the CONTRACTOR in writing to leave additional wood sheeting in place. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.
3. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. Unless otherwise approved or indicated on the Drawings or in the Specification, all sheeting and bracing shall be removed after completion of the piping or structure, care being taken not to disturb or otherwise injure the pipeline or finished structure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specifically made for that purpose or as may otherwise be directed by the COUNTY.
4. The CONTRACTOR shall construct, to the extent he deems it desirable for his method of operation, the cofferdams and sheeting outside the neat lines of the pipeline trench or foundation unless otherwise indicated on the Drawings or directed by the COUNTY. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing and cofferdams shall be adequate to withstand all pressures to which the pipeline or structure will be subjected. Pumping, bracing and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the pipeline or the structure. Any movement or bulging which may occur shall be corrected by the CONTRACTOR at his own expense so as to provide the necessary clearances and dimensions.
5. Drawings of the cofferdams and design computations shall be submitted to the ENGINEER and approved prior to any construction. However, approval of these drawings shall not relieve the CONTRACTOR of the responsibility for the cofferdams. The drawings and computations shall be prepared and stamped by a Registered Professional Engineer in the State of Florida and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the pipeline and structures. See table below for estimated cofferdam quantities for the intake structures.

Intake Structures Estimate Cofferdam Quantities

Lake Name	Retained soil Height	Retained water Height	Total Retained Height	Approximate Cofferdam Length
South Lake #1	----	-----	-----	Not Required
South Lake #2	7'	18'	25'	220'
East Lake	7'	20'	27'	220'

B. Dewatering, Drainage and Flotation

1. The CONTRACTOR shall construct and place all pipelines, concrete work, structural fill, bedding rock and limerock base course, in-the-dry. In addition, the CONTRACTOR shall make the final 24" of excavation for this work in-the-dry and not until the water level is a minimum of 12" below proposed bottom of excavation.
2. The CONTRACTOR shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavation and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, 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 elevations.
3. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
4. Wellpoints may be required for dewatering the soil prior to final excavation for deeper in-ground and underwater structures or piping and for maintaining the lowered groundwater level until construction has been completed to avoid the structure, pipeline, or fill from becoming floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
5. The CONTRACTOR shall furnish all materials and equipment to perform all work required to install and maintain the proposed drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
6. Where required, the CONTRACTOR shall provide a minimum of two operating groundwater observation wells at each structure to determine the water level during construction of the pipeline or structure. Locations of the observation wells shall be at structures and along pipelines as approved by the COUNTY prior to their installation. The observation wells shall be extended to 6 inches above finished grade, capped with screw-on caps protected by 24" x 24" wide concrete base and left in place at the completion of this Project.

7. Prior to excavation, the CONTRACTOR shall submit his proposed method of dewatering and maintaining dry conditions to the COUNTY for approval. Such approval shall not relieve the CONTRACTOR of the responsibility for the satisfactory performance of the system. The CONTRACTOR shall be responsible for correcting any disturbance of natural bearing soils for damage to pipeline or structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
8. As part of his request for approval of a dewatering system, the CONTRACTOR shall demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one quart sample. Discharge water shall not flow directly into wetlands or Waters of the State as defined by FDEP and SWFWMD.
9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the COUNTY.
10. Continuous pumping will be required as long as water levels are required to be below natural levels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General
   1. Materials for use as fill and backfill shall be described below. For each material, the CONTRACTOR shall notify the COUNTY of the source of the material and shall furnish the COUNTY, for approval, a representative sample weighing approximately 50 pounds, at least ten calendar days prior to the date of anticipated use of such material.
   2. Additional materials shall be furnished as required from off-site sources and hauled to the site.

B. Structural Fill
   1. Structural fill in trenches shall be used below spread footing foundations, slab-on-grade floors and other structures as backfill within three feet of the below grade portions of structures.
   2. Structural fill material shall be a minimum of 60 percent clean sand, with less than 12 percent passing No. 200 sieve, free of organic, deleterious and/or compressible material. Minimum acceptable density shall be 98 percent of the maximum density as determined by AASHTO T-180. Rock in excess of 2-1/2" in diameter shall not be used in the fill material. If the moisture content is improper for attaining the specified density, either water shall be added or material shall be permitted to dry until the proper moisture content for compaction is reached.

C. Common Fill

1. Common fill material shall be free from organic matter, muck or marl and rock exceeding 2-1/2" in diameter. Common fill shall not contain broken concrete, masonry, rubble or other similar materials. Existing soil may be used to adjust grades over the site with the exception of the construction area.
2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the COUNTY, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials by the CONTRACTOR.

D. Crushed Stone

1. Crushed stone may be used for pipe bedding, manhole bases, as a drainage layer below structures with underdrains and at other locations indicated on the Drawings.
2. Crushed stone shall be size No. 57 with gradation as noted in Table 1 of Section 901 of Florida Department of Transportation, Construction of Roads and Bridges.

PART 3 - EXECUTION

3.1 TRENCH EXCAVATION AND BACKFILLING

A. Excavation for all trenches required for the installation of pipes and electrical ducts shall be made to the depths indicated on the Drawings and in such manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches.

B. Rock shall be removed to a minimum 6" clearance around the bottom and sides of all the pipe or ducts being laid.

C. Where pipes or ducts are to be laid in limerock bedding or encased in concrete, the trench may be excavated by machinery to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

D. Where the pipes or ducts are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. The last of the material being excavated manually, shall be done in such a manner that will give a flat bottom true to grade so that pipe or duct can be evenly supported on undisturbed material. Bell holes shall be made as required.

E. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with suitable compacted material to the mid-diameter of the pipe.

F. Backfilling over ducts shall begin not less than three days after placing concrete encasement.

G. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings.

H. Any space remaining between the pipe and sides of the trench shall be packed full by hand shovel with selected earth, free from stones having a diameter greater than 2" and thoroughly compacted with a tamper as fast as placed, up to a level of one foot above the top of the pipe.

I. The filling shall be carried up evenly on both sides with at least one man tamping for each man shoveling material into the trench.

J. The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted by rolling, ramming, or puddling, as the COUNTY may direct, sufficiently to prevent subsequent settling.

++ END OF SECTION ++

SECTION 02223

EXCAVATION BELOW GRADE AND CRUSHED STONE OR SHELL REFILL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. If in the opinion of the COUNTY, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the COUNTY and replaced by crushed stone. .

PART 2 - PRODUCTS (NOT USED)

PART 3 - MATERIALS

3.1 EXCAVATION AND DRAINAGE

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench stabilization shall be complete and effective.

B. Should the CONTRACTOR excavate below the grade shown on the Contract drawings because of negligence or for his own convenience; due to failure in properly dewatering the trench; disturbs the subgrade before dewatering is sufficiently complete; he shall be directed by the COUNTY to excavate below grade. The work of excavating below grade and furnishing and placing the approved refill material shall be performed at the CONTRACTOR's expense.

3.2 REFILL

A. Should the material at the level of trench bottom consist of fine sand, sand and silt or soft earth, the subgrade material shall be removed as directed by the COUNTY and the excavation shall be refilled with crushed stone .

+ + END OF SECTION + +

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SECTION 02260

FINISH GRADING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The CONTRACTOR shall finish grade sub-soil.

B. The CONTRACTOR shall cut out areas to receive stabilizing base course materials for paving and sidewalks.

C. The CONTRACTOR shall place, finish grade and compact top soil.

1.2 PROTECTION

A. The CONTRACTOR shall prevent damage to existing fencing, trees, landscaping, natural features, bench marks, pavement and utility lines. Damage shall be corrected at no cost to the COUNTY.

PART 2 - PRODUCTS

2.1 WORK INCLUDED

A. Topsoil: Shall be friable loam free from subsoil, roots, grass, excessive amount of weeds or other organics, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter. The CONTRACTOR may use topsoil stockpiles on site if they conform to these requirements.

PART 3 - EXECUTION

3.1 SUB-SOIL PREPARATION

A. The CONTRACTOR shall rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Uneven areas and low spots shall be eliminated. Debris, roots, branches or other organics, stones, and sub-soil shall be removed by the CONTRACTOR and disposed of in a manner consistent with the latest Manatee County Standards as well as any affected regulatory agency. Should contaminated soil be found, the CONTRACTOR shall notify the COUNTY.

B. The CONTRACTOR shall cut out areas to sub-grade elevation to stabilize base material for paving and sidewalks.

C. The CONTRACTOR shall bring sub-soil to required profiles and contour graces gradually; and blend slopes into level areas.

D. The CONTRACTOR shall slope the structure grade a minimum of two (2) inches in ten (10) feet unless indicated otherwise on the Drawings.

E. The CONTRACTOR shall cultivate sub-grade to a depth of 3 inches where the topsoil is to be placed. He shall repeat cultivation in areas where equipment use has compacted sub-soil.

F. The CONTRACTOR shall not make grade changes which causes water to flow onto adjacent lands.

3.2 PLACING TOPSOIL

A. The CONTRACTOR shall place topsoil in areas where seeding, sodding and planting is to be performed. He shall place from the following minimum depths, up to finished grade elevations:
   1. 6 inches for seeded areas
   2. 4-1/2 inches for sodded areas
   3. 24 inches for shrub beds
   4. 18 inches for flower beds

B. The CONTRACTOR shall use topsoil in a dry state as determined by the COUNTY. He shall place the material during dry weather.

C. The CONTRACTOR shall use fine grade topsoil eliminating rough and low areas to ensure positive drainage. He shall maintain levels, profiles and contours of the sub-grades.

D. The CONTRACTOR shall remove stone, roots, grass, weeds, debris, and other organics or foreign material while spreading the material.

E. The CONTRACTOR shall manually spread topsoil around trees, plants and structures to prevent damage which may be caused by grading equipment.

F. The CONTRACTOR shall lightly compact and place the topsoil.

3.3 SURPLUS MATERIAL

A. The CONTRACTOR shall remove surplus sub-soil and topsoil from site at his expense.

B. The CONTRACTOR shall leave stockpile areas and entire job site clean and raked, ready for landscaping operations.

+ + END OF SECTION + +

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SECTION 02276

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work specified in this Section consists of the design, provision, maintenance and removal of temporary erosion and sedimentation controls as necessary.

B. Temporary erosion controls include, but are not limited to: grassing, mulching, netting, watering, and the reseeding of on-site surfaces and spoil and borrow area surfaces, interceptor ditches at ends of berms and other such work at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the COUNTY.

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

D. The CONTRACTOR is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.2 REFERENCE DOCUMENTS

A. Florida Building Code.

B. FDEP/COE Dredge and Fill Regulations and/or Permit as applicable.

C. SWFWMD Permit Regulations and/or Permit as applicable.

D. Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual.

PART 2 - PRODUCTS

2.1 EROSION CONTROL

A. Netting - fabricated of material acceptable to the COUNTY.

B. Seed and sod.

2.2 SEDIMENTATION CONTROL

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

B. Netting - fabricated of material acceptable to the COUNTY.

C. Filter stone - crushed stone conforming to Florida Dept of Transportation specifications.

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

E. Concrete - exterior grade not less than one inch thick.

PART 3 - EXECUTION

3.1 EROSION CONTROL

A. Minimum procedures for grassing shall be:
   1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
   2. Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
   3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2 inches.
   4. Apply netting over mulched areas on sloped surfaces.
   5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.2 SEDIMENTATION CONTROL

A. The CONTRACTOR shall install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Deteriorated hay bales and dislodged filter stone shall be replaced by the CONTRACTOR at his expense.

3.3 PERFORMANCE

A. The CONTRACTOR, at his own expense, shall immediately take whatever steps are necessary to correct any deficiencies of the temporary erosion and sediment control measures employed if they fail to produce results or do not comply with the requirements of the State of Florida or any other federal, governmental or regulatory agency.

++ END OF SECTION ++

SECTION 02485

SEEDING AND SODDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials and equipment necessary to satisfactorily return all construction areas to their original conditions or better.

B. Work shall include furnishing and placing seed or sod, fertilizing, planting, watering and maintenance until acceptance by COUNTY.

1.2 RELATED WORK NOT INCLUDED

A. Excavation, filling and grading required to establish elevation shown on the Drawings are included under other sections of these Specifications.

1.3 QUALITY ASSURANCE

A. It is the intent of this Specification that the CONTRACTOR is obliged to deliver a satisfactory stand of grass as specified. If necessary, the CONTRACTOR shall repeat any or all of the work, including grading, fertilizing, watering and seeding or sodding at no additional cost to the COUNTY until a satisfactory stand is obtained. For purposes of grassing, a satisfactory stand of grass is herein defined as a full lawn cover over areas to be sodded or seeded, with grass free of weeds, alive and growing, leaving no bare spots larger than 3/4 square yard within a radius of 8 feet.

B. All previously grassed areas where pipelines are laid shall be sodded. All sodding and grassing shall be installed in accordance with these Specifications or as directed by the COUNTY.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fertilizer: The fertilizer shall be of the slow-release type meeting the following minimum requirements: 12 percent nitrogen, 8 percent phosphorus, 8 percent potassium; 40 percent other available materials derived from organic sources. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur. The

amount of sulfur shall be indicated on the quantitive analysis card attached to each bag or other container. Fertilizer shall be uniform in composition, dry and free flowing delivered to sites in original unopened containers bearing manufacturer's statement or guarantee.

B. Seeding/Grassing: The CONTRACTOR shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with FDOT Specifications, Sections 570 and 981. The grassed areas shall be mulched and fertilized in accordance with FDOT Specifications, except that no additional payment will be made for mulching, fertilizing and/or watering.

C. Sodding: Sod shall be provided as required on the construction drawings or at locations as directed by the COUNTY in accordance with Florida Department of Transportation, Specifications Section 575 and 981. The CONTRACTOR shall furnish bahia grass sod or match existing sod. Placement and watering requirements shall be in accordance with FDOT Specifications Section 575, except that no additional payment will be made for placement and/or watering. This cost shall be included in the Contract price bid for sodding.

D. Topsoil: Topsoil stockpiled during excavation may be used as necessary. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the COUNTY. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants and grassing specified herein.

E. Water: It is the CONTRACTOR's responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. The CONTRACTOR shall make whatever arrangements that may be necessary to ensure an adequate supply of water to meet the needs for his work. He shall also furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

PART 3 - EXECUTION

3.1 INSTALLATION

A. When the trench backfill has stabilized sufficiently, the CONTRACTOR shall commence work on lawns and grassed areas, including fine grading as necessary and as directed by the COUNTY.

B. Finish Grading: Areas to be seeded or sodded shall be finish graded, raked, and debris removed. Soft spots and uneven grades shall be eliminated. The

COUNTY shall approve the finish grade of all areas to be seeded or sodded prior to seed or sod application.

C. Protection: Seeded and sodded areas shall be protected against traffic or other use by placing warning signs or erecting barricades as necessary. Any areas damaged prior to acceptance by the COUNTY shall be repaired by the CONTRACTOR as directed by the COUNTY.

3.2 CLEANUP

A. Soil or similar materials spilled onto paved areas shall be removed promptly, keeping those areas as clean as possible at all times. Upon completion of seeding and sodding operations, all excess soil, stones and debris remaining shall be removed from the construction areas.

3.3 LANDSCAPE MAINTENANCE

A. Any existing landscape items damaged or altered during construction by the CONTRACTOR shall be restored or replaced as directed by the COUNTY.

B. Maintain landscape work for a period of 90 days immediately following complete installation of work or until COUNTY accepts project. Watering, weeding, cultivating, restoration of grade, mowing and trimming, protection from insects and diseases, fertilizing and similar operations as needed to ensure normal growth and good health for live plant material shall be included at no additional cost to the COUNTY.

3.4 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATORS

A. Lawn areas planted under this Contract and all lawn areas damaged by the CONTRACTOR's operation shall be repaired at once by proper soil preparation, fertilizing and sodding, in accordance with these Specifications.

+ + END OF SECTION + +

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SECTION 02513

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials and equipment necessary to complete all milling asphalt pavement and asphalt concrete paving (including restoration of driveways) as called out on the Contract Documents or as shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Qualifications of Asphalt Concrete Producer: The only materials permitted shall be furnished by a bulk asphalt concrete producer exclusively engaged in the production of hot-mix, hot-laid asphalt concrete.

B. Qualification of Testing Agency: The COUNTY may employ a commercial testing laboratory to conduct tests and evaluations of asphalt concrete materials and design. The CONTRACTOR shall:
   1. Provide asphalt concrete testing and inspection service acceptable to COUNTY.
   2. Include sampling and testing asphalt concrete materials proposed, and tests and calculations for asphalt concrete mixtures.
   3. Provide field testing facilities for quality control testing during paving operations.

C. Requirements of Regulatory Agencies: The CONTRACTOR shall comply with the applicable requirements of:
   1. Manatee County Utility Operations Department
   2. Manatee County Transportation Department
   3. State of Florida Dept. of Transportation

1.3 PAVING QUALITY REQUIREMENTS

A. General: In addition to other specified conditions, the CONTRACTOR shall comply with the following minimum requirements:
   1. In-place asphalt concrete course shall be tested for compliance with requirements for density, thickness and surface smoothness.
   2. Final surface shall be provided of uniform texture, conforming to required grades and cross sections.

3. A minimum of four inch diameter pavement specimens for each completed course shall be taken from locations as directed by the COUNTY.
4. Holes from test specimens shall be repaved as specified for patching defective work.

B. Density:
1. When subjected to 50 blows of standard Marshall hammer on each side of an in place material specimen, densities shall be comparable to a laboratory specimen of same asphalt concrete mixture.
2. The minimum acceptable density of in-place course material shall be 98% of the recorded laboratory specimen density.

C. Thickness: In-place compacted thicknesses shall not be acceptable if less than the minimum thicknesses shown on the Drawings.

D. Surface Smoothness:
1. Finished surface of each asphalt concrete course shall be tested for smoothness, using a 10 ft. straightedge applied parallel to and at right angles to centerline of paved areas.
2. Surface areas shall be checked at intervals directed by COUNTY.
3. Surfaces shall not be acceptable if they exceed the following:
   a. Base Course: 1/4 in. in 10 ft.
   b. Surface Course: 3/16 in. in 10 ft.
   c. Crowned Surfaces:
      1) Test crowned surfaces with a crown template, centered and at right angles to the crown.
      2) Surfaces will not be acceptable if varying more than 1/4 in. from the template.

1.4 SUBMITTALS

A. Samples: The CONTRACTOR may be required to provide samples of materials for laboratory testing and job-mix design.

B. Test Reports: The CONTRACTOR shall submit laboratory reports for following materials tests:
1. Coarse and fine aggregates from each material source and each required grading:
   a. Sieve Analysis: ASTM C 136 (AASHO T 27).
      Unit Weight of Slag: ASTM C29 (AASHO T 19).
   b. Soundness: ASTM C 88 (AASHO T 104) for surface course aggregates only.
   c. Sand Equivalent: ASTM D 2419 (AASHO T 176).
   d. Abrasion of Coarse Aggregate: ASTM C131 (AASHO T 96),for surface course aggregates only.

2. Asphalt cement for each penetration grade:
   a. Penetration: ASTM D5 (AASHO T49).
   b. Viscosity (Kinematic): ASTM D2170 (AASHO T 201).
   c. Flash Point: ASTM D92 (AASHO T 48).
   d. Ductility: ASTM D 113 (AASHO T 51).
   e. Solubility: ASTM D 4 (AASHO T 44).
   f. Specific Gravity: ASTM D 70 (AASHO T 43).
3. Job-mix design mixtures for each material or grade:
   a. Bulk Specific Gravity for Coarse Aggregate: ASTM C 117(AASHO T 85).
   b. Bulk Specific Gravity for Fine Aggregate: ASTM C 128(AASHO T 84).
4. Uncompacted asphalt concrete mix: Maximum Specific Gravity: ASTM D 2041 (AASHO T 209).
5. Compacted asphalt concrete mix:
   a. Bulk Density: ASTM D 1188 (AASHO T 166).
   b. Marshall Stability and Flow: ASTM D 1559.
6. Density and voids analysis:
   a. Provide each series of asphalt concrete mixture text specimens, in accordance with A.I. MS-2 "Mix Design Methods for Asphalt Concrete".
   b. Use Marshall method of mix design unless otherwise directed or acceptable to the COUNTY.
   c. Report the quantity of absorbed asphalt cement in pounds of dry aggregate, percent air voids, and percent voids in mineral aggregate.
7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations:
   a. Uncompacted asphalt concrete mix.
      1) Asphalt Cement Content: ASTM D 2172 (AASHO T 164).
      2) Penetration of Recovered Asphalt Cement: ASTM D 5(AASHO T 49).
      3) Ductibility of Recovered Asphalt Cement: ASTM D 113(AASHO T 51).
   b. Compacted asphalt concrete mix:
      1) Bulk Density: ASTM D 1188 (AASHO T 166).
      2) Marshall Stability and Flow: ASTM D1559).
   c. Perform at least one test for each day's paving.
8. Asphalt plant inspection: ASTM D 290.
9. Additional testing:
   a. Retesting shall be required if previous tests indicate insufficient values, or if directed by the COUNTY.
   b. Testing shall continue until specified values have been attained.
10. Asphalt concrete materials which do not comply with specified requirements shall not be permitted in the work.

1.5 JOB CONDITIONS

A. Weather Limitations:
   1. Apply bituminous prime and tack coats only when the ambient temperature in the shade is 50 degrees F. and when the temperature has not been below 35 degrees F. for 12 hours immediately prior to application.
   2. Do not apply when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.
   3. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F., when the underlying base is dry, and when weather is not rainy.
   4. Base course may be placed when air temperature is not below 30 degrees F. and rising, when acceptable to the COUNTY.

B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

C. Traffic Control: Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Cement or Shell Base Course: as specified in FDOT Section 270, "Material for Base and Stabilized Base", and as called for in the Contract Documents.

B. Aggregate for Asphalt Concrete, General:
   1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D 692.
   2. Sand, stone, or slag screening: ASTM D 1073.
   3. Provide aggregate in gradations for various courses to comply with local highway standards.

C. Surface Course Aggregates:
   1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.

D. Asphalt Cement: Comply with ASTM D 946 for 85-100 penetration grade.

E. Prime Coat:
   1. Cut-back liquid asphalt.
   2. Medium-Curing type: ASTM D 2027, Grade MC-70.

2.2 ASPHALT-AGGREGATE MIXTURES

A. Job-mix criteria:
   1. Provide job-mix formulas for each required asphalt-aggregate mixture.
   2. Establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to aggregate, and a single temperature at which asphalt concrete is to be produced.
   3. Comply with the mix requirements of local governing highway standards.
   4. Maintain material quantities within allowable tolerances of the governing standards.

2.3 TRAFFIC AND PARKING MARKING MATERIALS

A. Traffic lane marking paint with chlorinated rubber base.

B. Factory mixed, quick drying and non bleeding, FS TT-P-115C, Type III.

C. Color: Driving Lane Dividers - White
No Parking Zone - Yellow
Parking Dividers - White

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Subbase Preparation:
   1. The CONTRACTOR shall remove from the area all organic substance encountered to a depth of six or eight inches (6" or 8"), or to such depth and width as directed by the COUNTY. The entire area shall be plowed and dragged prior to placing a stabilizing additive, if required to meet minimum bearing value.
   2. Subbase shall be compacted to a minimum density of 98 percent of the maximum as determined by the Modified Proctor Density AASHTO T180, and shall have a minimum bearing value of 40 pounds per square inch as determined by the Florida Bearing Test.

B. Base Course:
   1. Check subgrade for conformity with elevations and section immediately before placing base material.
   2. Place base material in compacted layers not more than 6 inches thick, unless continuing tests indicate the required results are being obtained with thicker layers.
   3. In no case will more than 8-inches of compacted base be placed in one lift.
   4. Spread, shape, and compact all base material deposited on the subgrade during the same day.

5. Compact base course material to be not less than 95% of maximum density: ASTM D 1557, Method D (98 percent maximum density: AASHTO T-180).
6. Test density of compacted base course: ASTM D 2167.
7 Conduct one test for each 250 sq. yds. of in-place material, but in no case not less than one daily for each layer.

C. Loose and Foreign Material:
1. Remove loose and foreign material from compacted subbase surface immediately before application of paving.
2. Use power brooms or blowers, and brooming as required.
3. Do not displace subbase material.

D. Prime Coat:
1. Uniformly apply at rate of 0.20 to 0.5 gal. per sq. yd. over compacted and cleaned subbase surface.
2. Apply enough material to penetrate and seal, but not flood the surface.
3. Allow to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 24 hours unless otherwise acceptable to the COUNTY.
4. Blot excess asphalt with just enough sand to prevent pick-up under traffic.
5. Remove loose sand before paving.

E. Tack Coat:
1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or portland cement concrete and similar surfaces.
2. Apply at rate of 0.05 to 0.15 gal. per sq. yd. of surface.
3. Apply tack coat by brush to contact surfaces of structures projecting into or abutting asphalt concrete pavement.
4. Allow surfaces to dry until material is at condition of tackiness to receive pavement.

3.2 MANHOLE FRAME / VALVE BOX ADJUSTMENTS (IF APPLICABLE)

A. Placing Manhole frames:
1. Surround manhole frames set to elevation with a ring of compacted asphalt concrete base prior to paving.
2. Place asphalt concrete mixture up to 1 in. below top of frame, slope to grade, and compact by hand tamping.

B. Adjust manhole frames to proper position to meet paving.

C. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.

D. Set cover manhole frames to grade, flush with surface of adjacent pavement.

3.3 PREPARING THE MIXTURE

A. Comply with ASTM D 995 for material storage, control, and mixing, and for plant equipment and operation.

B. Stockpiles:
   1. Keep each component of the various-sized combined aggregates in separate stockpiles.
   2. Maintain stockpiles so that separate aggregate sizes shall not be intermixed.

C. Heating:
   1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
   2. Use lowest possible temperature to suit temperature-viscosity characteristics of asphalt.
   3. Do not exceed 350 degrees F. (176.6 degrees C.).

D. Aggregate:
   1. Heat-dry aggregates to reduce moisture content to not more than 2.0%.
   2. Deliver dry aggregate to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
   3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.

E. Mix aggregate and asphalt cement to achieve 90-95% of coated particles for base mixtures and 85-90% of coated particles for surface mixture, when tested in accordance with ASTM D 2489.

F. Transporting:
   1. Transport asphalt concrete mixtures from mixing site in trucks having tight, clean compartments.
   2. Coat hauling compartments with a lime-water mixture to prevent asphalt concrete mixture from sticking.
   3. Elevate and drain compartment of excess solution before loading mix.
   4. Provide covers over asphalt concrete mixture when transporting to protect from weather and to prevent loss of heat.
   5. During periods of cold weather or for long-distance deliveries, provide insulation around entire truck bed surfaces.

3.4 EQUIPMENT

A. Provide size and quantity of equipment to complete the work specified within project time schedule.

B. Bituminous Pavers: Self-propelled that spread hot asphalt concrete mixtures without tearing, shoving or gouging surfaces, and control pavement edges to true lines without use of stationary forms.

C. Rolling Equipment:
   1. Self-propelled, steel-wheeled and pneumatic-tired rollers that can reverse direction without backlash.
   2. Other type rollers may be used if acceptable to the COUNTY.

D. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified.

3.5 PLACING THE MIX

A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine.

B. Spread mixture at a minimum temperature of 225 degrees F. (107.2 degrees C.).

C. Inaccessible and small areas may be placed by hand.

D. Place each course at thickness so that when compacted, it will conform to the indicated grade, cross-section, finish thickness, and density indicated.

E. Paver Placing:
   1. Unless otherwise directed, begin placing along centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
   2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
   3. Complete base courses for a section before placing surface courses.
   4. Place mixture in continuous operation as practicable.

F. Hand Placing:
   1. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to COUNTY.
   2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.

G. Joints:
   1. Carefully make joints between old and new pavements, or between successive days' work, to ensure a continuous bond between adjoining work.
   2. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
   3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
   4. Offset transverse joints in succeeding courses not less than 24 inches.
   5. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
   6. Offset longitudinal joints in succeeding courses not less than 6 inches.
   7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.6 COMPACTING THE MIX

A. Provide sufficient rollers to obtain the required pavement density.

B. Begin rolling operations as soon after placing when the mixture will bear weight of roller without excessive displacement.

C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.

D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.

F. Do not roll centers of sections first under any circumstances.

G. Breakdown Rolling:
   1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
   2. Operate rollers as close as possible to paver without causing pavement displacement.
   3. Check crown, grade, and smoothness after breakdown rolling.
   4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.

H. Second Rolling:
   1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.

2. Continue second rolling until mixture has been thoroughly compacted.

I. Finish Rolling:
   1. Perform finish rolling while mixture is still warm enough for removal of roller marks.
   2. Continue rolling until roller marks are eliminated and course has attained specified density.

J. Patching:
   1. Remove and replace defective areas.
   2. Cut-out and fill with fresh, hot asphalt concrete.
   3. Compact by rolling to specified surface density and smoothness.
   4. Remove deficient areas for full depth of course.
   5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
   6. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

3.7 MARKING ASPHALT CONCRETE PAVEMENT

A. Cleaning:
   1. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
   2. Do not begin marking asphalt concrete pavement until acceptable to the COUNTY.

B. Apply paint with mechanical equipment.
   1. Provide uniform straight edges.
   2. Not less than two separate coats in accordance with manufacturer's recommended rates.

3.8 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the COUNTY.

B. Protection:
   1. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than 6 hours.
   2. Provide barricades and warning devices as required to protect pavement.
   3. Cover openings of structures in the area of paving until permanent coverings are placed (if applicable).

++ END OF SECTION ++

SECTION 02999

MISCELLANEOUS WORK AND CLEANUP

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes items and operations which are not specified in detail as separate items, but may be sufficiently described as to the kind and extent of work involved. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to complete all work under this Section.

B. The work of this Section may include, but is not limited to the following:
   1. Restoration of roads, sidewalks, driveways, curbing and gutters, fences, guardrails, lawns, shrubbery and any other existing items damaged or destroyed.
   2. Crossing utilities.
   3. Relocation of existing water, reclaim water, or sewer lines less than four inches diameter, water and sanitary sewer services, low pressure gas lines, telephone lines, electric lines, cable TV lines as shown on the Contract Drawings.
   4. Restoring easements (servitudes) and rights-of-way.
   5. Clean up.
   6. Incidental work (project photographs, testing, shop drawings, traffic control, record drawings, etc.).
   7. Excavation and Embankment - As defined in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (1991 Edition or latest revision).
   8. Stormwater and erosion control devices.

1.2 SUBMITTAL OF LUMP SUM BREAKDOWN

A. CONTRACTOR shall submit to the COUNTY, a breakdown of the lump sum bid for Miscellaneous Work and Cleanup Item in the Proposal within 10 days after date of Notice to Proceed.

1.3 WORK SPECIFIED UNDER OTHER SECTIONS

A. All work shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials required for this Section shall equal or exceed materials that are to be restored. The CONTRACTOR may remove and replace or reuse existing materials with the exception of paving.

PART 3 - EXECUTION

3.1 RESTORING OF SIDEWALKS, ROADS, CURBING, FENCES AND GUARDRAILS

A. The CONTRACTOR shall protect existing sidewalks & curbing. If necessary, sidewalks & curbing shall be removed from joint to joint and replaced after backfilling. Curbing damaged during construction because of the CONTRACTOR's negligence or convenience, shall be replaced with sidewalks & curbing of equal quality and dimension at no cost to the COUNTY.

B. At the locations necessary for the CONTRACTOR to remove, store and replace existing fences and guardrails during construction, the sections removed shall be only at the direction of the COUNTY. If any section of fence is damaged due to the CONTRACTOR's negligence, it shall be replaced at no cost to the COUNTY with fencing equal to or better than that damaged and the work shall be satisfactory to the COUNTY.

C. Guardrails in the vicinity of the work shall be protected from damage by the CONTRACTOR. Damaged guardrails shall be replaced in a condition equal to those existing

D. Road crossings shall be restored in accordance with the Contract Documents and current FDOT Standards. Compensation for road restoration shall be included under the Road Restoration Bid Item if specified or under Miscellaneous Cleanup if it is not specified.

3.2 CROSSING UTILITIES

A. This item shall include any extra work required in crossing culverts, water courses, drains, water mains and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required or implied for the proposed crossing, whether or not shown on the Drawings.

3.3 RELOCATIONS OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES AND CABLE TV LINES

A. The CONTRACTOR shall notify the proper utility involved when relocation of these utility lines is required. The CONTRACTOR shall coordinate all relocation work by the utility so that construction shall not be hindered.

3.4 RESTORING THE EASEMENTS AND RIGHTS-OF-WAY

A. The CONTRACTOR shall be responsible for all damage to private property due to his operations. He shall protect from injury all walls, fences, cultivated shrubbery, pavement, underground facilities, including water, sewer and reclaimed water lines and services, or other utilities which may be encountered along the easement. If removal and replacement is required, it shall be done in a workmanlike manner, at his expense, so that the replacement are equivalent to that which existed prior to construction.

3.5 STORMWATER AND EROSION CONTROL DEVICES

A. The CONTRACTOR shall be responsible for, provide, and install all stormwater and erosion control devices necessary to insure satisfactory compliance with the Florida Department of Environmental Protection Stormwater, Erosion, and Sedimentation Control Inspector's Manual.

++ END OF SECTION ++

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SECTION 03100

SECTION 03100

CONCRETE FORMWORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete formwork. The Work also includes:
      a. Designing formwork systems in accordance with requirements of ACI 347 and the Contract Documents.
      b. Providing formwork to accommodate the Work under this and other Sections and building into formwork items such as sleeves, anchorage devices, inserts, pipe embedments, reinforcing, and all other items to be embedded in concrete for which placement is not specifically provided under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before concrete formwork Work.
   2. Coordinate formwork Specifications with requirements for finished surfaces specified in Section 03300, Cast-in-Place Concrete.

C. Related Sections:
   1. Section 03200, Concrete Reinforcement.
   2. Section 03251, Concrete Joints.
   3. Section 03300, Cast-in-Place Concrete.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
   2. ACI 301, Specifications for Structural Concrete.
   3. ACI 347, Guide to Formwork for Concrete.
   4. ASTM C805/C805M, Test Method for Rebound Number of Hardened Concrete.
   5. ASTM C1074, Practice for Estimating Concrete Strength by the Maturity Method.

6. NIST PS 1, Structural Plywood.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Professional Engineer:
      a. CONTRACTOR or formwork Supplier shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall be experienced in designing formwork and falsework of the type required. When required:
         1) Design of formwork and falsework shall be performed in accordance with performance and design criteria stated in the Contract Documents, and
         2) Design shall conform to all Laws and Regulations, and to prevailing standards of practice.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples:
      a. Not required.

B. Informational Submittals: Submit the following:
   1. Shop Drawings: When requested by ENGINEER, submit Shop Drawings showing and indicating general construction of individual forms, including:
      a. Jointing.
      b. Special formed joints or reveals.
      c. Location, pattern, and details of form tie placement, removal, and repair procedures.
      d. Location and details for temporary openings.
      e. Other items that would visually affect the finished concrete.
   2. Product Data: Manufacturer's data for proprietary materials, including form coatings, manufactured form systems, ties and accessories.
   3. Manufacturer's Instructions: Installation instructions for proprietary materials, including form coatings, manufactured form systems, ties and accessories.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage:
   1. Upon delivery to the Site, place materials in area protected from weather.
   2. Store materials in accordance with manufacturer's recommendations.
   3. Store materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.

B. Handle materials in accordance with the manufacturers' recommendations. Do not damage materials during handling.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Design, erect, support, brace and maintain formwork in accordance with ACI 347 so that formwork safely supports vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system or in-place construction that has attained adequate strength for the purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
   2. Design forms and falsework to include values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
   3. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks, or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
   4. Support form facing materials by structural members spaced sufficiently close to prevent beyond tolerance deflection, in accordance with ACI 117. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. For long-span members without intermediate supports, provide camber in formwork as required for anticipated deflections resulting from weight and pressure of fresh concrete and construction loads.
   5. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placing. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

2.2 FORM MATERIALS

A. Forms for Smooth Finish Concrete:
   1. Unless otherwise shown or indicated in the Contract Documents, construct formwork for smooth concrete surfaces with plywood, metal, metal-framed plywood-faced, or other panel type materials acceptable to ENGINEER, to provide continuous, straight, smooth as-cast surfaces with no wood grain or other surface texture imparted by formwork. Provide in largest practical

sizes to minimize number of joints and to conform to joint system shown or specified in the Contract Documents. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

B. Forms for Standard Finish Concrete:
   1. Form concrete surfaces designated to have standard formed finish with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least two edges and one side.

C. Form Ties:
   1. Provide factory-fabricated metal form ties, designed to prevent form deflection, and to prevent spalling of concrete surfaces upon removal.
   2. Unless otherwise shown or indicated in the Contract Documents, provide ties so that portion of tie remaining within concrete after removal of exterior parts of tie is at least 1.5 inches from the outer concrete surface. Unless otherwise shown or indicated in the Contract Documents, provide form ties that will leave a hole no larger than one-inch diameter in concrete surface.
   3. Ties shall have waterstops on all exterior, below-grade walls, and walls subject to hydrostatic pressure.
   4. Ties shall leave a uniform, circular hole when forms are removed.
   5. Do not use removable ties unless accepted by ENGINEER. Removable ties are not allowed on exterior below-grade walls or walls subject to hydrostatic pressure. If removable ties are accepted, CONTRACTOR shall submit hole repair details for ENGINEER approval.
   6. Wire ties are not allowed.
   7. Do not use reinforcing bars shown by the Drawings as part of the form tie system unless approved by ENGINEER.

D. Form Coatings:
   1. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. For concrete surfaces that will be in contact with potable water or water that will be treated to become potable, form coating shall be a mineral oil base coating.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which the Work will be performed and notify COUNTY in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORM CONSTRUCTION

A. Construct forms in accordance with ACI 347; to the exact sizes, shapes, lines, and dimensions shown; as required to obtain accurate alignment, location, and grades; to tolerances specified; and to obtain level and plumb work in finish structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes. Finish shall be in accordance with approved mock-up or sample panel, when specified.

B. Allowable Tolerances:
   1. Construct formwork to provide completed concrete surfaces complying with tolerances specified in ACI 117, ACI 301, and ACI 347.

C. Install formwork and accessories for facilities in accordance with manufacturer's instructions, Laws and Regulations, and the Contract Documents.

D. Fabricate forms for easy removal without damaging concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placing concrete. Brace temporary closures and set tightly to forms to prevent loss of cement paste. Locate temporary openings on forms in locations as inconspicuous as possible, consistent with requirements of the Work. Form intersecting planes of openings to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

F. Corner Treatment:
   1. Form exposed corners of beams, walls, foundations, bases and columns to produce smooth, solid, unbroken lines, except as otherwise shown or indicated in the Contract Documents. Chamfer exposed corners.
   2. Form chamfers with 3/4-inch by 3/4-inch strips, unless otherwise shown or indicated in the Contract Documents, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Use rigid PVC chamfers for architecturally formed concrete. Extend terminal edges to required limit and miter chamfer strips at changes in direction.

3. Reentrant or internal and unexposed corners may be formed either square or chamfered.

G. Joints:
1. For joint treatment, comply with Section 03251, Concrete Joints. Locate joints as shown and specified.

H. Openings and Built-In Work:
1. Provide openings in concrete formwork shown or required under other Sections. Refer to Paragraph 1.1.B of this Section for coordination requirements.
2. Accurately place and securely support items to be built into forms.

I. Sealing Formwork:
1. Formwork joints shall be tight-fitting or otherwise sealed to prevent loss of cement paste.
2. Provide formwork resting against concrete surfaces with compressible gasket material between the concrete and edge of form, to fill irregularities and create tight seal.

J. Cleaning and Tightening:
1. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed. Retighten forms immediately after placing concrete, as required to eliminate cement paste leaks.

K. Tie Hole Repair:
1. Repair tie holes in accordance with Section 03300, Cast-in-Place Concrete.

3.3 FORM COATINGS

A. Coat form contact surfaces with non-staining form-coating compound before installing reinforcing materials. Do not allow excess form coating material to accumulate in forms or come into contact with surfaces that will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with non-staining, rust-preventative form oil, or otherwise protect against rusting. Do not use rust-stained steel formwork.

C. For concrete surfaces that will be in contact with potable water or water that will be treated to become potable, form coating shall be mineral-oil base coating.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into formwork anchorage devices and other embedded items, shown, specified, or required under other Sections. Refer to Paragraph 1.1.B of this Section for coordination requirements. Use necessary setting drawings, diagrams, instructions, and directions.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Before placing concrete, check ties, tie cones, tie waterstops, embedded items, form coatings, formwork stability, alignment, and tolerances. Make corrections and adjustments to ensure formwork complies with intent of the formwork design, proper stability of forming systems, and accurate size and location of concrete members.
   2. During concrete placing, check formwork and related supports to ensure that forms are not displaced and that completed Work will be within specified tolerances.
   3. If forms are unsatisfactory in any way, either before or during concrete placing, stop or postpone placing of concrete until defects are corrected as required by CONTRACTOR's or Supplier's professional engineer and accepted by COUNTY.

3.6 REMOVAL OF FORMS

A. Determination of time between placing concrete and removing forms is CONTRACTOR's responsibility. Requirements specified in this Section are minimum times and requirements intended to ensure that concrete will support its own weight, and do not consider additional effects of the construction. Additional effects of the construction shall be accounted for by CONTRACTOR when determining time for removing formwork. Time for removing of forms is subject to COUNTY's acceptance.

B. Comply with requirements of ACI 301 and ACI 347, except as indicated in the Contract Documents.

C. Determination of In-place Concrete Strength:
   1. Determine compressive strength of in-place concrete by compression test specimens cured at the Site under the same conditions of temperature and moisture as the concrete member under consideration.
   2. Alternately, determine compressive strength of in-place concrete by maturity factor procedure in accordance with ASTM C1074 and approved by ENGINEER. Location of embedded thermistors or thermocouples shall be as approved by ENGINEER.

D. When high-early strength concrete is used, time for removing the forms will be developed at the Site from the age/strength relationships established for the materials and proportions used by tests in accordance with ACI 301.

E. Continue curing, including bottom surfaces of slabs and beams, after form removal in accordance with Section 03300, Cast-in-Place Concrete.

3.7 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in the construction. Do not use split, frayed, delaminated, or otherwise damaged form facing material. Apply form coating compound material to concrete contact surfaces as specified for formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces. Form surfaces are subject to COUNTY's approval.

+ + END OF SECTION + +

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete reinforcing.
   2. Extent of concrete reinforcing is shown and indicated in the Contract Documents.
   3. Work includes fabrication and placement of reinforcing including bars, ties, and supports, and welded wire fabric for concrete, encasements.

B. Related Sections:
   1. Section 03251, Concrete Joints.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 315, Details and Detailing of Concrete Reinforcement.
   2. ACI 318, Building Code Requirements for Structural Concrete.
   3. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   4. ANSI/AWS D1.4, Structural Welding Code - Reinforcing Steel.
   5. ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.
   6. ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   7. ASTM A615, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   8. ASTM A706, Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   9. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
   10. Concrete Reinforcing Steel Institute (CRSI), CRSI 1MSP, Manual of Standard Practice.
   11. ICC Evaluation Service (ES) AC 308, Acceptance Criteria for Post-Installed Anchors in Concrete Elements.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer of Adhesive Dowels: Shall be experienced and certified by manufacturer of adhesive as possessing necessary training for installing manufacturer's products. Distributors or manufacturer's representatives shall not provide product training unless qualified as certified trainers by anchor manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI 315, Parts A and B.
      b. For slabs and mats, show top and bottom reinforcing on separate plan views.
         1) Plans shall show all openings and shall reference details that identify additional reinforcing around each opening.
      c. Show bar schedules, stirrup spacing, diagrams of bent bars, location of bar splices, length of lap splices, arrangements, and assemblies, as required for fabricating and placing concrete reinforcing unless otherwise noted.
      d. Splices shall be kept to a minimum. Avoid, when possible, splices in regions of maximum tensile stresses.
      e. Drawings detailing location of all construction and expansion joints, as required under Section 03251, Concrete Joints, shall be submitted and approved before Shop Drawings for reinforcing are submitted.
      f. Drawings detailing location, spacing, edge distance, and embedment depth of adhesive dowels. Adhesive system shall be submitted and approved before Shop Drawings with adhesive dowels are submitted.
   2. Product Data:
      a. Manufacturer's product data for adhesive, if not submitted under other Sections.
      b. Adhesive manufacturer's test data and ICC ES report to verify specified capacity of adhesive dowels.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Steel manufacturer's certificates of mill analysis, tensile, and bend tests for reinforcing steel.
      b. Adhesive manufacturer's certification verifying that installer is qualified and using proper installation procedures.

2. Manufacturer's Instructions:
   a. Installation instructions for adhesive systems.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.

B. Store concrete reinforcing products to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: Shall be in accordance with ASTM A615, and as follows:
   1. Provide Grade 60 for all bars.

B. Mechanical Couplers: Reinforcement bars may be spliced with mechanical connection. Connection shall be full mechanical connection that shall develop in tension or compression, as required, at least 125 percent of specified yield strength (fy) of bar in accordance with ACI 318 and ACI 350. Where splices at the face of wall are shown or approved by ENGINEER, form saver-type mechanical couplers may be used. Form-saver couplers shall have integral plates designed to positively connect coupler to formwork.

C. Steel Wire: Shall be in accordance with ASTM A82.

D. Welded Smooth Wire Fabric: Shall be in accordance with ASTM A185.
   1. Furnish in flat sheets, not rolls.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing in place.
   1. Use wire bar type supports complying with CRSI 1 MSP recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
   2. For slabs on grade, use precast concrete blocks, four inches square in plan, with embedded tie wire as specified by CRSI 1 MSP. Precast concrete blocks shall have same or higher compressive strength as specified for concrete in which they are located.

3. For concrete surfaces where legs of supports are in contact with forms, provide supports complying with CRSI 1 MSP as follows:
   a. At formed surfaces in contact with soil, weather, or liquid, or located above liquid, supports shall be CRSI Class 1 for maximum protection. Plastic coating on legs shall extend at least 0.5-inch upward from form surface.
   b. At interior dry surfaces (not located above liquid), supports shall be either Class 1 or Class 2 for moderate protection.

F. Adhesive Dowels:
   1. Dowels:
      a. Dowel reinforcing bars shall conform to ASTM A615, Grade 60.
   2. Adhesive:
      a. For requirements for adhesive, refer to Section 05051, Anchor Bolts, Toggle Bolts, and Concrete Inserts.

2.2 FABRICATION

A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI 1 MSP. In case of fabricating errors, do not re-bend or straighten reinforcing in manner that injures or weakens material.

B. Unacceptable Materials: Reinforcing with one or more of the following defects is not allowed:
   1. Bar lengths, bends, and other dimensions exceeding specified fabrication tolerances.
   2. Bends or kinks not shown on approved Shop Drawings.
   3. Bars that do not meet or exceed their ASTM specification requirements when hand-wire-brushed, with respect to cross section, nominal weight, or average height of deformations.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which concrete reinforcing is to be placed and notify COUNTY in writing of unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable recommendations of Laws and Regulations, applicable standards, and CRSI 1 MSP for details and methods of reinforcing placement and supports.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
   1. Place reinforcing to obtain minimum concrete coverages specified in ACI 318, AC I 350, and the Contract Documents. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Prior to placing concrete, using surveyor's level or string line, demonstrate to COUNTY that specified cover of reinforcing has been attained.
   3. Do not secure reinforcing steel to forms with wire, nails, or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.

D. Allowable Placing Tolerances: Comply with ACI 318, Chapter 7 - Details of Reinforcement, and ACI 350, Chapter 7 - Details of Reinforcement, except as specified in this Section:
   1. Concrete surfaces in contact with liquid shall have minimum of two inches of concrete over reinforcing steel.

E. Provide sufficient number of supports of strength required to carry reinforcing. Do not place reinforcing bars more than two inches beyond last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Lap Splices:
   1. Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars as shown on the Drawings.

G. Install welded wire fabric in lengths as long as practical. Lap adjoining pieces at least one full mesh and lace splices with 16-gage wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.

H. Mechanical Couplers:
   1. Mechanical butt splices shall be in accordance with recommendations of mechanical splicing device manufacturer. Butt splices shall develop 125 percent of specified minimum yield tensile strength of spliced bars or of smaller bar in transition splices. Bars shall be flame-dried before butt splicing. Provide adequate jigs and clamps or other devices to support, align, and hold longitudinal centerline of bars being butt spliced in straight line.

I. Adhesive Dowels:
   1. Adhesive dowels shall be reinforcing bar dowels set in an adhesive in hole drilled into hardened concrete. Comply with manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop required tensile strength, and hole cleaning and preparation instructions. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.
   2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Holes shall not be more than 1/4-inch greater than nominal bar diameter, and hole depth shall not be less than twelve times nominal bar diameter. Hammer-drill holes. Cored holes are not allowed.
   3. Embedment depths shall be based on compressive strength of 2,000 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.
   4. Determine location of existing reinforcing steel in vicinity of proposed holes prior to drilling. Adjust location of holes to be drilled to avoid drilling through or damaging existing reinforcing bars only when approved by ENGINEER.
   5. Before setting adhesive dowel, hole shall be made free of dust and debris by method recommended by adhesive system manufacturer. Hole shall be brushed, with manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
   6. Inject adhesive into hole through injection system mixing nozzle and necessary extension tubes, placed to bottom of hole. Withdraw discharge end as adhesive is placed, but keep end of tube immersed to prevent forming air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placement.
   7. Twist dowels during insertion into partially filled hole to guarantee full wetting of bar surface with adhesive. Insert bar slowly to avoid developing air pockets.

3.3 FIELD QUALITY CONTROL

A. Site Inspections and Tests:
   1. Do not place concrete until reinforcing is inspected and permission for placing concrete is granted by COUNTY. Concrete placed in violation of this provision will be rejected.

2. Do not close up formwork for walls and other vertical members until reinforcing is inspected and permission for placing concrete is granted by COUNTY. Concrete placed in violation of this provision will be rejected.
3. Testing of Adhesive Dowels: Employ testing agency to perform field quality control testing of drilled dowel installations. After manufacturer's recommended curing period and prior to placing connecting reinforcing, proof-test for pullout ten percent of adhesive dowels installed. Adhesive dowels shall be tensioned to 60 percent of specified yield strength. Where dowels are located less than six bar diameters from edge of concrete, ENGINEER will determine tensile load required for test. If one or more dowels fail, retest all dowels installed for the Work. Dowels that fail shall be reinstalled and retested at CONTRACTOR's expense.

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SECTION 03251

CONCRETE JOINTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete joints.

B. Related Sections:
   1. Section 03100, Concrete Formwork.
   2. Section 03600, Grout.
   3. Section 07920, Calking and Sealants.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 301, Standard Specifications for Structural Concrete.
   2. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
   3. CRD-C572, U.S. Army Corps of Engineers Specifications for Polyvinyl-Chloride Waterstop.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Layout of construction and expansion joint locations. Submit and obtain approval prior to submitting concrete reinforcement Shop Drawings.
      b. For construction and expansion joints that require waterstops, submit layout of locations showing waterstop details. Indicate waterstop type, waterstop joint conditions, and details on how joint conditions will be handled.
      c. Layout of all control joint locations.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's specifications and installation instructions for all materials required.

1.4 DELIVERY, STORAGE AND HANDLING

A. Transportation and Handling of Products:
   1. Deliver materials to Site to ensure uninterrupted progress of the Work.

B. Storage and Protection:
   1. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight. Comply with manufacturer's storage and protection requirements.

PART 2 – PRODUCTS

2.1 WATERSTOPS

A. Hydrophilic Waterstop Materials:
   1. General Material Properties:
      a. Bentonite-free, and expandable by minimum of 80 percent of dry volume in presence of water to form watertight joint seal without damaging concrete in which material is cast. Provide only where shown or indicated in the Contract Documents.
      b. Material shall be composed of resins and polymers that absorb water and cause an increase in volume in completely reversible and repeatable process. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
      c. Select materials that are recommended by manufacturer for type of liquid to be contained.
   2. Hydrophilic Rubber Waterstop:
      a. Minimum cross sectional dimensions shall be 3/16-inch by 3/4-inch.
      b. Product and Manufacturer: Provide one of the following:
         1) Duroseal Gasket, by BBZ USA, Inc.
         2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.
         3) Hydrotite, by Greenstreak Plastic Products Company.
         4) Or equal.
   3. Hydrophilic Sealant:
      a. Hydrophilic sealant shall adhere firmly to concrete, metal, and PVC in dry or damp condition. When cured sealant shall be elastic indefinitely.
      b. Product and Manufacturer: Provide one of the following:
         1) Duroseal Paste, by BBZ USA, Inc.
         2) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.
         3) Hydrotite, by Greenstreak Plastic Products Company.
         4) SikaSwell S, by Sika Corporation.
         5) Or equal.

4. Hydrophilic Injection Resin:
   a. Hydrophilic injection resin shall be acrylate-ester based. Viscosity shall be less than 50 centipoises (cps). Resin shall be water soluble in its uncured state, solvent-free, and non-water reactive. In cured state, resin shall form solid, hydrophilic, flexible material resistant to permanent water pressure, and shall not attack bitumen, joint sealants, and concrete.
   b. Product and Manufacturer: Provide one of the following:
      1) Duroseal Inject 1K/2K, by BBZ USA, Inc.
      2) Sika Injection 29, by Sika Corporation.
      3) Or equal.

2.2 PREFORMED EXPANSION JOINT FILLER

A. Provide preformed expansion joint filler complying with ASTM D1752, Type I (sponge rubber) or Type II (cork).

2.3 CONCRETE CONSTRUCTION JOINT ROUGHENER

A. Provide water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following for the types of joints specified:
   1. Rugasol-S, by Sika Corporation for horizontal joints only.
   2. Concrete Surface Retarder-Formula S, by Euclid Chemical Company, for horizontal joints only.
   3. Concrete Surface Retarder-Formula F, by Euclid Chemical Company, for vertical joints only.
   4. TK-6100 Concrete Form Surface Retarder, by TK Products.
   5. Or equal.

2.4 EPOXY BONDING AGENT

A. Provide a two-component epoxy-resin bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sikadur 32 Hi-Mod LPL, by Sika Corporation.
   2. Eucopoxy LPL, by the Euclid Chemical Company.
   3. Resi-Bond J-58, by Dayton Superior.
   4. Or equal.

2.5 EPOXY-CEMENT BONDING AGENT

A. Provide three component epoxy resin-cement blended formulated as bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation.
   2. Duralprep A.C., as manufactured by the Euclid Chemical Company.
   3. Emaco P24, as manufactured by MBT/ChemRex.
   4. Or equal.

2.6 JOINT SEALANT AND ACCESSORIES

A. For joint sealants and accessories used on isolation joints, control joints, and expansion joints, refer to Section 07920, Calking and Sealants.

2.7 CONCRETE BOND BREAKERS

A. Provide asphalt-saturated rag felt building paper, not less in weight than commercially known as 15 pound felt building paper, which weighs 15 pounds per 100 square feet.

B. Chemical Bond Breaker:
   1. Provide medium solids resin solution chemical concrete bond breaker complying with ASTM C309, Type I, Class B.

2.8 NEOPRENE BEARING PADS

A. Product and Manufacturer: Provide one of the following:
   1. 65 Durometer, Sheet Neoprene No. 1200, as manufactured by Williams Products Company.
   2. Or equal.

2.9 RUBBER BONDING AGENT

A. Product and Manufacturer: Provide one of the following:
   1. Scotch-Grip 1300 Rubber Adhesive, as manufactured by 3M Company.
   2. Or equal.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installing Subcontractor, if any, shall examine substrate and conditions under which the Work is to be performed and notify COUNTY in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION JOINTS

A. Comply with requirements of ACI 301 and the Contract Documents.

B. Locate and install construction joints as shown or indicated on the Drawings. Where not shown or indicated, locate joints to not impair strength of the structure; position joints at points of minimum shear. Location of joints shall be approved by ENGINEER. In addition to joints shown or indicated on the Drawings, locate construction joints as follows:
   1. In foundation mats, locate joints at spacing of approximately 40 feet. Joints shall be located within middle third of element span, unless otherwise shown or indicated on the Drawings. Element span shall be considered distance between piles or, as determined by ENGINEER, distance between bearing elements, such as columns, exterior walls and interior walls. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.
   2. In walls, locate joints at a maximum spacing of 40 feet. Locate joints away from wall intersections a minimum of one-quarter of the clear span distance between wall intersections measured horizontally.
   3. In structural slabs and beams, joints shall be located within middle third of element span and shall be located in compliance with ACI 301, unless otherwise shown or indicated on the Drawings.
   4. In slabs on grade, locate joints at spacing of approximately 40 feet. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.

C. Horizontal Joints:
   1. Roughen concrete at interface of construction joints by abrasive blasting, hydroblasting, or using surface retardants and water jets to expose aggregate and remove accumulated concrete on projecting rebar immediately subsequent to form stripping, unless otherwise approved by ENGINEER. Immediately before placing fresh concrete, thoroughly clean existing contact surface using stiff brush or other tools and stream of pressurized water. Surface shall be clean and wet, and free from pools of water at time of placing fresh concrete.
   2. Remove laitance, waste mortar, and other substances that may prevent complete adhesion. Where joint roughening was performed more than seven days prior to concrete placing or where dirt or other bond reducing contaminants are on surface, perform additional light abrasive blasting or hydroblasting to remove laitance and all bond-reducing materials just prior to concrete placement.

D. Vertical Joints:
   1. Apply roughener to the form in thin, even film by brush, spray, or roller in accordance with manufacturer's instructions. After roughener is dry, concrete may be placed.

2. When concrete has been placed, remove joint surface forms as early as necessary to allow for removal of surface retarded concrete. Forms covering member surfaces shall remain in place as required under Section 03100, Concrete Formwork. Wash loosened material off with high-pressure water spray to obtain roughened surface subject to approval by ENGINEER. Alternately, surface shall be roughened by abrasive blasting or hydroblasting to expose aggregate. Outer one-inch of each side of joint face shall be masked and protected from blasting to avoid damaging member surface.

3.3 EXPANSION JOINTS

A. Comply with requirements of ACI 301 and this Section.

B. Locate and install expansion joints as shown and indicated in the Contract Documents. Install joint filler in accordance with manufacturer's instructions. Install sealants as specified in this Section.

3.4 CONTROL JOINTS

A. Provide control joints in non-water bearing slabs on grade as shown or indicated on the Drawings. Where control joints are not shown or indicated on the Drawings, space control joints at 24 to 36 times thickness of slab in both directions. Locate control joints only at places approved by ENGINEER.

B. A groove, with depth of at least 25 percent of the member thickness, shall be tooled, formed, or saw-cut in concrete. Groove shall be filled with joint sealant material in accordance with Section 07920, Calking and Sealants.

C. Where control joint is formed by sawcutting, make sawcut in presence of COUNTY immediately after concrete has set sufficiently to support the saw and be cut without damage to concrete. Keep concrete continually moist during cutting. Joints shall be approximately 1/8-inch wide.

D. Control joints may be formed with tool or by inserting joint forming strip. After concrete has achieved design strength, remove upper portion of joint forming strip and fill void with sealant.

3.5 ISOLATION JOINTS

A. Provide isolation joint where sidewalk or other slab on grade abuts a concrete structure and slab on grade is not shown doweled into that structure. Form isolation joint by 1/2-inch joint filler with upper 1/2-inch of joint filled with sealant.

3.6 WATERSTOPS

A. General:
   1. Comply with ACI 301 and this Section. Make joints in accordance with manufacturer's instructions.
   2. Waterstops shall be fully continuous for extent of joint and with waterstops in intersecting joints. Maintain waterstop continuity at transitions between waterstops in joints at different levels and orientations.
   3. In vertical joints in walls that are free at the top, waterstops shall extend no closer than six inches from top of wall.
   4. In placing concrete around horizontal waterstops, with waterstop flat face in horizontal plane, work the concrete under waterstops by hand to avoid forming air and rock pockets.

B. Hydrophilic Rubber Waterstop and Sealant:
   1. Where a hydrophilic rubber waterstop or sealant is required in accordance with the Contract Documents, or where approved by ENGINEER, install waterstop or sealant in accordance with manufacturer's instructions and recommendations; except, as modified in the Contract Documents.
   2. When requested by ENGINEER OR COUNTY, provide manufacturer's technical assistance at the Site.
   3. Locate waterstop or sealant as near as possible to center of joint. Waterstop or sealant shall be continuous around entire joint. Minimum distance from edge of waterstop to face of the member shall be three inches.
   4. Where hydrophilic rubber waterstop is used in combination with PVC waterstop, hydrophilic rubber waterstop shall overlap PVC waterstop for minimum of six inches. Fill contact surface between hydrophilic rubber waterstop and PVC waterstop with hydrophilic sealant.
   5. Where wet curing methods are used, apply hydrophilic rubber waterstop and sealant after curing water is removed and just prior to closing up of the forms for concrete placement. Protect hydrophilic rubber waterstop and sealant from direct rays of sun and from becoming wet prior to concrete placement. If material becomes wet and expands, allow material to dry until material has returned to original cross sectional dimensions before placing concrete.
   6. Install hydrophilic rubber waterstop in bed of hydrophilic sealant, before skinning and curing begins, so that irregularities in concrete surface are completely filled and waterstop is bonded to sealant. After sealant has cured, install concrete nails, with washers of a diameter equal to waterstop width, to secure waterstop to concrete at maximum spacing of 1.5 feet.
   7. Prior to installing hydrophilic sealant, wire brush or sandblast the concrete surface to remove laitance and other materials that may interfere with bonding. Metal and PVC surfaces to receive sealant shall be cleaned of paint and any material that may interfere with bond. When sealant alone is shown or indicated in the Contract Documents, place sealant placed in built-up bead

which has a triangular cross section with each side of triangle at least 3/4-inch long, unless otherwise indicated in the Contract Documents. Do not place concrete until sealant has cured as recommended by sealant manufacturer.

3.7 BONDING AGENT

A. Use epoxy bonding agent for bonding of fresh concrete to concrete that has been in place for at least 60 days, and for bonding to existing concrete.

B. Use epoxy-cement bonding agent for the following:
   1. Bonding toppings and concrete fill to concrete that has been in place for at least 60 days, and for bonding to existing concrete.
   2. For locations where bonding agent is required and concrete cannot be placed within open time period of epoxy bonding agent.
   3. Bonding of horizontal construction joints where joints are required in accordance with the Drawings or approved by ENGINEER for foundation mats that are five feet thick or greater.

C. Use cement-water slurry as bonding agent for toppings and concrete fill to new concrete. Cement water slurry shall be worked into surface with stiff bristle broom and place the concrete before cement-water slurry dries.

D. Handle and store bonding agent in accordance with manufacturer's printed instructions and safety precautions.

E. Mix bonding agent in accordance with manufacturer's instructions.

F. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with bonding agent not less than 1/16-inch thick. Place fresh concrete while bonding agent is still tacky (within its open time), without removing in-place bonding agent coat, and as directed by manufacturer.

3.8 BEARING PAD INSTALLATION

A. Neoprene Bearing Pad: Install with water insensitive adhesive in accordance with manufacturer's instructions.

+ + END OF SECTION + +

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install cast-in-place concrete.
   2. The Work includes providing concrete consisting of portland cement, fine and coarse aggregate, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured. The Work also includes:
      a. Providing openings in concrete to accommodate the Work under this and other Sections, and building into the concrete all items such as sleeves, frames, anchorage devices, inserts, and all other items to be embedded in concrete Work.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

C. Classifications of Concrete:
   1. Class "A" concrete shall be steel-reinforced and includes the following:
      a. All concrete, unless otherwise shown or indicated.
   2. Class "B" concrete shall be placed without forms or with simple forms, with little or no reinforcing, and includes the following, unless otherwise shown or indicated:
      a. Concrete fill within structures.
      b. Duct banks.
      c. Unreinforced encasements.
      d. Curbs and gutters.
      e. Sidewalks.
      f. Thrust blocks.

D. Related Sections:
   1. Section 03100, Concrete Formwork.
   2. Section 03200, Concrete Reinforcement.
   3. Section 03251, Concrete Joints.
   4. Section 03600, Grout.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. AASHTO M 182, Specification for Burlap Cloth Made From Jute or Kenaf and Cotton Materials.
2. AASHTO TP23, Test Method for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.
3. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
4. ACI 214R, Evaluation of Strength Test Results of Concrete.
5. ACI 301, Specifications for Structural Concrete.
6. ACI 302.1R, Guide for Concrete Floor and Slab Construction.
7. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
8. ACI 305R, Specification for Hot Weather Concreting.
9. ACI 309R, Guide for Consolidation of Concrete.
10. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
11. ACI 350/350R, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
12. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
13. ASTM C33, Specification for Concrete Aggregates.
14. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
15. ASTM C42/C42M, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
16. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
17. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
18. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
19. ASTM C143/C143M, Test Method for Slump of Hydraulic- Cement Concrete.
20. ASTM C150, Specification for Portland Cement.
21. ASTM C157/C157M, Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
22. ASTM C171, Specification for Sheet Materials for Curing Concrete.
23. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
24. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
25. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
26. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
27. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
28. ASTM C618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
29. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
30. ASTM C1064/C1064M, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

31. ASTM C1077, Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
32. ASTM D1042, Test Method for Linear Dimensional Changes of Plastics Under Accelerated Service Conditions.
33. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
34. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
35. ASTM E1643, Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
36. ASTM E1745, Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
37. NSF/ANSI 61, Drinking Water System Components - Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Concrete Testing Laboratory:
      a. Employ independent testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes. Employ different laboratories for design of concrete mixes and field testing.
         1) Testing agency shall be in accordance with ASTM E329 and ASTM C1077.
         2) Testing laboratory shall have been inspected and passed within previous two years by Cement and Concrete Reference Laboratory (CCRL) of NIST for: testing concrete aggregates, and for preparing and testing concrete trial batches with or without admixtures.
         3) Selection of testing laboratory is subject to COUNTY's acceptance.
   2. Water Reducing Admixture Manufacturer:
      a. Water-reducing admixtures shall be manufactured under strict quality control in facilities operated under a quality assurance program. Submit copy of manufacturer's quality assurance handbook to document program existence.
      b. Manufacturer shall maintain a concrete testing laboratory approved by CCRL at NIST.
      c. Manufacturer shall be capable of providing services of qualified field service representatives at the Site.

B. Laboratory Trial Batch:
   1. Each concrete mix design specified shall be verified by laboratory trial batch, unless indicated otherwise.
   2. For classes of concrete that require air-entrainment, test the trial batch at highest percentage of air allowed for that class of concrete.
   3. Perform the following testing on each trial batch:
      a. Aggregate gradation for fine and coarse aggregates.

b. Fly ash testing to verify meeting specified properties, unless fly ash Supplier submits certification by an independent testing laboratory.
c. Slump.
d. Air content.
e. Compressive strength based on three cylinders each tested at seven days and at 28 days.
f. Shrinkage test in accordance with this Section, for Class "A" concrete.

4. Submit for each trial batch the following information:
a. Project identification name and number (if applicable).
b. Date of test report.
c. Complete identification of aggregate source of supply.
d. Tests of aggregates for compliance with the Contract Documents.
e. Scale weight of each aggregate.
f. Absorbed water in each aggregate.
g. Brand, type, and composition of cementitious materials.
h. Brand, type, and amount of each admixture.
i. Amounts of water used in trial mixes.
j. Proportions of each material per cubic yard.
k. Gross weight and yield per cubic yard of trial mixtures.
l. Measured slump.
m. Measured air content.
n. Compressive strength developed at seven days and 28 days, from not less than three test cylinders cast for each seven day and 28 day test, and for each design mix.
o. Shrinkage test results where required and as specified in this Section. Report results and averages for original length and at zero, seven, 14, 21, and 28 days of drying.

C. Shrinkage Test:
1. Perform drying shrinkage tests for trial batch as specified in this Section.
2. Drying shrinkage specimens shall be four-inch by four-inch by 11-inch prisms with effective gage length of ten inches; fabricated, cured, dried, and measured in accordance with ASTM C157 modified as follows: remove specimens from molds at an age of 23 hours, plus-or-minus one hour, after trial batching; shall be placed immediately in water at 70 degrees F plus-or-minus three degrees F for at least 30 minutes; and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F plus-or-minus three degrees F. Measurement to determine expansion expressed as percentage of original length shall be made at age of seven days. Length at age of seven days shall be base length for drying shrinkage calculations (zero days drying age). Immediately afterward store specimens in humidity-controlled room maintained at 73 degrees F plus-or-minus three degrees F, and 50 percent (plus-or-minus four percent) relative humidity for remainder of test. Obtain measurements to determine shrinkage expressed as percentage of base length and report measurements separately for seven, 14, 21, and 28 days of drying after seven days of moist curing.

3. Determine drying shrinkage deformation of each specimen as the difference between base length (at zero days drying age) and length after drying at each test age. Determine average drying shrinkage deformation of specimens to nearest 0.0001-inch at each test age. If drying shrinkage of a specimen departs from average of that test age by more than 0.0004-inch, results obtained from that specimen shall be disregarded. Report results of shrinkage test to nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from same concrete used for preparing drying shrinkage specimens. Tests shall be considered part of normal compression tests for the Work. Allowable shrinkage limitations shall be as specified in Part 2 of this Section.

D. Component Supply and Compatibility:
   1. Provide all admixture materials from a single manufacturer.

E. Concrete Coordination Conference:
   1. Conduct concrete coordination conference to review detailed requirements of CONTRACTOR's proposed concrete design mixes, to discuss procedures for producing proper concrete construction, and to clarify roles of the parties involved. CONTRACTOR shall organize and schedule the conference, and prepare and distribute to all parties attending conference minutes of the conference.
   2. Conduct concrete coordination conference no later than 14 days after the date the Contract Times commence running. Conference shall be held at mutually agreed upon date and time; conference shall be held at the Site unless otherwise mutually agreed upon. Notify all parties to attend concrete coordination conference not less than five days prior to scheduled date of conference.
   3. All parties involved in the concrete Work shall attend concrete coordination conference including, but not limited to, the following:
      a. CONTRACTOR.
      b. Field testing services representative.
      c. Concrete Subcontractor (if any).
      d. Reinforcing steel Subcontractor (if any) and reinforcing steel Supplier and detailer.
      e. Concrete Supplier.
      f. Admixture manufacturer's representative.
      g. ENGINEER.
      h. COUNTY.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. List of concrete materials and proportions for the proposed concrete mix designs. Include data sheets, test results, certifications, and mill reports to qualify the materials proposed for use in the mix designs. Do not start

laboratory trial batch testing until this submittal is approved by ENGINEER.

b. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.

2. Product Data:
   a. Manufacturers' specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.

B. Informational Submittals: Submit the following:
   1. Certifications:
      a. Notarized certification of conformance to reference standards used in this Section, when required by ENGINEER.
   2. Field Quality Control Submittals:
      a. Report of testing results for testing of field concrete cylinders for each required time period. Submit within 24 hours after completion of associated test. Test report shall include results of all testing required at time of sampling.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Transportation, Delivery, and Handling:
   1. Materials used for concrete shall be clean and free from foreign matter during transportation and handling, and kept separate until measured and placed into concrete mixer.
   2. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.

B. Storage:
   1. For storage, provide bins or platforms with hard, clean surfaces.

PART 2 – PRODUCTS

2.1 CEMENTITIOUS MATERIALS

A. Cement:
   1. Portland cement shall be Type II(MH) ASTM C150.
   2. Portland cement shall be produced by one facility. Alternate cement sources may be used provided that mix design has been approved and acceptable trial batch verifying performance has been made.
   3. Do not use cement that has deteriorated because of improper storage or handling.

B. Fly Ash Mineral Admixture:
   1. Mineral admixtures, when used, shall conform to the requirements of ASTM C618 Class F, except as follows:
      a. The loss on ignition shall be a maximum of four percent.
      b. The maximum percent of sulfur trioxide (SO3) shall be 4.0.
   2. Fly ash shall be considered to be a cementitious material.
   3. Laboratory trial batches shall be tested to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.

C. For all classes of concrete, with Type II Cement is used, fly ash shall be used within the following percentages by weight.
   1. When fly ash is used, material shall have minimum of 20 percent and maximum of 25 percent of total weight of cementitious material.

2.2 AGGREGATES

A. General:
   1. Aggregates shall conform to ASTM C33, Class Designation 4S, and as specified in this Section.
   2. Do not use aggregates containing soluble salts or other substances, such as iron sulfides, pyrite, marcasite, ochre, or other materials, that can cause stains on exposed concrete surfaces.

B. Fine Aggregate:
   1. Provide clean, sharp, natural sand free of loam, clay, lumps, and other deleterious substances.
   2. Dune sand, bank run sand, and manufactured sand are unacceptable.

C. Coarse Aggregate:
   1. Provide clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
      a. Crushed stone, processed from natural rock or stone.
      b. Washed gravel, either natural or crushed. Slag, pit gravel, and bank run gravel are unacceptable.

2.3 WATER

A. Water used in producing and curing concrete shall be clean and free of injurious quantities of oils, acids, alkalis, organic materials, and other substances that may be deleterious to concrete and steel.

2.4 CONCRETE ADMIXTURES

A. Provide admixtures in accordance with product manufacturer's published instructions. Admixtures shall be compatible with each other. Admixtures shall not contain thiocyanates, shall not contain more than 0.05 percent chloride ion, and shall

be non-toxic in the concrete mix after 30 days. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise approved by ENGINEER.

B. Air Entraining Admixtures: ASTM C260.
   1. Air entraining admixture shall be vinsol resin or vinsol rosin-based.

C. Water-Reducing Admixture: ASTM C494, Type A.
   1. Proportion Class "A" and Class "B" concrete with non-air entraining, normal setting, water-reducing, aqueous solution of modified organic polymer. Admixture shall not contain lignin, nitrates, or chlorides added during manufacturing.

D. High Range Water-Reducing Admixture (HRWR): ASTM C494, Type F/G.
   1. Use high range water-reducing admixture in the concrete classifications so specified or indicated. Use of HRWR admixture is allowed at CONTRACTOR's option in all other classifications of concrete. When used, HRWR admixture shall be added to concrete in accordance with admixture manufacturer's published instructions. Specific admixture formulation shall be as recommended by admixture manufacturer for Project conditions.

E. Set Control Admixtures: In accordance with ASTM C494. Use the following as required:
   1. Type B, Retarding.
   2. Type C, Accelerating.
   3. Type D, Water reducing and Retarding.
   4. Type E, Water reducing and Accelerating.
   5. Type F, Water-reducing, high range admixtures.
   6. Type G, Water-reducing, high range, and retarding admixtures.

F. Calcium Chloride: Do not use calcium chloride.

G. Shrinkage Reducing Admixture:
   1. Shrinkage reducing admixture may be used in mix design when necessary to conform to specified shrinkage limitations, provided that specified strength requirements are complied with and there is no reduction in sulfate resistance in the concrete and no increase in concrete permeability.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare concrete design mixes in accordance with Table 03300-A:

TABLE 03300-A
CONCRETE DESIGN MIX CRITERIA

Concrete Class	Coarse Aggregate[1]		Minimum Cementitious (lbs/cu yd)	Max. W/CM[4]	Slump[2]	Air (%)	Min. Comp Strength[3] (psi)
	Size A	Size B					
Class "A"	No. 57	No. 8	564	0.42	4" max.	6 +/- 1	4,500
Class "B"	No. 57 or No. 67		517	0.50	4" max.	6 +/- 1	3,000

Notes Applicable to Table 03300-A:

(1) Coarse aggregate size numbers refer to ASTM C33. Where Size A and B are designated in Table 03300-A, it is intended that the smaller Size B aggregate is to be added, replacing a portion of the coarse or fine aggregate, in the minimum amount necessary to make a workable and pumpable mix with sand content not exceeding 41 percent of total aggregate.

(2) Slumps indicated are prior to addition of high range water reducer (super plasticizer).

(3) Mix designs shall be made for all Classes so that the compressive strength achieved for laboratory trial batches will not be less than 125 percent of specified design strength.

(4) Quantity of water to be used in the determination of water-cementitious materials (W/CM) ratio shall include free water on aggregates in excess of SSD and water portion of admixtures.

B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, Site conditions, weather, test results, or other circumstances warrant; at no additional cost to COUNTY and as approved by ENGINEER. Before using adjusted concrete mixes, laboratory test data and strength results shall be submitted to and approved by ENGINEER.

C. Admixtures:

1. Use air-entraining admixture in concrete, unless otherwise shown or indicated. Add air-entraining admixture at admixture manufacturer's prescribed rate to produce concrete at point of placement having air content within prescribed limits.
2. Use water-reducing or high-range water-reducing admixtures in all Class "A".
3. Use amounts of admixtures recommended by admixture manufacturer for climatic conditions prevailing at the Site at time of placing. Adjust quantities and types of admixtures as required to maintain quality.

D. Slump Limits with High-Range Water Reducer:
   1. Slump shall not exceed four inches prior to adding high-range water reducer and shall not exceed eight inches, measured at point of placement, after adding high-range water reducer.

E. Shrinkage Limitation:
   1. Concrete shrinkage for specimens cast in laboratory from trial batch with total water of 30.2 gallons per cubic yard or less, as measured at 21-day drying age and at 28-day drying age shall not exceed 0.039 percent and 0.045 percent, respectively. For trial batch with total water of 32.7 gallons per cubic yard or greater respective limits shall not exceed 0.035 percent and 0.040 percent,. Limits in between shall be linear interpolated. Use mix design for construction that complies with trial batch shrinkage requirements. Shrinkage limitations apply to Class "A".
   2. Trial Batch Does Not Comply with Shrinkage Limitation:
      a. If trial batch results do not comply with shrinkage limitation specified in the Contract Documents, redesign the mix to reduce shrinkage.
      b. After mix has been repeatedly redesigned and ENGINEER is satisfied that all reasonable means to provide concrete mix that complies with shrinkage requirement have been exercised; and mix design still fails to comply with shrinkage limitation in the Contract Documents, ENGINEER reserves the right to accept the higher-shrinkage mix, provided that the quantity of shrinkage reinforcing in structures is increased.
      c. "Reasonable means" will be construed as reducing the total water content to a maximum of 27 gallons per cubic yard, having the large aggregate blended so that eight percent to 18 percent of combined aggregate is retained on each sieve, using an alternate aggregate source, and a combination of these means.
      d. Basis for shrinkage reinforcing increase will be proportional to amount that shrinkage value is over the specified shrinkage limitation and will be determined by ENGINEER. The cost of providing additional shrinkage reinforcement will be paid by the COUNTY.

2.6 BONDING AGENT

A. Provide epoxy and epoxy-cement bonding agents in accordance with Section 03251, Concrete Joints.

2.7 CONCRETE CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.

B. Curing Mats: Shall be heavy carpets or cotton mats, quilted at four inches on centers, and weighing minimum of 12 ounces per square yard when dry.

C. Moisture-Retaining Cover: Provide one of the following, complying with ASTM C171:
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap polyethylene sheet.

D. Liquid Curing Compound: ASTM C309 Type 1-D (water retention requirements):
   1. Provide fugitive dye.
   2. Curing compound shall be applied by roller or power sprayer.

2.8 FINISHING AIDS

A. Evaporation Retardant:
   1. Product and Manufacturer: Provide one of the following:
      a. Confilm, by Master Builders.
      b. Eucobar, by Euclid Chemical Company.
      c. SikaFilm, by Sika Corporation.
      d. Or equal.

2.9 CRACK INJECTION MATERIALS

A. Structural Crack Repair System:
   1. Epoxy for Injection: Low-viscosity, high-modulus moisture insensitive type.
   2. Products and Manufacturers: Provide one of the following:
      a. Sikadur 35, Hi-Mod L.V. and Sikadur 31, Hi-Mod Gel, by Sika Corporation.
      b. Eucopoxy Injection Resin, by Euclid Chemical Company.
      c. Or equal.

B. Non-structural Crack Repair System:
   1. Hydrophobic Polyurethane Chemical Grout:
      a. Provide hydrophobic polyurethane that forms a flexible gasket.
      b. Products and Manufacturers: Provide one of the following:
         1) SikaFix HH LV, by Sika Chemical Company.
         2) Hydro Active Flex SLV, by De Neef Construction Chemicals, Inc.
         3) Or equal.
      c. Shrinkage limit shall not exceed 4.0 percent in accordance with ASTM D1042.
      d. Minimum elongation of 250 percent in accordance with ASTM D3574.
      e. Minimum tensile strength of 150 psi in accordance with ASTM D3574.
   2. Hydrophilic Acrylate-Ester Resin:
      a. Hydrophilic crack repair system shall be acrylate-ester resin that forms a flexible gasket and increase in volume a minimum of 50 percent when in contact with water.
      b. Products and Manufacturers: Provide one of the following:

1) Duroseal Multigel 850, manufactured by BBZ USA, Inc.
2) Or equal.

2.10 CONCRETE REPAIR MATERIALS

A. Concrete repair mortar shall be pre-packaged, polymer-modified cementitious repair mortar with the following minimum properties:
   1. Compressive Strength at One Day: 2,000 psi (ASTM C109).
   2. Compressive Strength at 28 Days: 6,000 psi (ASTM C109).
   3. Bond Strength at 28 Days: 1,800 psi (ASTM C882 modified).

B. Products and Manufacturers: Provide one of the following:
   1. Five Star Structural Concrete, by Five Star Products, Inc. Use formulation recommended by manufacturer for the specific application conditions.
   2. SikaTop 122 Plus, SikaTop 123 Plus, SikaTop 111 Plus, or Sikacem 133, by Sika Corporation. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   3. Emaco S88-CA or S66-CR, by Master Builders Inc. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   4. Verticoat, Verticoat Supreme, or Euco SR-VO, by Euclid Chemical Company. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   5. Or equal.

C. Cement Mortar: Shall consist of mix of one part cement to 1.5 parts sand with sufficient water to form trowelable consistency. Minimum compressive strength at 28 days shall be 4,000 psi. Where required to match the color of adjacent concrete surfaces, blend white portland cement with standard portland cement so that, when dry, patching mortar matches the color of surrounding concrete.

2.11 CHEMICAL HARDENER

A. Provide clear chemical hardener of fluosilicate family.

B. Product and Manufacturer: Provide one of the following:
   1. Lapidolith, by Sonneborn ChemRex Inc.
   2. Hornolith, by A.C. Horn, Inc.
   3. Or equal.

2.12 SHAKE-ON METALLIC HARDENER

A. Provide metallic hardener formulated, processed, and packaged under stringent quality control at metallic hardener manufacturer-owned and -controlled factory. Hardener shall be a mixture of specially-processed and -graded aggregate, selected portland cement, and plasticizing agents.

B. Product and Manufacturer: Provide one of the following:
   1. Euco-Plate H.D., by Euclid Chemical Company.
   2. Masterplate 200, by Master Builders, Inc.
   3. Or equal.

2.13 VAPOR RETARDER

A. Accessories:
   1. Provide accessories by same manufacturer as vapor retarder.
   2. Seam Tape:
      a. Tape shall have water vapor transmission rate (ASTM E96) of 0.3 perms or lower.
      b. Products and Manufacturers: Provide one of the following:
         1) Stego Tape by Stego Industries LLC.
         2) Griffolyn Fab Tape by Reef Industries
         3) Moistop Tape by Fortifiber Industries.
         4) Or equal.
   3. Vapor Proofing Mastic:
      a. Mastic shall have a water vapor transmission rate ASTM E96, 0.3 perms or lower.
   4. Pipe Boots:
      a. Construct pipe boots from vapor barrier material, pressure sensitive tape, mastic, or a combination thereof, in accordance with manufacturer's recommendations.

2.14 SOURCE QUALITY CONTROL

A. Concrete materials may require testing, as directed by COUNTY or ENGINEER, at any time during the Work if concrete quality is in question. Provide access to material stockpiles and facilities at all times. Tests shall be done at no expense to COUNTY.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the Work will be performed and notify COUNTY in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 CONCRETE MIXING

A. General:

1. Concrete may be produced at batch plants or by the ready-mixed process. Batch plants shall comply with recommendations of ACI 304R and have sufficient capacity to produce concrete of qualities required and in quantities required to comply with the accepted Progress Schedule. All plant facilities are subject to acceptance of ENGINEER.
2. Mixing:
    a. Mix concrete with a rotating type batch machine, except where hand mixing of very small quantities is approved by ENGINEER.
    b. Remove hardened accumulations of cement and concrete from drum and blades to ensure proper mixing action.
    c. Replace mixer blades upon loss of ten percent of mixer blades' original height.

B. Ready-Mix Concrete:
1. Comply with ASTM C94 and the Contract Documents.
    a. Plant Equipment and Facilities: Conform to requirements of NRMCA certification.
    b. Mix concrete in revolving-type truck mixers that are in good condition and produce thoroughly-mixed concrete conforming to the Contract Documents.
    c. Do not exceed rated capacity of mixer.
    d. Mix concrete for minimum of two minutes after arrival at the Site, or as recommended by mixer manufacturer.
    e. Do not allow drum to mix while in transit.
    f. Mix at proper speed until concrete is discharged from mixer.
    g. Maintain adequate facilities at the Site for continuous delivery of concrete at required rates.
    h. Provide access to mixing plant for ENGINEER upon request.

C. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery to prevent delay of placing concrete after mixing, or holding dry-mixed materials too long in mixer before the adding water and admixtures.

3.3 TRANSPORTING CONCRETE

A. Transport and place concrete not more than 90 minutes after water has been added to the dry ingredients.

B. Avoid spilling and separation of concrete mixture during transportation.

C. Do not place concrete in which the ingredients have separated.

D. Do not retemper partially set concrete.

E. Use suitable equipment for transporting concrete from mixer to forms.

3.4 PREPARATION FOR CONCRETING

A. Submit to ENGINEER laboratory trial batch test results for proposed mixes at least 15 days prior to start of Work. Do not begin concrete production until associated laboratory trial batch test result submittal has been approved by ENGINEER.

B. Notify COUNTY AND ENGINEER a minimum of 24 hours in advance of placing concrete to allow for inspection of form work, joints, waterstops, reinforcement, embedded items, and vapor retarders. The section to be placed shall be fully prepared for concrete placement at the time of notice. Confirm inspection status with COUNTY AND ENGINEER a minimum of 4 hours prior to concrete placement. Do not begin placing concrete until Work is in conformance with the Contract Documents.

C. Subgrade surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

D. Reinforcing steel and embedded items shall be completely cleaned of mortar, loose rust, form release compounds, dirt, or any other substance which would interfere with proper bonding with concrete. Protective coatings on embedded aluminum items shall continuously cover the surface to be in contact with concrete. Any defects in the coating shall be repaired.

E. Do not place concrete until flow of water entering space to be filled with concrete has been properly stopped or has been diverted by pipes, or other means, and carried out of the forms, clear of the Work. Do not deposit concrete underwater, and do not allow water to rise on concrete surfaces until concrete has attained its initial set. Do not allow water to flow over concrete surface in manner and or velocity that will injure concrete surface finish. Provide temporary pumping or other dewatering operations for removing water as required.

F. Prepare joint surfaces in accordance with Section 03251, Concrete Joints.

3.5 CONCRETE PLACEMENT

A. General:
   1. Place concrete continuously, so that no concrete will be placed on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. If section cannot be placed continuously, provide construction joints in accordance with Section 03251, Concrete Joints.
   2. Deposit concrete as nearly as practical in its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to action that may cause segregation.

3. Screed concrete that is to receive other construction to proper level to avoid excessive skimming or grouting.
4. Do not use concrete that becomes non-plastic and unworkable, or does not conform to required quality limits, or that has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the Site and dispose of it in conformance with Laws and Regulations.
5. Do not place concrete until forms, bracing, reinforcing, and embedded items are each in final position and secure.
6. Do not place footings in freezing weather unless adequate precautions are taken against frost action.
7. Do not place footings, piers or pile caps on frozen soil.
8. Unless otherwise instructed, place concrete only when COUNTY representative is present.
9. Allow minimum of three days between adjoining concrete placements.

B. Bonding for Next Concrete Pour:
   1. Prepare for bonding of fresh concrete to concrete that has set but is not fully cured, as follows:
      a. Thoroughly wet the surface, but allow no free-standing water.
      b. For horizontal surfaces place a six-inch layer of Construction Joint Grout, as specified in Section 03600, Grout, over the hardened concrete surface.
      c. Place fresh concrete before the grout has attained its initial set.
   2. Accomplish bonding of fresh concrete to fully cured, hardened, existing concrete by using a bonding agent as specified in Section 03251, Concrete Joints.

C. Concrete Conveying:
   1. Handle concrete from point of delivery at the Site, transfer to concrete conveying equipment, and transfer to locations of final deposit as rapidly as practical by methods that prevent segregation and loss of concrete mix materials.
   2. Provide mechanical equipment for conveying concrete to ensure continuous flow of concrete at delivery end of conveyor. Provide runways for wheeled concrete conveying equipment from concrete delivery point to locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice, and other deleterious materials.
   3. Do not use chutes for distributing concrete, unless accepted by ENGINEER.
   4. Pumping concrete is allowed, however do not use aluminum pipe for conveying concrete.

D. Placing Concrete into Forms:
   1. Deposit concrete in forms in horizontal layers not deeper than 18 inches each and in manner that avoids inclined construction joints. Where placement consists of several layers, place concrete at such rate that concrete being integrated with fresh concrete while still plastic.

2. Do not allow concrete to free-fall within the form from height exceeding four feet. Where high-range water reducer is used to extend slump to at least six inches, maximum allowable free-fall of concrete is six feet. Use "elephant trunks" to prevent free-fall and excessive splashing of concrete on forms and reinforcing. Discontinue free-falls in excess of four feet if there is evidence of segregation.
3. Remove temporary spreaders in forms when concrete placing has reached elevation of such spreaders.
4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidating concrete in accordance with applicable recommended practices in ACI 309. Vibration of forms and reinforcing is not allowed unless otherwise accepted by ENGINEER.
5. Where height of concrete placement in walls exceeds 14 feet, provide temporary windows in formwork to facilitate vibration. Properly close temporary windows when height of concrete approaches windows. Determine location, size, and spacing of temporary windows to suit equipment used.
6. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly-spaced locations not farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate the layer of concrete and at least six inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcing and other embedded items without causing segregation of concrete mix.
7. Do not place concrete in beam and slab forms until concrete previously placed in columns and walls is no longer plastic.
8. Prevent voids in the concrete. Force concrete under pipes, sleeves, openings, and inserts from one side until visible from the other side.

E. Placing Concrete Slabs:
1. Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placing of a slab panel or section is completed.
2. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcing and other embedded items and into corners.
3. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs on ground, as specified in this Article for formed concrete structures.
4. Bring slab surfaces to correct elevation and level. Smooth the surface, leaving surface free of humps or hollows. Do not sprinkle water on surface while concrete is plastic. Do not disturb slab surfaces prior to commencing concrete finishing.
5. Where slabs are placed in conditions of high temperature or wind that could lead to formation of plastic shrinkage cracks, provide evaporation retardant

applied in accordance with retardant manufacturer's recommendations, when required by ENGINEER.

F. Quality of Concrete Work:
   1. Concrete shall be solid, compact, and smooth, and free of laitance, cracks, and cold joints.
   2. Concrete for liquid-retaining structures, and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
   3. Cut out and properly replace to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, surfaces with cracks or voids, that are unduly rough, or are defective in any other way. Thin patches or plastering are unacceptable.
   4. Leaks through concrete that exhibit flowing water, and cracks, holes, or other defective concrete in areas of potential leakage, shall be repaired and made watertight.
   5. Repair, removal, and replacement of defective concrete as directed by ENGINEER shall be at no additional cost to COUNTY.

G. Cold Weather Placing:
   1. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures, in compliance with ACI 306 and the Contract Documents.
   2. When air temperature has fallen to or may be expected to fall below 40 degrees F, provide adequate means to maintain temperature in area where concrete is being placed between 50 degrees F and 70 degrees F for at least seven days after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Maintain temporary heating and protection as necessary so that ambient temperature does not fall more than 30 degrees F in the 24 hours following the seven-day period. Avoid rapid dry-out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.
   3. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing for concrete as required to obtain concrete mixture temperature not less than 55 degrees F and not more than 85 degrees F at point of placement.
   4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Before placing concrete, verify that forms, reinforcing, and adjacent concrete surfaces are entirely free of frost, snow, and ice.
   5. Do not use salt or other materials containing antifreeze agents. Do not use chemical accelerators or set-control admixtures unless approved by ENGINEER and tested in mix design proposed for use.

H. Hot Weather Placing:
   1. When hot weather conditions exist that would impair the quality and strength of concrete, place concrete in compliance with ACI 305 and the Contract Documents.

2. When ambient air temperature is at or above 90 degrees F and rising, cool ingredients before mixing concrete to maintain concrete temperature at time of placement below 80 degrees F. When ambient air temperature is at or above 90 degrees F and falling, cool the ingredients before mixing concrete to maintain concrete temperature at time of placement below 85 degrees F. In no case shall the concrete temperature at time of placement exceed 90 degrees F.
3. Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided the water equivalent of ice is calculated in total amount of mixing water. If required, reduce the time from addition of mix water to placement, or use set-retarding admixture.
4. Cover reinforcing materials with water-soaked burlap if ambient air temperature becomes too hot, so that reinforcing material temperature does not exceed ambient air temperature immediately before embedment of reinforcing in concrete.
5. Wet forms thoroughly before placing concrete.
6. Do not place concrete at temperature that causes difficulty from loss of slump, flash set, or cold joints.
7. Do not use set-control admixtures unless approved by ENGINEER in mix design.
8. Obtain ENGINEER's approval of substitute methods and materials proposed for use.

3.6 FINISHING OF FORMED SURFACES

A. Standard Form Finish:
   1. Standard form finish shall be basically smooth and even, but is allowed to have texture imparted by the form material used. Repair defects in accordance with the Contract Documents.
   2. Use standard form finish for the following:
      a. Exterior vertical surfaces from foundation up to one foot below grade.
      b. Vertical surfaces not exposed to view.
      c. Other areas shown or indicated.

B. Smooth Form Finish:
   1. Produce smooth form finish by selecting form materials that will impart smooth, hard, uniform texture. Arrange panels in orderly and symmetrical manner with minimum of seams. Repair and patch defective areas in accordance with the Contract Documents.
   2. Use smooth form finish for the following:
      a. Exterior surfaces exposed to view.
      b. Surfaces to be covered with coating material. Coating material may be applied directly to concrete or may be a covering bonded to concrete such as waterproofing, dampproofing, painting, or other similar system.
      c. Interior vertical surfaces of liquid-containers.
      d. Interior and exterior exposed beams and undersides of slabs.
      e. Surfaces to receive abrasive blasted finish.

f. Surfaces to receive smooth rubbed or grout cleaned finish.
g. Other areas shown or indicated.

C. Related Unformed Surfaces:
1. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown or indicated.

3.7 SLAB FINISHES

A. Non-Slip Broom Finish:
1. Immediately after float finishing, slightly roughen concrete surface by brooming in direction perpendicular to main traffic route. Use fine fiber-bristle broom, unless otherwise directed by COUNTY. Coordinate required final finish with COUNTY before applying finish.
2. Use non-slip broom finish for the following:
a. Exterior exposed horizontal surfaces subject to lightweight foot traffic.
b. Interior and exterior concrete steps and ramps.

3.8 CONCRETE CURING AND PROTECTION

A. General:
1. Protect freshly placed concrete from premature drying, excessive cold or hot temperatures, and maintain without drying at relatively constant temperature for period necessary for hydration of cement and proper hardening of concrete.
2. Start curing after placing and finishing concrete, as soon as free moisture has disappeared from concrete surface. Keep surface continuously moist during entire curing period. Cure for a minimum of 10 days and in accordance with ACI 301 procedures. For concrete sections over 30-inches thick, the curing period shall be for a minimum of 14 days. Avoid rapid drying at end of final curing period.
3. For curing, use water that is free of impurities that could etch or discolor exposed concrete surfaces.
4. Confine water for curing to area being cured.

B. Curing Methods: Curing methods are specified below. Curing methods to be used on each type of concrete surface are specified elsewhere in this Article.
1. Water Curing. Cure by one of the following methods:
a. Keep concrete surface continuously wet.
b. Ponding or immersion.
c. Continuous water-fog spray.
d. Covering concrete surface with curing mats, thoroughly saturating mats with water, and keeping mats continuously wet with sprinklers or porous hoses. Place curing mats to cover concrete surfaces and edges with

four-inch horizontal lap over adjacent mats; provide eight-inch lap over adjacent mats at vertical surfaces. If necessary, weigh down curing cover to maintain contact with concrete surface.

2. Form Curing: Cure by one of the following methods:
   a. Forms shall be maintained and loosened during curing period.
   b. Immediately after forms are loosened or removed, continue with the required curing method as applicable, for remainder of curing period.
   c. Where wood forms are kept in place, apply water to keep forms wet.
3. Moisture Retaining Cover Curing. Cure as follows:
   a. Cover concrete surfaces with the required moisture retaining cover for curing concrete, placed in widest practical width with sides and ends lapped at least three inches and sealed using waterproof tape or adhesive. Immediately repair holes or tears during curing period using cover material and waterproof tape.
4. Liquid Compound Curing Cure as follows:
   a. Unless otherwise approved by ENGINEER, provide water curing or form curing. Request to use liquid curing compound will be considered by ENGINEER on case-by-case basis. Construction joints, formed surfaces prior to receiving specified form finish, and concrete to receive surface treatment where surface treatment will be bonded to concrete surface (such as, but not limited to grout fill, hardener, coatings, lining, water repellent, painting, resilient flooring, terrazzo flooring, ceramic tile, quarry tile, chemical resistant coatings, or other applications) shall be water-cured or form-cured.
   b. Apply curing compounds immediately after final finishing or after terminating water curing. Apply curing compound in continuous operation by power spray equipment in accordance with curing compound manufacturer's directions. If areas are subjected to rainfall within three hours after completing curing compound application, area shall be recoated. Maintain coating continuity and repair areas damaged during curing period.
   c. When liquid curing compound is used, apply first coat of liquid curing compound at compound manufacturer's recommended coverage rate, and subsequently apply second coat at identical rate, thus providing twice the curing compound manufacturer's recommended coverage.
   d. At end of curing period, remove liquid curing compound where required.

C. Formed Surfaces: Use the following curing methods:
   1. Walls That Will Retain Liquid or That are Under Ground Surface:
      a. If forms are wood, form curing is allowed for entire curing period. If forms are steel, form curing is allowed for maximum of three days after which forms shall be removed so that concrete is free of the forms for remainder of the curing process.
      b. Immediately after the forms are loosened or removed, continue with water curing for remainder of curing period.

c. When wall surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed. Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.

2. Formed Slab Underside and Beam Surfaces Where Will Retain Liquid:
   a. Form curing is allowed for the full curing period.
   b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.
   c. When slab surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed.
3. Vertical Joint Surfaces and Surfaces to Receive Surface Treatment:
   a. Form curing is allowed for entire curing period.
   b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.
4. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

D. Unformed Surfaces: Treat with one of the following curing methods:
   1. Slabs and Mats That Will Retain Liquid or are Below Ground Surface:
      a. Water curing.
      b. Moisture-retaining cover curing when allowed by ENGINEER.
      c. When slab or mat surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed. Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.
   2. Construction Joint Surfaces and Slab and Mat Surfaces to Receive Surface Treatment.
      a. Water curing.
      b. Moisture-retaining cover curing.
   3. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

E. Temperature of Concrete During Curing:
   1. When ambient temperature is 40 degrees F or less, continuously maintain concrete temperature between 50 degrees F and 70 degrees F throughout curing period. When necessary, before concrete placing provide for temporary heating, covering, insulation, or housing as required to continuously maintain specified temperatures and moisture conditions throughout concrete curing period. Provide cold weather protection in accordance with ACI 306.
   2. When the ambient temperature is 80 degrees F and above, or during other climatic conditions that would cause too-rapid drying of concrete, before starting concrete placing, provide wind breaks and shading as required, and fog spraying, wet sprinkling, or moisture retaining coverings as required. Continuously protect concrete throughout concrete curing period. Provide hot weather protection in accordance with ACI 305, unless otherwise specified.

3. Maintain concrete temperature as uniformly as possible, and protect from rapid ambient temperature changes. Avoid concrete temperature changes that exceed five degrees F in one hour and 50 degrees F in 24-hour period.

F. Protection:
1. During curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and damage by rain and flowing water. Protect finished concrete surfaces from damage by subsequent construction operations.

3.9 CONCRETE INSTALLATION TOLERANCES

A. Installation Tolerances:
1. Concrete placement tolerances, unless otherwise specified in the Contract Documents, shall be in accordance with ACI 117.
2. Notify COUNTY in writing when concrete placement does not conform with required tolerances, as soon as the condition is known to CONTRACTOR.
3. When concrete installation does not conform to required tolerances, do not repair or correct by grinding unless specified in the Contract Documents or approved by ENGINEER in writing.
4. Verification Measurements:
   a. If surfaces where tolerances are in question, obtain measurements to verify conformance with tolerances in manner acceptable to ENGINEER.
   b. If surfaces tolerances are in question, cost of obtaining measurements shall be at no additional cost to the COUNTY.
   c. Before obtaining measurements, obtain ENGINEER's acceptance of method proposed for obtaining measurements.
   d. After obtaining measurements, submit measurements to ENGINEER.
5. Submit with verification measurements submittal proposed method to rectify out-of-tolerance concrete. Do not start repair Work without obtaining ENGINEER's approval.

3.10 FIELD QUALITY CONTROL

A. Field Testing Services:
1. COUNTY will employ testing laboratory to perform field quality control testing for concrete. ENGINEER will direct the testing requirements.
2. Testing laboratory will make standard compression test cylinders and entrained air tests as specified in this Article, under observation of ENGINEER or COUNTY.
3. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including: scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.
4. CONTRACTOR shall provide all curing and necessary cylinder storage.

B. Quality Control Testing During Construction:

1. Perform sampling and testing for field quality control during placement of concrete, as follows:
   a. Sampling Fresh Concrete: ASTM C172.
   b. Slump: ASTM C143; one test for each concrete load at point of discharge.
   c. Concrete Temperature: ASTM C1064; one for every two concrete loads at point of discharge, and when a change in the concrete is observed. Test each load when time from batching to placement exceeds 75 minutes.
   d. Air Content: ASTM C231; one for every two concrete load at point of discharge, and when a change in the concrete is observed.
   e. Unit Weight: ASTM C138; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
   f. Compression Test Specimens:
      1) In accordance with ASTM C31; make one set of compression cylinders for each 50 cubic yards of concrete, or fraction thereof, of each mix design placed each day. Each set shall be four standard cylinders, unless otherwise directed by ENGINEER.
      2) Cast, store, and cure specimens in accordance with ASTM C31.
      3) Test and record the following when cylinders are cast: slump, concrete temperature, air content, and unit weight.
   g. Compressive Strength Tests:
      1) In accordance with ASTM C39; one specimen tested at seven days, and three specimens tested at 28 days.
      2) Adjust mix design if test results are unsatisfactory and resubmit for approval.
      3) Concrete that does not comply with strength requirements will be considered as defective Work.
   h. Water/Cementitious Materials Ratio: Perform one test from each sample from which compression test specimens are taken, in accordance with AASHTO TP23.
   i. Within 24 hours of completion of test, testing laboratory will submit certified copy of test results to CONTRACTOR and ENGINEER.

C. Evaluation of Field Quality Control Tests:
   1. Do not use concrete delivered to final point of placement having slump, concrete temperature, total air content or unit weight outside specified values.
   2. Water/Cementitious Materials Ratio:
      a. When water content testing indicates water/cementitious materials ratio to exceed specified requirements by greater than 0.02, remaining batches required to complete concrete placement shall have water content decreased in the mix and water reducing admixture dosage increased as required to bring subsequently-batched concrete within specified water/cementitious materials ratio.
      b. Perform additional testing to verify compliance with specified water/cementitious materials ratio.

c. Do not resume concrete production for further concrete placement until CONTRACTOR has identified cause of excess water in the mix and revised batching procedures, or adjusted the mix design (and obtained ENGINEER's associated approval) to bring water/cementitious materials ratio into conformance with the Contract Documents.

3. Compressive Strength:
   a. Compressive strength tests for laboratory-cured cylinders will be acceptable if the averages of all sets of three consecutive compressive strength tests results equal or exceed specified 28-day design compressive strength of the associated type or class of concrete, and no individual strength test falls below required compressive strength by more than 500 psi.
   b. Questionable Field Conditions During Concrete Placement:
      1) Where questionable field conditions exist during concrete placement or immediately thereafter, strength tests of specimens cured under field conditions will be required by ENGINEER to check adequacy of curing and protecting of concrete placed. Specimens shall be molded at the same time and from the same samples as laboratory-cured specimens.
      2) Provide improved means and procedures for protecting concrete when 28-day compressive strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders.
      3) When laboratory-cured cylinder strengths are appreciably higher than minimum required compressive strength, field-cured cylinder strengths need not exceed minimum required compressive strength by greater than 500 psi even though the 85 percent criterion may not be met.
      4) If individual tests of laboratory-cured specimens produce strengths more than 500 psi below the required minimum compressive strength, or if tests of field-cured cylinders indicate deficiencies in protection and curing, provide additional measures to ensure that load-bearing capacity of the structure is not jeopardized or impaired. If likelihood of low-strength concrete is confirmed and evaluations indicate load-bearing capacity may have been reduced, perform tests of cores from the concrete in question at CONTRACTOR's expense.
   c. If compressive strength tests fail to indicate compliance with minimum requirements of the Contract Documents, concrete represented by such tests will be considered defective.

D. Testing Concrete Structure for Strength:
   1. When there is evidence that strength of in-place concrete does not comply with the Contract Documents, CONTRACTOR shall employ the services of concrete testing laboratory to obtain cores from hardened concrete for compressive strength determination. Cores and tests shall comply with ASTM C42 and the following:

a. Obtain at least three representative cores from each concrete member or suspect area of concrete at locations directed by ENGINEER.
b. Strength of concrete for each series of cores will be acceptable if average compressive strength is at least 85 percent of specified compressive strength and no single core is less than 75 percent of required 28-day required concrete compressive strength.
c. Testing laboratory shall submit test results to ENGINEER on same day that tests are completed. Include in test reports Project name and number (if any), date of sampling and testing, CONTRACTOR name, name of concrete testing laboratory, exact location of test core in the Work, type or class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength, and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plane of concrete as placed, and moisture condition of the core at time of testing.

2. Fill core holes solid with non-shrink grout in accordance with Section 03600, Grout, and finish to match adjacent concrete surfaces.
3. If results of core tests are unacceptable or if it is impractical to obtain cores, perform static load test and evaluations complying with ACI 318 and ACI 350, as directed by ENGINEER.

E. Concrete Tolerance Verification Measurements: Refer to Article 3.9 of this Section.

F. Supplier's Services:
1. Water-Reducing Admixture Manufacturer: Furnish services of qualified concrete technician employed by admixture manufacturer to assist in proportioning concrete for optimum use of admixture. Concrete technician shall advise on proper addition of admixture to concrete and on adjustment of concrete mix proportions to meet changing conditions at the Site.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Temporary Openings:
1. Openings in concrete walls and slabs required for passage of Work are allowed only upon approval of ENGINEER.
2. Temporary openings made in concrete shall be provided with waterstop in below-ground or liquid-retaining members and structures. Reinforcement going through and around the opening shall be made continuous to provide continuity and shall be approved by the ENGINEER.
3. Temporary openings that remain in concrete structures shall be filled with the same class of concrete as the adjoining construction, after the Work causing need for temporary opening is complete, unless otherwise shown or directed by ENGINEER. Mix, place, and cure concrete as specified in this Section to blend with in-place construction. Provide miscellaneous concrete filling shown or required to complete the Work.

B. Bases or Pads for Piping, Panels, and Equipment:
   1. Unless specifically shown or indicated otherwise, provide concrete bases or pads for equipment, floor-mounted panels, and floor-mounted supports for piping and similar construction. Provide all concrete pad and base Work not specifically included under other Sections.
   2. Dimensions and Elevations:
      a. Coordinate and construct bases and pads to dimensions shown or indicated, or as required to comply with equipment, panel, or piping manufacturer's requirements and elevations indicated on the Drawing.
      b. Unless otherwise shown or indicated, place concrete bases for equipment up to one-inch below the equipment manufacturer's base or mounting plate.
      c. Where specific dimensions or elevations are not shown or indicated, bases and pads shall be six inches thick and extend three inches outside dimensions of the equipment, panel, or supports.
   3. Finish: Bases and pads outside of areas to receive non-shrink grout shall have smooth trowel finish, unless special finish such as terrazzo, ceramic tile, quarry tile, or heavy-duty concrete topping is required. In such cases, provide appropriate concrete finish. Surfaces of bases and pads to receive non-shrink grout shall have broom finish.

C. Curbs:
   1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green followed by steel-troweling surfaces to hard, dense finish with corners, intersections, and terminations slightly rounded.
   2. Exterior curbs shall have rubbed finish for vertical surfaces and broomed finish for top surfaces.

3.12 REPAIR OF CONCRETE PLACED UNDER THIS CONTRACT

A. Repair of Formed Surfaces:
   1. Repair the following defects in all formed finishes:
      a. Spalls, air bubbles, rock pockets, form depressions, and other defects that are more than 1/4-inch in depth.
      b. Holes from tie rods and other form tie systems.
      c. Fins, offsets, and other projections that extend more than 1/4-inch beyond designated concrete member surface.
      d. Structural cracks, as defined by ENGINEER.
      e. Non-structural cracks greater than 0.010-inch wide as defined by ENGINEER. In liquid-retaining structures, elevated slabs subject to the elements or washdowns, below-grade members, and cracks that evidence leakage. Where it is not possible to verify whether a crack is leaking, repair the crack.
   2. Repair the following defects in smooth-finish surfaces, in addition to those listed above in this Section:

a. Spalls, air bubbles, rock pockets, form depressions, and other defects that extend to more than 1/2-inch in width in any direction, no matter how deep.
b. Spalls, air bubbles, rock pockets, form depressions, and other defects of any size that exceed three in number in a 12-inch by 12-inch area, or 12 in number in a three-foot by three-foot area.
c. Fins, offsets, and other projections shall be completely removed and smoothed.
d. Scratches and gouges in concrete surface.
e. Texture and color irregularities. In liquid-retaining surfaces, texture and color irregularities need not be repaired when greater than 12 inches below minimum normal operating liquid surface elevation, except where such defects are indicative of reduced durability.

B. Method of Repair of Formed Surfaces:
1. Immediately after removing forms, repair and patch defective areas with cement mortar or concrete repair mortar as directed by ENGINEER.
2. Honeycombs, Rock Pockets, and Holes Left by Tie Rods and Bolts:
a. Cut out honeycomb, rock pockets, voids, and holes left by tie rods and bolts, down to solid concrete but, in no case, to depth less than one-inch for cement mortar and 1/2-inch for repair mortar. Make edges of cuts perpendicular to concrete surface.
b. Before placing cement mortar, thoroughly clean and brush-coat area to be patched with specified bonding agent.
c. When using concrete repair mortar, use of bonding agent is optional; prepare the surface and place mortar in accordance with mortar manufacturer's recommendations.
d. Repairs at exposed-to-view surfaces shall match the color of surrounding concrete, except color matching is not required for interior surfaces of liquid-retaining surfaces up to one foot below typical minimum liquid level. Impart texture to repaired surfaces to match texture of existing adjacent surfaces. Provide test areas at inconspicuous locations to verify mixture, texture, and color match before proceeding with patching.
e. Compact mortar in place and strike off slightly higher than the surrounding surface.
3. Structural Cracks: Pressure-grout structural cracks using injectable epoxy installed using pressurized system. Apply in accordance with epoxy manufacturer's directions and recommendations.
4. Non-structural Cracks: Shall be pressure-grouted using hydrophobic or hydrophilic resin. Install in accordance with resin manufacturer's directions and recommendations.
5. Determination of the crack type shall be made by the ENGINEER.
6. Holes Through Concrete:
a. Using plunger-type gun or other suitable device, fill holes extending through concrete from least-exposed face, using flush stop held at exposed face; completely fill the hole with specified repair material.

b. At below-grade and liquid-containing members, fill holes with concrete repair mortar and use color-matched cement mortar for outer two inches at exposed-to-view surfaces.

7. Where powerwashing or scrubbing is not adequate, abrasive blast exposed-to-view surfaces that require removal of stains, grout accumulations, sealing compounds, and other substances marring the surfaces. Use sand finer than No. 30 and air pressure from 15 to 25 psi.

C. Repair of Unformed Surfaces:
1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to specified tolerances for each surface and finish. Correct low and high areas in accordance with this Section.
2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using template having the required slope. Correct high and low areas in accordance with this Section.
3. Repair finish of unformed surfaces containing defects that adversely affect concrete durability. Surface defects include crazing, cracks in excess of 0.01-inch wide, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
4. Repair structural cracks in all structures and non-structural cracks in liquid-retaining structures. In liquid-retaining structures, where dry face of concrete member can be observed, repair all cracks evidencing any rate of water flow through crack. Where dry face of member cannot be observed, repair all cracks.

D. Methods of Repair of Unformed Surfaces:
1. Correct high areas in unformed surfaces by grinding, after concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.
2. Correct low areas in unformed surfaces, during or immediately after completion of surface finishing, by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Where repairs are required and concrete has already set, sawcut around perimeter of area to be repaired to depth of 1/2-inch and remove concrete so that minimum thickness of repair is 1/2-inch. Apply specified concrete repair mortar in accordance with repair mortar manufacturer's directions and recommendations.
3. Repair defective areas, except random cracks and single holes not exceeding one-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4-inch clearance all around. Minimum thickness of repair shall be 1.5 inches. Dampen concrete surfaces in contact with patching concrete and brush with specified bonding agent. Place patching concrete while bonding agent is tacky. Mix patching concrete of same materials and proportions to provide concrete of same classification as original, adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

4. Repair isolated, random, non-structural cracks (in members that are not below grade or liquid-retaining), and single holes not greater than one-inch diameter, by dry-pack method. Groove top of cracks, and cut out holes to sound concrete, and clean repair area of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack before cement grout takes its initial set. Mix dry-pack, consisting of one part portland cement to 2.5 parts fine aggregate passing No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for at least 72 hours.
5. Structural cracks shall be pressure-grouted using injectable epoxy. Apply in accordance with epoxy manufacturer's directions and recommendations.
6. Non-structural cracks in below-grade and liquid-retaining structures shall be pressure-grouted using hydrophilic resin. Apply in accordance with resin manufacturer's directions and recommendations.
7. Determination of crack type will be by ENGINEER.
8. Ensure that surface is acceptable for flooring material to be installed in accordance with flooring manufacturer's recommendations.

E. Other Methods of Repair:
   1. Repair methods not specified in this Section may be used when approved by ENGINEER.

+ + END OF SECTION + +

SECTION 03431

PRECAST CONCRETE VAULTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install all precast concrete structures.

B. General:
   1. Structures shall conform in shape, size, dimensions, material, and other respects to the details shown or as ordered by ENGINEER.
   2. Concrete for cast-in-place manholes and for inverts in precast and masonry manholes shall be Class A and shall conform to the requirements specified under Section 03300.

C. Related Sections:
   1. Division 2 Sections on Site work.
   2. Section 03300, Cast-in-Place Concrete.
   3. Section 05542, Floor Access Hatch Covers.
   4. Division 15 Sections on Piping.

1.2 QUALITY ASSURANCE

A. Reference Standards:
   1. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   2. ASTM A 82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   3. ASTM A 153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A 185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   5. ASTM A 497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   6. ASTM A 615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   7. ASTM A 706, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   8. ASTM C 33, Standard Specification for Concrete Aggregates.

9. ASTM C 150, Standard Specification for Portland Cement.
10. ASTM C 260, Air-Entraining Admixtures for Concrete.
11. ASTM C494, Standard Specification for Chemical Admixtures for Concrete.
12. ASTM C 478, Specification for Precast Reinforced Concrete Manhole Sections. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
13. PCI MNL 116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
14. PCI MNL 120, PCI Design Handbook - Precast and Prestressed Concrete.

B. Fabrication Tolerances:
1. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116, unless otherwise indicated. Keep bar sizes small, even where this will reduce the spacing of the bars.
2. Units shall be true to dimensions. Unit bow, as fabricated and installed, shall not exceed 1/8 inch per unit in the short dimension and 1/4 inch per unit in the long dimension. Step in alignment face and jog in alignment shall not exceed 1/4 inch. Provide a 3/4-inch chamfer or 1x2-inch radius on all exposed edges and corners.
3. Imperfections such as air bubbles, ripples, joint lines, warpage, stains, projections, honeycombs, uneven matrix plate, and other defects will not be acceptable.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
1. Precast Structures:
a. Drawing showing design and construction of all precast concrete, as well as the location and details of all items that are to be embedded in the precast units.
b. Design calculations, shop drawings, signed and stamped with a seal of a Registered Professional Engineer licensed to practice in the State of Florida shall be submitted for information only review.
c. Test result from concrete cylinder strength tests.

B. Shop Tests:
1. Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test. At a minimum, conduct the following shop tests:
a. Conduct concrete cylinder strength tests. Cylinders shall be cured in the same manner as the precast structures. Collect a minimum of five test cylinders from every 50 cubic yards of concrete poured at a minimum.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
   1. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation.

B. Storage of Materials:
   1. Store units at project site in a manner that will prevent cracking, distortion, warping, staining, or other physical damage and so that precast copings are without damage at time of installation.

C. Handling of Materials:
   1. Lift and support units only at designated lifting or supporting points as shown on final Shop Drawings.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Layout and details shall be as shown and specified. Design shall be adequate to withstand live loads, lateral earth pressure loading, and uplift case.
   1. Design Criteria:
      a. Live load on the top slab shall be 300 psf or AASHTO HS-20 truck wheel loads, whichever causes the greater stress.
      b. Lateral soil pressure above ground water surface: 60 pcf equivalent fluid pressure.
      c. Lateral soil pressure below ground water surface: 90 pcf equivalent fluid pressure.
      d. Maximum allowable soil bearing pressure: 2000 psf.
      e. Unit weight of soil = 115 pcf.
      f. Ground water table at grade elevation.
      g. Vertical surcharge on soil of 300 psf.
      h. Safety factor for uplift > 1.5.
   2. Design shall meet the requirements of ACI 350, PCI MNL 120, and the Building Code of the State of Florida.

B. Concrete Mix: Standard-weight concrete consisting of specified portland cement, pigments, aggregates, admixtures, and water to produce the following properties:
   1. Compressive Strength: 5,000 psi minimum at 28 days.
   2. Total Air Content: Not less than 1 percent nor more than 6 percent.

C. Where precast structures are made up of various precast components such as base sections, riser sections and top sections, the joint between sections shall be watertight and be the tongue and groove type complying with AWWA C302.

D. Walls shall be precast with flanged wall pipes or with pipe sleeves with water stop suitable for use with mechanical link seal as shown on the Drawings.

E. Precast structure shall be designed and constructed to accept access hatches as shown and specified on the Drawings.

F. Precast structures shall be designed to support the weight of equipment lifted from the station to the top slab.

G. Underground precast units shall have a shop-applied coal tar epoxy applied to the exterior surface.

H. Lifting holes, if used, shall be tapered. Tapered, solid rubber plugs shall be furnished to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face only.

I. Mark date of manufacture and name of trademark of manufacturer on inside of barrel.

2.2 ACCESS HATCHES

A. All necessary access hatches as shown and specified shall be cast into concrete as necessary.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and his installer shall examine the substrate and the conditions under which Work is to be performed and notify COUNTY of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to COUNTY

3.2 INSTALLATION

A. Set units in true alignment. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface. Raised or rough joint finishes will not be accepted.

B. Precast structures shall be set on a crushed stone, crushed gravel, or concrete foundation as shown on drawings and in accordance with geotechnical recommendations. Precast units shall be set at the proper grade and carefully leveled and aligned.

C. Install units in accordance with manufacturer's recommendations.

D. Replace precast concrete units damaged for any reason or which fail to perform as specified.

3.3 PRECAST SECTIONS

A. Set sections vertical and in true alignment. The base of the bell or groove end at joints between components shall be buttered with 1:2 cement-sand mortar to provide a uniform bearing between components. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface. Raised or rough joint finishes will not be accepted.

B. Install sections, joints and gaskets in accordance with manufacturer's recommendations.

C. Lifting holes shall be sealed tight with a solid rubber plug driven into the hole from the outside of the barrel and the remaining void filled with 1 to 2 cement-sand mortar.

3.4 VAULT WATERTIGHTNESS

A. All manholes shall be free of visible leakage. Each manhole shall be tested for leaks and inspected, and all leaks shall be repaired in a manner subject to ENGINEER'S approval.

B. Testing:
   1. All vaults and chambers shall be field-tested.
   2. Any vault which fails the test applied shall be repaired and retested by CONTRACTOR at his expense until satisfactory results are obtained.
   3. Any leaks discovered after testing and/or during the maintenance period shall be repaired by CONTRACTOR at his expense. Any leaks discovered after the initial testing shall require re-testing of the vault after repairs are made.
   4. All precast vaults shall be free of all visible leaks. Any vault section exhibiting visible leaks shall be replaced by CONTACTOR at his expense. Any repairs proposed require approval of ENGINEER.

5. Testing requirements of this section apply to all special chambers as well as vaults.

+ + END OF SECTION + +

SECTION 03600

GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install grout.
   2. The types of grout include the following:
      a. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced. Two classes of non-shrink grout (Class I and II) and areas of application are specified herein.
      b. Non-Shrink Epoxy Grout (Class III).
      c. Grout Fill, Topping Grout.
      d. Construction Joint Grout.

B. Related Sections:
   1. Section 03251, Concrete Joints.
   2. Section 03300, Cast-In-Place Concrete.
   3. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

C. Application: The following is a listing of typical applications and the corresponding type of grout which is to be used. Unless otherwise indicated, grouts shall be provided as listed below whether called for on the Drawings or not.

Application	Type of Grout
Beam and column (1 or 2 story) base plates and precast concrete bearing less than 16-inches in the least dimension.	Non-shrink Class II.
Column base plates and precast concrete bearing (greater than 2 story or larger than 16-inches in the least dimension).	Non-shrink Class I.
Base plates for storage tanks and other non-motorized equipment and machinery less than 50 horsepower.	Non-shrink Class I.

Machinery over 50 horsepower and equipment under 50 horsepower but subject to severe shock loads and high vibration.	Non-shrink Class III.
Filling blockout spaces for embedded items such as railing posts, gate guide frames, etc.	Non-shrink Class II (Class I where placement time exceeds 15 minutes).
Toppings and concrete fill less than 4-inches thick.	Grout Fill, Topping Grout.
Toppings and concrete fill greater than 4-inches thick.	Class "A" Concrete in accordance with Section 03300, Cast-In-Place Concrete.
All anchor bolts and reinforcing steel set in grout.	Refer to Section 03200, Concrete Reinforcement, and Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
Applications not listed above, where grout is called for on the Drawings.	Non-shrink Class I, unless noted otherwise.

1.2 REFERENCES

A. Standards referenced in this Section are:
1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavy-Weight and Mass Concrete.
2. ACI 301, Specification for Structural Concrete (Includes ASTM Standards referred to herein).
3. ASTM C33, Specification for Concrete Aggregates.
4. ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-in. or 50 mm. Cube Specimens).
5. ASTM C150, Specification for Portland Cement.
6. ASTM C230, Specification for Flow Table for use in Tests of Hydraulic Cement.
7. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacings.
8. ASTM C579, Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes.
9. ASTM C827, Test Method for Early Volume Change of Cementitious Mixtures.

10. ASTM C882, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete.
11. ASTM C937, Specification for Grout Fluidifier for Preplaced-Aggregate Concrete.
12. ASTM C939, Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
13. ASTM C1107, Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
14. ASTM C1181, Test Method for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
15. ASTM D696, Test Method for Coefficient of Linear Thermal Expansion of Plastics.

1.3 QUALITY ASSURANCE

A. Field Tests:
   1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the ENGINEER to ensure continued compliance with these Specifications. The specimens will be made by the COUNTY or its representative.
   2. Compression tests and fabrication of specimens for non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at seven days, 28 days, and each additional time period as appropriate.
   3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at seven days, and each earlier time period as appropriate.
   4. The cost of all laboratory tests on grout will be borne by the COUNTY, but CONTRACTOR shall assist the COUNTY in obtaining specimens for testing. However, CONTRACTOR shall be charged for the cost of any additional tests and investigation on Work performed which does not conform to the requirements of the Specifications. CONTRACTOR shall supply all materials necessary for fabricating the test specimens.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following:
   1. For Grout Fill and Construction Joint Grout, copies of grout design mix and laboratory test reports for grout strength tests.

B. Reports and Certificates, submit for approval the following:
   1. For proprietary materials, submit copies of manufacturer's certification of compliance with the specified properties for Class I, II, and III grouts.

2. Submit certified testing lab reports for ASTM C 1107, Grade B and Grade C (as revised herein) requirements for Class I and II grouts tested at a fluid consistency for temperatures of 45, 73.4, 90°F with a pot life of 30 minutes at fluid consistency.
3. Submit certification that materials conform to the Specifications requirements for nonproprietary materials.
4. Submit certifications that all grouts used on the project are free of chlorides or other chemicals causing corrosion.
5. Manufacturer's specifications and installation instructions for all proprietary materials.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Grout materials from manufacturers shall be delivered in unopened containers and shall bear intact manufacturer's labels.

B. Storage of Materials: Store grout materials in a dry shelter and protect from moisture.

PART 2 - PRODUCTS

2.1 GROUTS

A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.

B. Class I, Non-Shrink Grout:
1. Class I, non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Grout is for precision grouting and where water-tightness and non-shrink reliability in both plastic and hardened states are critical. Refer to areas of application as specified in this Section.
2. Meet requirements of ASTM C1107 Grade C and B (as modified below) when tested using amount of water required to achieve the following properties:
   a. Fluid consistency (20 to 30 seconds) in accordance with ASTM C939.
   b. At temperatures of 45, 73.4, and 95 degrees F.
3. Length change from placement to time of final set shall not have a shrinkage greater than amount of expansion measured at three or fourteen days. Expansion at three or fourteen days shall not exceed the 28-day expansion.
4. Non-shrink property is not based on a chemically generated gas or gypsum expansion.

5. Fluid grout shall pass through the flow cone, with a continuous flow, one hour after mixing.
6. Products and Manufacturer: Provide products of one of the following:
   a. Masterflow 928, manufactured by Master Builders, Inc.
   b. Five Star Grout, manufactured by Five Star Products, Inc.
   c. Hi-Flow Grout, manufactured by the Euclid Chemical Company.
   d. Or equal.

C. Class II Non-Shrink Grout:
1. Class II, non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Grout is for general purpose grouting applications as specified in this Section.
2. Meet requirements of ASTM C1107 and the following requirements when tested using amount of water required to achieve the following properties:
   a. Flowable consistency (140 percent flow on ASTM C230, five drops in 30 seconds).
   b. Fluid working time of at least 15 minutes.
   c. Flowable for at least 30 minutes.
3. Grout when tested shall not bleed at maximum allowed water.
4. Non-shrink property is not based on a chemically generated gas or gypsum expansion.
5. Products and Manufacturer: Provide products of one of the following:
   a. Construction Grout, manufactured by Master Builders, Inc.
   b. NBEC Grout, manufactured by Five Star Products, Inc.
   c. NS Grout, manufactured by the Euclid Chemical Company.
   d. Or equal.

D. Class III Non-Shrink Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. Epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. Resin component shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not allowed unless specifically recommended by manufacturer. Manufacturer's instructions shall be printed on each container in which products are packaged. The following properties shall be attained with minimum quantity of aggregate allowed by manufacturer.
2. Products and Manufacturer: Provide products of one of the following:
   a. Euco High Strength Grout, manufactured by The Euclid Chemical Company.
   b. Sikadur 42 Grout Pak, manufactured by Sika Corporation.
   c. Five Star Epoxy Grout, manufactured by Five Star Products, Incorporated.
   d. Or equal.

3. Vertical volume change at all times before hardening shall be between zero percent shrinkage and 4.0 percent expansion when measured according to ASTM C827 (modified for epoxy grouts by using an indicator ball with a specific gravity between 0.9 and 1.1). Alternately, epoxy grouts that maintain an effective bearing area of not less than 95 percent are acceptable.
4. Length change after hardening shall be less than 0.0006 inch per inch and coefficient of thermal expansion shall be less than 0.00003 inch per inch per degree F when tested in accordance with requirements of ASTM C531.
5. Compressive creep at one year shall be less than .001 inch per inch when tested under a 400 psi constant load at 140 degrees F per requirements of ASTM C1181.
6. Seven-day compressive strength shall be a minimum of 14,000 psi when tested per requirements of ASTM C579
7. Grout shall be capable of maintaining at least a flowable consistency for a minimum of 30 minutes at 70 degrees F.
8. Shear bond strength to portland cement concrete shall be greater than shear strength of concrete when tested per requirements of ASTM C882.
9. Effective bearing area shall be a minimum of 95 percent.

E. Grout Fill, Topping Grout:
1. Grout for topping of slabs and concrete fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. Materials and procedures specified for normal concrete in Section 03300, Cast-In-Place Concrete, shall apply except as otherwise specified in this Section.
2. Topping grout and concrete fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45. Where concrete fill is thicker than four inches, Class "A" concrete, as specified in Section 03300, Cast-In-Place Concrete, may be used when accepted by ENGINEER.
3. Coarse aggregate shall be graded as follows:

U.S. Standard Sieve Size	**Percent by Weight Passing**
1/2-inch	100
3/8-inch	90 to 100
No. 4	20 to 55
No. 8	5 to 30
No. 16	0 to 10
No. 30	0

4. Final mix design shall be as determined by trial mix design under supervision of approved testing laboratory.

5. Strength: Minimum compressive strength of grout fill at the end of 28 days shall be 4000 psi.

F. Construction Joint Grout:
   1. Construction Joint Grout approximates Class "A" concrete, as specified in Section 03300, Cast-In-Place Concrete, with aggregate coarser than 1/2-inch removed. Mix shall be designed as flowable with high mortar content. It is intended to be placed over construction joints and mixed with Class "A" concrete as specified in Section 03300, Cast-In-Place Concrete. Mix requirements are:
      a. Compressive Strength: 4,500 psi minimum at 28 days.
      b. Maximum Water-Cement Ratio: 0.45 by weight.
      c. Coarse Aggregate: ASTM C33, No. 8 size.
      d. Fine Aggregate: ASTM C33, approximately 60 percent by weight of total aggregate.
      e. Air Content: eight percent (plus or minus one percent).
      f. Minimum Cement Content: 752 pounds per cubic yard.

G. Requirements for Grout Fill and Construction Joint Grout:
   1. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for grout required. Comply with ACI 211.1 and report to ENGINEER the following data:
      a. Complete identification of aggregate source of supply.
      b. Tests of aggregates for compliance with specified requirements.
      c. Scale weight of each aggregate.
      d. Absorbed water in each aggregate.
      e. Brand, type and composition of cement.
      f. Brand, type and amount of each admixture.
      g. Amounts of water used in trial mixes.
      h. Proportions of each material per cubic yard.
      i. Gross weight and yield per cubic yard of trial mixtures.
      j. Measured slump.
      k. Measured air content.
      l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven-day and 28-day test, and for each design mix.
   2. Submit written reports to COUNTY of proposed mix of grout at least 30 days prior to start of the Work. Do not begin grout production until mixes have been approved by ENGINEER.
   3. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Section 4 - Proportioning. However, mixes need not be designed for greater than 125 percent of specified strength, regardless of standard deviation of production facility.

4. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301, Section 4.
5. Admixtures: Use air-entraining admixture in all grout. Use amounts of admixtures as recommended by grout manufacturer for climate conditions prevailing at time of placing. Adjust quantities and types of admixtures as required to maintain quality. Do not use admixtures that have not been incorporated and tested in accepted design mix unless otherwise authorized in writing by ENGINEER.

2.2 CURING MATERIALS

A. Curing materials shall conform to Section 03300, Cast-in-Place Concrete, and as recommended by manufacturer of prepackaged grouts.

2.3 CONSISTENCY

A. Consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that grout is plastic and moldable, but will not flow. Where "dry pack" is required per the Contract Documents, it shall mean a grout of that consistency; type of grout to be used shall be as specified in this Section for the application.

B. Slump for topping grout and grout fill shall be adjusted to match placement and finishing conditions, but shall not exceed four inches.

C. Slump for construction joint grout shall be seven inches (plus or minute one inch).

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine substrate and conditions under which grout is to be placed and notify COUNTY in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

A. General:
   1. Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, request clarification from COUNTY and do not proceed until ENGINEER provides clarification.

2. Manufacturers of proprietary products shall make available upon 72 hours notification services of qualified, full time employee to aid in assuring proper use of product under job conditions.
3. Placing grout shall conform to temperature and weather limitations in Section 03300, Cast-In-Place Concrete.
4. Cure grout per manufacturer's instructions for prepackaged grout and requirements of Section 03300, Cast-In-Place Concrete, for grout fill and topping grout.

B. Columns, Beams and Equipment Bases:
1. Epoxy Grout: After shimming equipment to proper grade, securely tighten anchorages. Properly form around base plates, allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with epoxy grout.
2. Non-shrink, Non-metallic Grout: After shimming columns, beams and equipment to proper grade, securely tighten anchorages. Properly form around base plates allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with non-shrink, non-metallic grout.

C. Handrails and Railings:
1. After posts have been properly inserted into holes or sleeves, fill annular space between posts and sleeve with non-shrink, non-metallic grout. Bevel grout at juncture with post so that moisture flows away from post.

D. Construction Joints:
1. Place a six-inch minimum thick layer of construction joint grout over contact surface of old concrete at interface of horizontal construction joints as specified in Section 03251, Concrete Joints, and Section 03300, Cast-In-Place Concrete.

E. Topping Grout:
1. All mechanical, electrical, and finish work shall be completed prior to placement of topping grout. Base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing aggregates to ensure bonding to base slab.
2. Minimum thickness of grout topping shall be one-inch.
3. Thoroughly clean and wet base slab prior to placing topping and fill. Do not place topping concrete until slab is complete free from standing pools and ponded water. A thin coat of neat Type II cement slurry shall be broomed into surface of slab and topping or fill concrete shall be placed while slurry is wet. Topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to

revolving mechanism of equipment in accordance with procedures recommended by equipment manufacturer after grout is brought to established grade.

4. Topping grout placed on sloping slabs shall proceed uniformly from bottom of slab to top, for full width of placement.
5. Surface shall be tested with a straight edge to detect high and low spots that shall be immediately eliminated. When topping has hardened sufficiently, it shall be steel troweled to a smooth surface free of pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but last pass over surface shall be by hand-troweling. During finishing, do not apply the following to surface: water, dry cement, or mixture of dry cement and sand.
6. Cure and protect grout topping as specified in Section 03300, Cast-In-Place Concrete.

F. Grout Fill:
   1. All mechanical, electrical, and finish work shall be completed prior to placement of grout fill. Grout fill shall be mixed, placed, and finished as required in Section 03300, Cast-In-Place Concrete.
   2. Minimum thickness of grout fill shall be one inch. Where finished surface of grout fill is to form an intersecting angle of less than 45 degrees with concrete surface it is to be placed against, a key shall be formed in concrete surface at intersection point. Key shall be a minimum of 3.5-inches wide by 1.5-inches deep.
   3. Surface shall be tested with a straight edge to verify that surface slopes uniformly to drain, and to detect high and low spots that shall be immediately eliminated. When grout fill has hardened sufficiently, it shall be steel troweled to a smooth surface free of pinholes and other imperfections. During finishing, do not apply the following to surface: water, dry cement, or mixture of dry cement and sand.

+ + END OF SECTION + +

SECTION 05051

SECTION 05051

ANCHOR BOLTS, TOGGLE BOLTS AND CONCRETE INSERTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
   2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 318, Building Code Requirements for Structural Concrete.
   2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   3. ACI 355.2, Standard for Evaluating the Performance of Post Installed Mechanical Anchors in Concrete.
   4. ASTM A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   5. ASTM A276, Specification for Stainless Steel Bars and Shapes.
   6. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
   7. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   8. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   9. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   10. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   11. ASTM C580, Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   12. ASTM C881, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   13. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.

14. ASTM D790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
15. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
16. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
17. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
18. FS A-A-1922A for Shield, Expansion (Caulking Anchors, Single Lead).
19. FS A-A-1923A for Concrete Expansion Anchors.
20. FS A-A-55614 for Shield, Expansion (non-drilling expansion anchors).
21. FS FF-B-588, Bolt, Toggle and Expansion Sleeve Screw.
22. ICC Evaluation Service (ES) AC 01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
23. ICC ES AC 58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
24. ICC ES AC 193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
25. ICC ES AC 308, Acceptance Criteria for Post-Installed Anchors in Concrete Elements.
26. ISO 898-1, Mechanical properties of fasteners made of carbon steel and alloy steel -- Part 1: Bolts, screws and studs
27. ISO 3506-1, Mechanical properties of corrosion-resistant stainless steel fasteners -- Part 1: Bolts, screws and studs
28. ANSI/MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacturer.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Comply with ASTM E329 and shall be experienced in tension testing of adhesive anchoring systems.
   2. Adhesive Anchor Installer: Shall be experienced and certified by adhesive anchor system manufacturer as possessing training necessary for installing manufacturer's products. Distributors or manufacturer's representatives shall not provide product training unless qualified as certified trainers by anchor manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Work, and embedded lengths.

2. Product Data:
   a. Copies of manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
   b. Copies of valid ICC ES reports certifying load-carrying capacities and installation requirements for anchor systems.
   c. Clearly indicate allowable strength design safety factors when ultimate load carrying capacities are submitted for approval.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. For each type of anchor bolt or threaded rod, submit certified copies of laboratory test reports and other data required to demonstrate compliance with the Contract Documents.
      b. Adhesive anchor system manufacturer's certification that installer is qualified for installing manufacturer's products.
   2. Manufacturer's Instructions:
      a. Installation instructions for anchor systems, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).
   3. Field Quality Control Submittals: Reports of field quality control testing, as applicable.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchorage products to be embedded in concrete to avoid delaying the Work.
   2. Inspect materials upon delivery to the Site and notify COUNTY in writing of loss or damage to materials and promptly replace lost or damaged materials. Do not install damaged materials.

B. Storage and Protection:
   1. Keep materials dry during delivery and storage.
   2. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria

1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:
    a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
    b. Adhesive Anchors, Expansion Anchors, or Concrete Inserts: Provide size, length, type, and capacity required to carry design load based on values and requirements in manufacturer's load tables. Alternately, capacity may be based on tension and shear strength capacities determined by independent testing laboratory retained by manufacturer or CONTRACTOR, using minimum safety factor of four.
        1) Determine capacity considering reductions due to embedment length, strength of base fastening materials, spacing, and edge distance.
2. Design Loads:
    a. Equipment Anchors: Use design load recommended by equipment manufacturer.
    b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.

B. Application:
1. Anchor Bolts:
    a. Where anchor bolt is shown or indicated, use cast-in-place anchor bolt unless another anchor type is approved by ENGINEER.
    b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.
2. Adhesive Anchors:
    a. Use where adhesive anchors are shown or indicated for installation in concrete, grout-filled concrete masonry units, or hollow concrete unit masonry.
    b. Use where subject to vibration or where subject to freezing.
    c. Use where submerged or buried.
    d. Use for floor-mounted pipe supports.
    e. Do not use in ceilings.
    f. Do not use for pipe hangers.
3. Expansion Anchors:
    a. Use where expansion anchors are shown or indicated for installation in concrete, grout-filled concrete masonry units, hollow concrete unit masonry, or solid brick.

b. Do not use where subject to vibration.
c. Do not use where submerged or buried.
d. Do not use in exterior locations subject to freezing.
e. Use in ceilings.
f. Expansion anchors may be used for hanging or supporting piping two-inch diameter and smaller. Do not use expansion anchors for supporting piping larger than two-inch diameter unless otherwise shown or approved by ENGINEER.

4. Undercut Anchors:
   a. Use where undercut anchors are shown or indicated for installation in concrete.
   b. Use where subject to vibration.
   c. Do not use in submerged or buried applications.
   d. Do not use in exterior locations subject to freezing.
   e. Use in ceilings.
5. Concrete Inserts:
   a. Use only where shown or indicated in the Contract Documents.
   b. Use for pipe hangers and supports for pipe size and loading recommended by the insert manufacturer.
6. Toggle Bolts:
   a. Use only when approved by ENGINEER for light-duty fastening brackets and other elements onto hollow concrete elements or hollow masonry units.

2.2 MATERIALS

A. Anchor Bolts:
   1. Interior and Dry Locations: Provide threaded carbon steel rods complying with ASTM F1554, Grade 55, with heavy hex nuts complying with ASTM A563 Grade 55, unless otherwise shown or indicated on the Drawings.
   2. Exterior, Buried, or Submerged Locations, or When Exposed to Wastewater: Provide stainless steel threaded rods complete with washers complying with ASTM F593, AISI Type 316, Condition A, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts. Other AISI types may be used if approved by ENGINEER.
   3. Equipment: Provide anchor bolts conforming material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection.
   4. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:
   1. General:
      a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
   2. Products and Manufacturers: Provide one of the following:

a. HIT-RE 500-SD Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
b. Or equal.

3. Adhesive:
   a. Adhesive system shall use two-component adhesive mix.
   b. Epoxy adhesives shall conform to physical requirements of ASTM C881 Type IV, Grade 2 and 3, Class A, B, and C except gel times.
   c. Adhesives shall have an evaluation report by ICC ES and be successfully tested for use in cracked and uncracked concrete in accordance with ICC ES AC 308.
4. Anchor:
   a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts.

C. Grout-filled Masonry Adhesive Anchors:
1. General:
   a. Adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
2. Products and Manufacturers: Provide one of the following:
   a. HIT-HY 150 Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
   b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Co.
   c. Or equal.
3. Adhesive:
   a. Adhesive system shall use two-component adhesive mix.
   b. Adhesives shall conform to physical requirements of ASTM C881 Type I and IV, Grade 3, Class A, B, and C.
   c. Acrylate hybrid adhesives shall conform to the following:
      1) ASTM C579 Compressive Strength >7,252 psi
      2) ASTM C580 Flexural Strength > 2,900 psi
      3) ASTM C307 Modulus of Elasticity > 507,000 psi
   d. Adhesives shall have evaluation report by ICC ES and be tested in accordance with ICC ES AC 58 for the following:
      1) Seismic and wind loading
      2) Long-term creep at elevated temperatures
      3) Static loading at elevated temperatures
      4) Damp and water-filled holes
      5) Freeze-thaw conditions
      6) Critical and minimum edge distance and spacing
4. Anchor:
   a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (Nitronic 60) stainless steel nuts and locknuts.

D. Hollow Concrete Masonry Adhesive Anchors:

1. General:
   a. Adhesive anchors shall consist of threaded rods with a cylindrical mesh screen tube anchored into hollow concrete block masonry using an adhesive system.
2. Products and Manufacturers: Provide one of the following:
   a. HIT-HY 20 for Masonry Anchoring System, by Hilti Fastening Systems, Inc.
   b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Co.
   c. Or equal.
3. Adhesive:
   a. Adhesive system shall use two-component adhesive mix.
   b. Adhesives shall conform to physical requirements of ASTM C881 Type I and IV, Grade 3, Class A, B, and C.
   c. Hybrid adhesives shall conform to the following:
      1) ASTM D695 Compressive Strength: 10,420 psi
      2) ASTM D790 Modulus of Elasticity: 1.02×10^6 psi
   d. Adhesives shall have an evaluation report by ICC ES and be tested in accordance with ICC ES AC 58 for the following
      1) Seismic and wind loading
      2) Long-term creep at elevated temperatures
      3) Static loading at elevated temperatures
      4) Damp and water-filled holes
      5) Freeze-thaw conditions
      6) Critical and minimum edge distance and spacing
4. Anchor:
   a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts.
5. Mesh Screen Tube:
   a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.
   b. Mesh shall be manufactured of AISI 304 stainless steel.

E. Concrete Wedge Expansion Anchors:
1. Where expansion anchors are shown or indicated to be installed in concrete, provide concrete wedge expansion anchors.
2. Products and Manufacturers: Provide one of the following:
   a. Kwik Bolt TZ Wedge Anchor, by Hilti Fastening Systems, Inc.
   b. Strong-Bolt Wedge Anchor, by Simpson Strong-Tie Co.
   c. Or equal.
3. Anchors shall conform to physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
4. Interior and Dry Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.

5. Exterior or Wet Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
6. Anchors shall be tested in accordance with ICC ES AC 193 for mandatory tests and the following:
   a. Seismic and wind loading.

F. Grout-filled Masonry Wedge Expansion Anchors:
1. Product and Manufacturers: Provide one of the following:
   a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
   b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Co.
   c. Or equal.
2. Interior Locations: Where expansion anchors are shown or indicated as being installed in grout-filled masonry, provide masonry wedge type expansion anchors.
3. Anchors shall conform to physical requirements of FS A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.
4. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Anchors shall have an evaluation report issued by ICC ES and be tested in accordance with ICC ES AC 01 for the following:
   a. Seismic and wind loading.
   b. Combination of tension and shear loads.
   c. Critical and minimum edge distance.

G. Sleeve Expansion Anchors:
1. Where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick, provide sleeve-type expansion anchors.
2. Products and Manufacturers: Provide one of the following:
   a. HLC Sleeve Anchors, by Hilti Fastening Systems, Inc.
   b. Sleeve-All Sleeve Anchor, by Simpson Strong-Tie Co.
   c. Or equal.
3. Anchors shall conform to physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.
4. Interior Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Exterior Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.
6. Anchors shall be tested in accordance with ICC ES AC 01 for the following:
   a. Static loads.

b. Critical and minimum edge distance and spacing.

H. Drop-in Expansion Anchors:
1. Where light-duty expansion anchors, to be installed in concrete or grout-filled concrete unit masonry, are required by CONTRACTOR for supporting piping or conduit two-inch diameter or smaller, properly-sized drop-in anchors will be acceptable.
2. Products and Manufacturers: Provide one of the following:
   a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
   b. Drop-In Anchor, by Simpson Strong-Tie Co.
   c. Or equal.
3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, conforming to physical requirements of FS A-A-55614, Type I. Anchors shall be bottom-bearing type with slotted, single-piece steel shell and tapered expander plug providing 360-degree contact with base material.
4. Anchors shall be tested in accordance with ICC ES AC 01 for the following:
   a. Seismic and wind loading.
   b. Combination of tension and shear loads.
   c. Critical and minimum edge distance and spacing.

I. Concrete Undercut Anchors
1. Where undercut anchors are shown or indicated for installation in concrete, provide undercut concrete anchors.
2. Products and Manufacturers: Provide one of the following:
   a. HDA Undercut Anchor, by Hilti Fastening Systems, Inc.
   b. DUC Ductile Undercut Anchor, by USP Structural Connectors.
   c. Or equal.
3. Provide concrete undercut expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete undercut anchors in accordance with ACI 355.2 prequalification tests.
4. Installed anchor shall have minimum tension bearing area in concrete, measured as the horizontal projection of the bearing surface, of not less than two times the net tensile area of anchor bolt. Installed anchor shall exhibit form fit between bearing elements and undercut in the concrete.
5. Interior and Dry Locations: Provide carbon steel anchors manufactured of materials complying with ISO 898-1, with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5 (five microns minimum).
6. Exterior or Wet Locations: Provide stainless steel anchors manufactured of materials complying with ISO 3506-1 and having corrosion resistance equivalent to AISI Type 316 stainless steel. Stainless steel anchors shall be provided with Nitronic 60 stainless steel nuts and washers.
7. Test anchors in accordance with ICC ES AC 193 for mandatory tests and the following:
   a. Seismic and wind loading.

J. Concrete Inserts:
   1. Provide malleable iron inserts for pipe hangers, grating, floor plate, and masonry lintels. Comply with ANSI/MSS SP-58. Provide inserts recommended by insert manufacturer for required loading.
   2. Finish shall be black.
   3. Products and Manufacturers: Provide one of the following:
      a. Figure 282, by Anvil International Inc.
      b. No. 380E, by Hohmann and Barnard, Inc.
      c. Or equal.

K. Toggle Bolts:
   1. Where light-duty toggle bolts, to be installed in hollow concrete unit masonry, hollow brick or gypsum wallboard, are required by CONTRACTOR to support piping or conduit one-inch diameter or smaller, properly sized toggle bolts are acceptable.
   2. Products and Manufacturers: Provide one of the following:
      a. Toggler Bolt by Hilti Fastening Systems, Inc.
      b. Toggle Bolt by The Simpson Strong-Tie Co.
      c. Or equal.
   3. Toggle Bolts: FS FF-B-588, Type I, Class A, Style 1. Provide spring-wing toggle bolts, with two-piece wings.
   4. Provide carbon steel bolts with zinc coating in accordance with ASTM B633.

L. Do not use powder activated fasteners and other types of bolts and fasteners not specified in this Section, unless approved by ENGINEER.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Anchor Bolts:
   1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
   2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is not allowed.

3. Protect threads and shank from damage during installation and subsequent construction operations.
4. Unless otherwise shown or approved by ENGINEER anchor bolts shall conform to Table 05051-A:

TABLE 05051-A
SINGLE ANCHOR ALLOWABLE LOADS ON ANCHOR BOLTS [1]

Bolt Diameter (inch)	F1554 Grade 36 F593 Type 316, Condition A				F1554 Grade 55			
	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3,4] (lb)	Tension[3] (lb)	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3] (lb)	Tension[3] (lb)
1/2	6	9	1,262	2,420	8.5	12.75	1,660	3,190
5/8	7.5	11.25	2,010	3,860	10.5	15.75	2,640	5,080
3/4	9	13.5	2,974	5,720	13	19.5	3,910	7,520
7/8	10.5	15.75	4,106	7,890	15	22.5	5,400	10,390
1	12	18	5,386	10,360	17	25.5	7,090	13,450
1 1/8	13.5	20.25	6,787	13,052	19	28.5	8,930	16,580
1 1/4	15	22.5	8,617	16,572	21	31.5	11,340	20,040

Table Notes:
1. Table is based on ACI 318 and ACI 350, Appendix D, f'c = 4000 psi. Table 05051-A is not applicable to anchor bolts embedded in grouted masonry.
2. Critical edge distance and spacing are indicated in the table. Capacity of anchor bolts for other combination of edge distances and spacing shall be evaluated in accordance with ACI 318 and ACI 350, Appendix D.
3. Values for shear and tension listed are not considered to act concurrently. Interaction of tension and shear will be evaluated by ENGINEER in accordance with ACI 318 and ACI 350, Appendix D.

B. Adhesive Anchors, Undercut Anchors, and Expansion Anchors, General:
1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:
1. Comply with manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop tensile strength of anchor (0.75 x Fu), and hole cleaning/preparation. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.
2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Hole diameter shall not be

greater than 1/8-inch more than nominal rod diameter. Holes shall be hammer-drilled with carbide bits; do not core-drill holes.

3. Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance of 12 anchor diameters. Effect on anchor capacity of deviations, if any, in spacing and edge distance shall be investigated by ENGINEER in accordance with adhesive anchor system manufacturer's requirements.
4. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
5. Before injecting adhesive, obtain COUNTY's concurrence that hole is dry and free of oil and other contaminants.
6. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Before installing, verify that anchor is dry and free of oil and other contaminants.
8. Twist anchors during insertion into partially filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
9. Limitations:
    a. Installation Temperature: See manufacturer's instructions for installation temperature requirements.
    b. Oversized Holes: Notify COUNTY immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.
    c. Embedment depths shall be based on compressive strength of 2,000 psi when embedded in existing concrete and 4,000 psi when embedded in new concrete.

D. Expansion Anchors:
    1. Unless otherwise shown or approved by ENGINEER, provide minimum anchor spacing and edge distance of seven anchor diameters. Effect on anchor capacity of deviations, if any, in spacing and edge distance shall be evaluated in accordance with requirements of the anchor system manufacturer.
    2. Protect threads from damage during anchor installation. Set anchors to manufacturer's recommended torque, using a torque wrench.

E. Concrete Undercut Anchors:
   1. Unless otherwise shown or indicated, or approved by ENGINEER, provide minimum anchor spacing and edge distance as tabulated in anchor manufacturer's instructions. Effect on anchor capacity of deviations, if any, in spacing and edge distance shall be evaluated in accordance with requirements of anchor system manufacturer.
   2. Protect threads from damage during anchor installation.
   3. Drill hole to anchor manufacturer's specified depth and diameter using a stop drill bit matched to the specific anchor.
   4. Before setting the undercut anchor, hole shall be free of dust and debris using method recommended by undercut anchor system manufacturer. Hole shall be blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
   5. Insert the anchor by hand until anchor reaches bottom of hole.
   6. Set anchor in conformance with manufacturer's instructions using anchor manufacturer's specified setting tool and hammer drill, and using appropriate gear for hammer drill.
   7. Continue setting operation until red mark on bolt is visible above top edge of sleeve. Position top edge of anchor sleeve approximately three millimeters below surface of the fixture. If anchor setting time exceeds 60 seconds for M10, M12, or M16 anchors, or 120 seconds for M20 anchors, installation has failed and anchor shall be removed and replaced unless otherwise directed by ENGINEER.

F. Concrete Inserts:
   1. Protect embedded items from damage and, during concrete placing, ensure that embedded items are not filled with concrete.

3.3 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. COUNTY will employ independent testing and inspection agency to perform field quality testing at the Site of post-installed anchors.
      a. Test at least ten percent of all types of post-installed anchors to 50 percent of ultimate tensile capacity of post installed anchors.
      b. Apply test loads with hydraulic ram.
      c. Displacement of post-installed anchors shall not exceed D/10, where D is nominal diameter of anchor.
   2. If post-installed anchor fails the test, CONTRACTOR shall pay cost of testing all post-installed anchors of same diameter and type not initially tested.

3. Correct defective Work by removing and replacing or correcting, as directed by ENGINEER.
4. CONTRACTOR shall pay for all corrections and subsequent testing required to confirm integrity of post-installed anchors.
5. Independent testing and inspection agency shall complete report on each area of the Work relative to anchor systems. Report shall summarize observations made by inspector and be submitted to COUNTY.

B. Manufacturer's Services:
1. Provide services at the Site of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train CONTRACTOR personnel in proper selection and installation procedures. Manufacturer's representative shall observe to confirm the installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

+ + END OF SECTION + +

SECTION 05130

STRUCTURAL ALUMINUM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install structural aluminum.
   2. The Work also includes:
      a. Providing openings in and attachments to structural aluminum to accommodate the Work under this and other Sections, and providing for structural aluminum items such as anchorage devices, studs, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before structural aluminum Work.

C. Related Sections:
   1. Section 03600, Grout.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 05511, Pre-engineered Aluminum Stairs
   4. Section 09900, Coatings .

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA ADM-1, Aluminum Design Manual – Specifications for Aluminum Structures.
   2. AISC Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts, approved by RCSC.
   3. ASTM A325, Specification for Structural Bolts, Steel, Heat-Treated, 120/105 KSI Minimum Tensile Strength.
   4. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   5. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   6. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

7. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
8. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
9. ASTM B429/B429M, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM F436, Standard Specification for Hardened Steel Washers.
11. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
12. ASTM F594, Specification for Stainless Steel Nuts.
13. AWS D1.2/D1.2M, Structural Welding Code - Aluminum.
14. NAAMM AMP 500, Metal Finishes Manual for Architectural and Metal Products.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welders and Welding Processes:
      a. Qualify welding processes and welding operators in accordance with AWS D1.2/D1.2M.
      b. When requested by ENGINEER, provide certification that all welders employed on or to be employed on the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Complete details and schedules for fabrication and shop assembly of members and details, schedules, procedures, and diagrams showing proposed sequence of erection. Shop Drawings shall not be reproductions of Contract Drawings.
      b. Include complete information for fabrication of the structure's components, including location, type, and size of bolts, details of blocks, copes and cuts, connections, camber, holes, member sizes and lengths, and other pertinent data. Clearly indicate welds using standard AWS notations and symbols, and clearly show or indicate size, length, and type of each weld.
      c. Provide setting drawings, templates, and directions for installing anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's specifications and installation instructions for products listed below.
         1) Welding electrodes and rods.

B. Informational Submittals: Submit the following:
   1. Certificates.
      a. Welders' certifications, when requested by ENGINEER.
   2. Test Reports.
      a. Laboratory test reports and other data required to show compliance with the Contract Documents for the following:
         1) Mill test report documenting chemical and physical properties of each type of aluminum framing material.
         2) Mill test report documenting chemical and physical properties of stainless steel connection bolts, nuts, and washers.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Site at such intervals to ensure uninterrupted progress of the Work.

B. Storage:
   1. Do not store materials in a manner that could cause distortion or damage to the members. Repair or replace damaged materials as directed by COUNTY.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum Types:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
   3. Aluminum Bars and Rods: ASTM B211, Alloy 6061-T6.
   4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

B. Anchorages, Fasteners, and Connectors:
   1. Anchorage Devices: Refer to Section 05051, Anchor Bolts, Toggle Bolts, and Concrete Inserts.
   2. Threaded Fasteners: Stainless steel bolts, ASTM F593, AISI Type 303, and stainless steel nuts and washers, ASTM F594, AISI Type 303.
   3. Bolts used in slip-critical connections shall comply with ASTM A325; nuts shall comply with ASTM A563 Grade DH; and washers shall comply with ASTM F436. Bolts, nuts, and washers shall be zinc-coated by the hot-dip process in accordance with ASTM A325.

C. Electrodes for Welding: ER 5356 complying with AWS D1.2/D1.2M.

D. Finish: Provide mill finish as specified in NAAMM AMP 500.

2.2 FABRICATION

A. Shop Fabrication and Assembly:
   1. General:
      a. Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural aluminum in accordance with AA ADM-1, the Contract Documents, and as shown on approved Shop Drawings. Provide camber in structural members as shown.
      b. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize handling of materials for storage and minimize handling at the Site.
      c. Where finishing is required, complete the assembly, including welding of units, before commencing finishing operations. Provide finish surfaces of members exposed-to-view in the completed Work that are free of markings, burrs, and other defects.
      d. Design of Members and Connections:
         1) Details shown on the Drawings are typical; similar details apply to similar conditions, unless otherwise shown or specified.

B. Connections:
   1. Shop Connections:
      a. Unless otherwise shown or indicated, shop connections may be welded or stainless steel bolted. Unless shown otherwise, welds shall be 1/4-inch minimum.
      b. Where reaction values of a beam are not shown or indicated, connections shall be detailed to support the total uniform load capacity tabulated in AA ADM-1 tables for allowable loads on beams for the given shape, span, and aluminum specified for beam in question.
      c. Shop-welded connections shall be detailed to eliminate or minimize eccentricity in the connection.
      d. End connection angles fastened to webs of beams and thickness of angles, size and extent of fasteners or shop welds, shall comply with design standards in AA ADM-1. Connections shall be two-sided unless otherwise shown or indicated.
   2. Fabrication Considerations Regarding Field Connections:
      a. Unless otherwise specified below or indicated, make field connections using stainless steel bolts.
      b. Field welding is not allowed.
   3. Bolted Construction:
      a. Stainless steel design shear values shall be based on bolts with bearing type connections with threads in the shear plane.
      b. Minimum bolt diameter shall be 3/4-inch.
   4. Welded Construction: Comply with AWS D1.2/D1.2M for procedures, appearance, and quality of welds, and methods used in correcting defective welding Work.

C. Bracing:
   1. Bracing for which stress is not shown or indicated shall have minimum two-bolt connection, or shop-welded connection of equivalent strength.
   2. Vertical bracing and knee braces connecting to columns shall be on the centerline of columns, unless otherwise shown or indicated.
   3. Knee braces shall be at 45-degree angle, unless otherwise shown or indicated.
   4. Connection plates shall be minimum 3/8-inch thick, unless otherwise shown.

D. Columns: Fabrication tolerances shall be as required by AA ADM-1 and AWS D1.2/D1.2M for welded members.

E. Holes and Appurtenances for Other Work:
   1. Provide holes required for securing other work to structural aluminum framing, and for passage of other work through framing members, as shown on the Shop Drawings and the Contract Documents. If large block-outs are required and approved, reinforce the webs to develop specified shear strength. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.
   2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not frame cut holes or enlarge holes by burning. Drill holes in bearing plates.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which structural aluminum Work will be performed and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with AA ADM-1 and the Contract Documents.

B. Anchorage Devices:
   1. Provide anchorage devices, including anchor bolts, and other connectors required for securing structural aluminum to foundations and other in-place Work.
   2. Provide templates and other devices necessary for pre-setting anchorage devices to accurate locations.
   3. Refer to Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts, for anchorage requirements.

C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   1. Set loose and attached base plates and bearing plates for structural members on stainless steel wedges or other adjusting devices.
   2. Tighten anchorage devices after positioning and plumbing supported members. Do not remove wedges or shims, but if protruding, cut off flush with edge of the base or bearing plate prior to packing with grout.
   3. Place non-shrink grout between bearing surfaces and bases or plates in accordance with Section 03600, Grout. Finish exposed surfaces, protect installed materials, and cure in compliance with grout manufacturer's instructions.
   4. Leveling plates and wood wedges are not allowed.

D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure within tolerances specified in AA ADM-1. For members requiring accurate alignment, provide clip angles, lintels and other members shall be with slotted holes for horizontal adjustment at least 3/8-inch in each direction, or more when required.
   2. Splice members only where shown or indicated.

E. Erection Bolts: On exposed, welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

F. Gas Cutting: Do not use gas-cutting torches at the Site for correcting structural framing fabrication errors.

G. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09900, Painting.

3.3 FIELD QUALITY CONTROL

A. Engage an independent testing and inspection agency to inspect stainless steel bolted connections and welded connections as follows:
   1. Visually inspect all welds. Test wells that appear to be visually deficient using non-destructive methods by qualified testing laboratory. CONTRACTOR shall correct improper workmanship by removing and replacing, or repairing, as instructed by ENGINEER, welds that are defective. Pay for all corrections and subsequent retesting to confirm integrity of welds.

2. Visually inspect all bolted connections.
   a. Visually inspect connections to verify that plies of connected elements are in snug contact.
   b. Where bolts or connections are defective, correct improper workmanship and materials by removing defective bolts and connections and replacing or repairing as directed by ENGINEER. Pay for corrections and subsequent tests required to confirm integrity of connection.
3. Independent testing and inspection agency shall prepare a report on each structure. Report shall summarize observations made by inspector and be submitted to COUNTY.

B. Correct defecctive structural aluminum Work. Perform additional tests, at CONTRACTOR'S expense, necessary to confirm non-compliance of the original Work and to demonstrate compliance of corrected Work.

+ + END OF SECTION + +

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SECTION 05501

MISCELLANEOUS METAL FABRICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish miscellaneous metal fabrications including surface preparation and shop priming.
   2. The Work also includes:
      a. Providing openings in miscellaneous metal fabrications to accommodate the Work under this and other Sections, and attaching to miscellaneous metal fabrications all items such as sleeves, bands, studs, fasteners, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work to be installed with, or attached to miscellaneous metal fabrications Work.
   2. Hot-dip Galvanizing: Coordinate with steel fabricator detailing for and fabrication of assemblies to be hot-dip galvanized, to minimize distortion during galvanizing process.

C. Related Sections:
   1. Section 03600, Grout.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 09900, Painting,

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Ladders – Fixed –Safety Requirements.
   2. ANSI Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
   3. ASTM A36/A36M, Specification for Carbon Structural Steel.
   4. ASTM A53/A53M, Specification for Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   5. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Aapplications.
8. ASTM A320/A320M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.
9. ASTM A384/A384M-02 Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
10. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A572/A572M, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
12. ASTM A992/A992M, Specification for Structural Steel Shapes.
13. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
14. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
15. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
16. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
17. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
18. AWS D1.1/D1.1M, Structural Welding Code – Steel.
19. AWS D1.2/D1.2M, Structural Welding Code – Aluminum.
20. AWS D1.6, Structural Welding Code – Stainless Steel.
21. NAAMM, Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welding:
      a. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M, D1.2/D1.2M, or D1.6, as applicable.
      b. When requested by ENGINEER, provide certification that each welder employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

B. Regulatory Requirements: Conform to the following:
   1. 29 CFR 1910, Occupational Health and Safety Standards.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection details for assemblies of miscellaneous metal Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for locating and installing miscellaneous metal items and anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions for products to be used in miscellaneous metal Work.

B. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Mill test report that indicate chemical and physical properties of each type of material, when requested by ENGINEER.
   2. Qualifications Statements:
      a. Copies of welder's certifications, when requested by ENGINEER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in other construction in ample time to prevent delaying the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel:
   1. W-Shapes and WT-Shapes: ASTM A992/A992M.
   2. S-Shapes and Channels: ASTM A572/A572M, Grade 50.
   3. Hollow Structural Sections: ASTM A500, Grade B.
   4. Angles, Plates, Bars: ASTM A36/A36M.
   5. Steel Pipe: ASTM A53/A53M, Grade B.

B. Aluminum:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B 221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.

3. Aluminum Bars and Rod: ASTM B211, Alloy 6061-T6.
4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

C. Stainless Steel:
1. Plates and Sheets: ASTM A240/A240M, Type 304L or Type 316 stainless steel.
2. Submerged or Intermittently Submerged: Type 316 stainless steel.
3. Non-submerged: Type 304L stainless steel.

D. Stainless Steel Fasteners and Fittings: ASTM A 320/A 320M, Type 304L or Type 316 Stainless Steel.

E. Zinc-coated Hardware: ASTM A153/A153M.

2.2 MISCELLANEOUS METAL ITEMS

A. Shop Assembly:
1. Pre-assemble items in the shop to the greatest extent possible to minimize field-splicing and field-assembly of units at the Site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Shelf Angles:
1. Provide structural steel shelf angles of sizes shown, for attachment to concrete or masonry construction. Provide slotted holes to receive 3/4-inch bolts, spaced not more than six inches from ends and not more than 2.0 feet on centers, unless otherwise shown.
   a. Provide galvanized shelf angles on outdoor construction.
2. Provide wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

C. Bollards:
1. Provide Schedule 80 galvanized steel pipe filled with concrete as shown on the Drawings. Paint as required in accordance with Section 09900, Painting. Unless otherwise shown or specified, finish-paint bollard "Safety Yellow."

D. Miscellaneous Framing and Supports:
1. Provide miscellaneous metal framing and supports that are not part of structural steel framework and are required to complete the Work.
2. Fabricate miscellaneous units to sizes, shapes, and profiles shown on the Drawings or, if not shown, of required dimensions to receive adjacent grating, plates, tanks, doors, and other work to be retained by the framing.

3. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all-welded construction using mitered corners, welded brackets, and splice plates and minimum number of joints for field connection.
4. Cut, drill, and tap units to receive hardware and similar items to be anchored to the Work.
5. Furnish units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units are to be installed after concrete is placed.
    a. Except as otherwise shown, space anchors, 2.0 feet on centers, and provide units the equivalent of 1.25-inch by 1/4-inch by eight-inch strips.
    b. Galvanize exterior miscellaneous frames and supports.
    c. Where shown or indicated, galvanize miscellaneous frames and supports that are not to be installed outdoors.
6. Miscellaneous steel framing and supports shall be hot-dip galvanized and finish-painted.
7. For grating requirements refer to Section 05532, Aluminum Grating and Checker Plate.
8. Surface preparation and painting of galvanized surface shall conform to Section 09900, Painting

E. Fasteners and Hardware: Provide Type 316 stainless steel fasteners.

F. Anchors and Expansion Anchors: Refer to Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

2.3 FINISHING

A. Surface Preparation and Shop Priming: Perform surface preparation and apply primer coat to miscellaneous metal fabrications in the shop. Conform to surface preparation and shop priming requirements in Section 09900, Painting.

B. Galvanizing:
    1. Galvanizing of fabricated steel items shall comply with ASTM A123/A123M.
    2. Details of fabrication of steel items and assemblies to be hot-dip galvanized shall conform to recommendations of ASTM A384/A384M to minimize the potential for distortion.

C. Aluminum Finish: Provide natural mill finish for aluminum Work unless otherwise shown or specified.

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections:

1. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures complying with the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which the Work is to be performed and notify COUNTY in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install miscellaneous metal fabrications accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork where fabrications are to be built into concrete, masonry, or other construction.

B. Anchor securely as shown and as required for the intended use, using concealed anchors where possible.

C. Fit exposed connections accurately together to form tight, hairline joints. Field-weld steel connections that are not to be exposed joints and cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1/D1.1M, D1.2/D1.2M and D1.6, as applicable to the material being welded. Grind steel joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09900, Painting.

++ END OF SECTION ++

SECTION 05511

PRE-ENGINEERED ALUMINUM STAIRS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including surface preparation and shop priming.
   2. The extent of aluminum stairs shall be as shown.
   3. The Work also includes:
      a. Providing openings in and attachments to aluminum stairs to accommodate the Work under this and other Sections and providing for the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum stairs Work.

C. Related Sections:
   1. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   2. Section 05522, Aluminum Handrails and Railings.
   3. Section 05532, Aluminum Grating.
   4. Section 09900, Coatings.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. Aluminum Association (AA), Specification for Aluminum Structures.
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
      b. ASTM B 211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
      c. ASTM B 221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

d. ASTM B 308/B 308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
e. ASTM B 429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
f. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
g. ASTM F 594, Specification for Stainless Steel Nuts.

3. American Welding Society, (AWS).
   a. AWS D1.2/D1.2M, Structural Welding Code-Aluminum.
4. National Association of Architectural Metal Manufacturers, (NAAMM).
   a. NAAMM, Metal Stairs Manual and Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of the component manufacturer from a single pre-engineered aluminum stair manufacturer.
   2. The pre-engineered aluminum stair manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pre-engineered aluminum stair manufacturer.

C. Codes: Comply with the applicable requirements of the state and local building codes.

D. Source Quality Control: CONTRACTOR shall be responsible for entire design, fabrication and installation of pre-engineered aluminum stair Work.

E. The Shop Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State in which the pre-engineered aluminum stairs will be installed and is a recognized expert in the type of Work shown and specified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:

a. Erection and detailed Shop Drawings, which show the plan location, elevation and details for the fabrication and erection of the aluminum stair Work. Show anchorage and accessory items. Include details of all connections between all materials.

2. Delegated Design Submittals:
   a. Provide signed and sealed Shop Drawings and calculations, which are prepared by a Registered Professional Engineer licensed in the State of Florida.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect materials from corrosion and deterioration.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify COUNTY, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Pre-engineered aluminum stairs shall comply with the requirements of the NAAMM, "Metal Stairs Manual".

B. Sizes of miscellaneous items such as carrier angles and platform stiffeners, and design stresses shall be as recommended in Section 4 of the "Metal Stairs Manual", unless otherwise shown.

C. All required stair loadings and other stair related requirements shall comply with the 2007 Florida Building Code and 2009 Supplements.

2.2 FABRICATION

A. General:
   1. Use welding for joining pieces together, unless otherwise shown or specified. Welding to comply with the applicable provisions of AWS D1.2/D1.2M. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.
   2. Construct stair units to conform to sizes and arrangements as shown. Provide pre-engineered aluminum framing, hangers, columns, struts, clips, brackets, bearing plates and other components for the support of pre-engineered aluminum stairs and platforms. Erect pre-engineered aluminum stair Work to line, plumb, square, and true with runs registering level with floor and platform levels.
   3. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the pre-engineered aluminum stairs on the supporting structure.
   4. Finish: Provide Architectural mill finish as specified in the NAAMM Manual.
   5. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials, such as concrete, masonry and steel as specified in Section 09900, Coatings.

B. Stair Framing:
   1. Fabricate stringers of structural aluminum channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers.
   2. Construct platforms of structural aluminum channel headers and miscellaneous framing members, as shown. Bolt or weld headers to stringers. Bolt or weld framing members to strings and headers.

C. Aluminum Grating Treads and Platforms:
   1. For aluminum grating and treads, refer to Section 05532, Aluminum Grating.
   2. Fabricate grating treads with abrasive nosing on one edge and with aluminum angle or aluminum plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
   3. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe-plates at open-sided edges of floor grating fastened to platform framing members.
   4. Provide platforms 3/8-inch minimum thick with solid abrasive surface matching that on treads. Secure platforms to platform framing members with bolts.

D. Stair Aluminum Railing:
   1. Aluminum railings shall conform to the requirements of Section 05522, Aluminum Handrails and Railings.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the COUNTY, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

3.3 INSTALLATION

A. Fastening to In-Place Construction:
   1. Provide anchorage devices and fasteners where necessary for securing pre-engineered aluminum stairs to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts and other connectors as required. The anchorage devices and fasteners shall be Type 316 stainless steel.

B. Cutting, Fitting and Placement:
   1. Perform cutting, drilling and fitting required for the installation of the pre-engineered aluminum stairs. Set the pre-engineered aluminum stairs accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
   2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. 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.

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SECTION 05522

ALUMINUM HANDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install aluminum handrail and railing systems. The Work also includes:
      a. Providing openings in, and attachments to, aluminum handrail and railing systems to accommodate the Work under this and other Specification Sections. Provide all items for aluminum handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
   2. Aluminum handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete aluminum handrail and railing system in accordance with the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum handrails and railings Work.
   2. Aluminum handrail and railing locations shall comply with Laws and Regulations.

C. Related Sections:
   1. Section 033000, Cast-in-Place Concrete.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 09900, Coatings.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA, Aluminum Design Manual.
   2. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   3. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
   4. ASTM B136, Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.

5. ASTM B137, Standard Test Method for Measurement of Coating Mass per Unit Area on Anodically Coated Aluminum.
6. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
7. ASTM B241/B241M, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
8. ASTM B244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
9. ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and rolled Ring Forgings.
10. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
11. ASTM E 935, Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
12. NAAMM/Architectural Metal Products Division (AMP), Pipe Railing Manual.
13. NAAMM/AMP AMP 501 Finishes for Aluminum.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Upon request manufacturer shall submit document at least five years successful experience in fabricating aluminum handrail and railing systems of scope and type similar to that required.
   2. Professional Engineer:
      a. CONTRACTOR or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience designing aluminum handrails and railings.
      b. Responsibilities include:
         1) Reviewing aluminum handrail and railing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations verifying compliance of aluminum handrail and railing system with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of aluminum handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and

b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.

3. Installer:
   a. Retain a single installer trained and with record of successful experience in installing aluminum handrail and railing systems.
   b. Installer shall have record of successfully installing aluminum handrail and railing systems in accordance with recommendations and requirements of manufacturer, or shall provide evidence of being acceptable to the manufacturer.
   c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.
   d. When requested by ENGINEER, submit name and qualifications of installer with the following information for at least three successful, completed projects:
      1) Names and telephone numbers of COUNTY and architect or engineer responsible for each project.
      2) Approximate contract cost of the aluminum handrail and railing systems for which installer was responsible.
      3) Amount (linear feet) of aluminum handrail and railing installed.

B. Component Supply and Compatibility:
   1. Obtain all materials furnished under this Section regardless of component manufacturer, from a single aluminum handrail and railing system manufacturer.
   2. Aluminum handrail and railing system manufacturer shall review and approve or prepare all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.
   3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall assembly by aluminum handrails and railings manufacturer.

C. Regulatory Requirements: Comply with Laws and Regulations including:
   1. OSHA Part 1910.23, Guarding Floor and Wall Openings and Holes.

D. Certifications:
   1. Submit certification, signed by authorized officer of manufacturer and notarized, stating that handrail and railing systems comply with the design prepared by the professional engineer.
   2. Submit certification, signed by authorized officer of CONTRACTOR and notarized, stating that all components and fittings are furnished by the same manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabrication and installation of aluminum handrail and railing systems with sizes of members, pipe wall thickness, information on components, and anchorage devices. Show all anchorages. Provide details drawn at scale of 1.5-inch equal to one foot.
      b. Indicate required location of posts.
      c. Indicate locations and details of all expansion joints, if any.
      d. Indicate locations and details of gaps across seismic joints, if any.
      e. Profile drawings of aluminum handrail and railing system components.
      f. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.
   2. Product Data:
      a. Manufacturer's specifications, standard detail drawings, and installation instructions for aluminum handrail and railing systems.
      b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.
   3. Delegated Design Submittals:
      a. Design Data:
         1) Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional engineer's seal shall be clearly legible, including state of registration, registration number, and name on seal.
         2) Certification by professional engineer that professional engineer has performed design of aluminum handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design conforms to all local, state, and federal Laws and Regulations, and to prevailing standards of practice.
      b. ENGINEER will review Samples for finish, color, joint tolerances, workmanship, and general component assembly only. Compliance with other requirements is the responsibility of the CONTRACTOR.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification on source of supply, as specified in Article 1.3 of this Section.
      b. Manufacturer certification specified in Article 1.3 of this Section.
   2. Qualifications Statements: Submit qualifications for the following:
      a. Manufacturer, when requested by ENGINEER.

b. Professional engineer.
c. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:
1. Maintenance Manuals: Furnish detailed maintenance manuals that include the following:
a. Product name and number.
b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods and precautions in use of products that may be detrimental to finish when improperly applied.
c. Handrail and railings systems manufacturer's current catalog including individual parts.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
1. Keep products off ground using pallets, platforms, or other supports. Protect products from corrosion and deterioration.

B. Handling of Products:
1. Do not subject handrail and railing products to bending or stress.
2. Do not damage edges or handle products in a manner that will cause scratches, warping, or dents.
3. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

1.6 GUARANTEE

A. Guarantee: Manufacturer shall provide written guarantee of availability of replacement parts and components for period of at least five years after completion of the Project.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description: Aluminum handrail and railing system shall consist of equally spaced horizontal rails with totally concealed mechanical fasteners, internally threaded tubular rivets and components fastened to posts spaced no more than five

feet on centers and system of handrails supported from adjacent construction by mounting brackets spaced at no more than five feet on centers.

B. Design Criteria and Performance Criteria:
   1. Design, fabricate, and install aluminum handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
      a. Uniform Load: 50 pounds per foot, applied at top in any direction.
      b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.
      c. Components: Intermediate rails (all rails except the handrail), balusters, and panel fillers, if any, shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
      d. Comply with AA Aluminum Design Manual for determining allowable stresses and safety factors for aluminum structural components.
      e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum, and to 1/4-inch maximum on railing posts. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
   2. Thermal Control: Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, which accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
   3. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
   4. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to conform to loading and deflection criteria specified, at intervals no greater than maximum post spacing specified. Where posts are shown for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Wesrail, by Moultrie Manufacturing Company.
   2. Alumaguard, by Alumaguard – A division of Bettinger West, Inc.
   3. Or equal.

2.3 MATERIALS

A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.

B. Aluminum Forgings: ASTM B247.

C. Extruded or Drawn Aluminum Pipe and Tube:
   1. ASTM B429 or ASTM B241/B241M, Alloy 6063-T5, 6063-T52, or 6063-T832 as required by loadings, deflections, and post spacing specified.
   2. Provide Schedule 40 pipe, minimum, unless conditions of detail and fabrication require extra-heavy pipe to comply with Specifications. Rails and posts shall have minimum outside diameter of 1.90 inches.

D. Reinforcing Bars: Urethane foam-filled, Schedule 80, 23 inches long 6061-T6 aluminum reinforcing bars or tubes with outside diameter same as inside diameter of post.

E. Anchors and Fastenings:
   1. For anchors and fasteners, use Type 316 stainless steel; minimum 3/8-inch diameter.
   2. Provide minimum of four bolt fasteners per post where surface-mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as approved or accepted (as applicable) by ENGINEER on submittals.
   3. Anchors: In accordance with Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

F. Castings:
   1. Provide high-strength aluminum alloy brackets, flanges, and fittings suitable for anodizing as specified.
   2. Aluminum alloy sand castings: ASTM B26/B26M.

G. Connector Sleeves: Schedule 40, five-inch long by 1.610-inch diameter.

H. Sockets: Provide six-inch deep by 2.5-inch outside diameter aluminum sockets with 3.5-inch wide socket cover on bottom of each socket and on top and bottom of removable post sockets.

I. Non-shrink Grout: Comply with Section 03600, Grout.

J. Toeboards:
   1. Provide extruded Alloy 6063-T5 or T52 aluminum alloy toeboards, unless railing is mounted on curbs or other construction of sufficient height and type to comply with OSHA 1910.23. Bars or plates are not acceptable.
   2. Unless otherwise specified, toeboards shall comply with OSHA 1910.23, Section (e).

K. System Components and Miscellaneous Accessories: Provide complete selection of manufacturer's standard and custom aluminum handrail and railing systems components and miscellaneous accessories required. Show type and location of all such items on Shop Drawings and other submittals as applicable.

2.4 FABRICATION

A. General: Unless otherwise shown or specified, provide typical non-welded construction details and fabrication techniques recommended in NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501.

B. Fabricate handrail and railing systems true to line and level, with accurate angles surfaces and straight edges. Fabricate corners without using fittings. Provide bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends. Provide not less than four-inch outside radius.

C. Remove burrs from exposed edges.

D. Close aluminum pipe ends by using prefabricated fittings.

E. Weep Holes:
   1. Fabricate joints that will be exposed to weather to exclude water.
   2. Provide 15/64-inch diameter weep holes at lowest possible point on each post in handrail and railing systems.
   3. Provide pressure relief holes at closed ends of handrail and railing systems.

F. Toeboards:
   1. Provide manufacturer's standard toeboard, that accommodates movement caused by thermal change specified without warping or bowing toeboards.
   2. Provide manufacturer's standard toeboard, which accommodates storage for removable socket covers.
   3. Coordinate and cope toeboard as required to accommodate cover flanges at posts.

4. Toeboards shall follow curvature of railing. Where railing is shown to have curved contours at corners, or other locations, toeboard shall likewise be curved to follow line of railing system.

G. Reinforcing Bars: Provide reinforcing bar friction-fitted at each post in railing system. Extend reinforcing bars of tubes six inches into cast-in-place sleeves or other types of supporting brackets.

H. Mechanically Fitted Component Pipe Handrail and Railing System:
1. Use non-welded pipe handrail and railing system with posts, top and intermediate rail(s), and flush joints.
2. Provide top and bottom intermediate horizontal rail(s), equally spaced.
3. Use Type 304/305 stainless steel blind rivets and Type 304/305 stainless steel self-tapping screws in assembling components of the Work.

2.5 FINISHES

A. General:
1. Prepare surfaces for finishing in accordance with recommendation of aluminum producer and the aluminum finisher or processor.
2. Adjust and control direction of mechanical finishes specified to achieve best overall visual effect in the Work.
3. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for aluminum components. ENGINEER reserves the right to reject aluminum materials because of color or texture variations that are visually objectionable, but only where variation exceed range of variations established by manufacturer prior to fabrication, by means of range of Samples approved by ENGINEER.
4. Anodize aluminum components.

B. Finish:
1. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; AA Designation - M32 Medium Satin Directional Texture.
2. Hand-Rubbed Finish: Where required to complete the Work and provide uniform, continuous texture, provide hand-rubbed finish to match medium satin directional texture specified to even out and blend satin finishes produced by other means.

C. Cleaning:
1. Provide non-etching chemical cleaning by immersing aluminum in inhibited chemical solution, as recommended by coating applicator, to remove lard oil, fats, mineral grease, and other contamination detrimental to providing specified finishes.

2. Clean and rinse with water between steps as recommended by aluminum manufacturer.

D. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified that do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the alloy, temperature, current density, and acid electrolytes to obtain specified colors in compliance with designation system and requirements of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501. Comply with the following:
   1. Provide Architectural Class I high density anodic treatment by immersing the components in tank containing solution of 15 percent sulfuric acid at 70 degrees F with 12 amperes per square foot of direct current for minimum of sixty minutes; AA Designation A41 Clear.
   2. Physical Properties:
      a. Anodic Coating Thickness, ASTM B244: Minimum of 0.7-mils thick.
      b. Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.
      c. Resistance to Staining, ASTM B136: No stain after five minutes dye solution exposure.
      d. Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.
   3. Seal finished anodized coatings using deionized boiling water to seal pores and prevent further absorption.
   4. Products and Manufacturers: Provide one of the following:
      a. Alumilite 215 Clear by Aluminum Company of America, Inc.
      b. Or equal.

2.6 SOURCE QUALITY CONTROL

A. Allowable Tolerances:
   1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      a. Spacing: Plus-or-minus 3/8-inch.
      b. Alignment: Plus-or-minus 1/4-inch.
      c. Plumbness: Plus-or-minus 1/8-inch.
   2. Minimum Handrails and Railings Systems Plumb Criteria:
      a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12 feet with posts set plumb to within 1/16-inch in 3.0 feet.
      b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.
   3. Provide "pencil-line" thin butt joints.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be performed and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Verify to COUNTY the gage of aluminum pipe railing posts and rails brought to the Site by actual measurement of on-Site material in presence of COUNTY.

3.2 INSTALLATION

A. General:
   1. Do not erect components that are scarred, dented, chipped, discolored, otherwise damaged, or defaced. Remove from Site railing and handrail system components that have holes, cuts, gouges, deep scratches, or dents of any kind. Repairs to correct such Work will not be accepted. Remove and replace with new material.
   2. Comply with installation and anchorage recommendations of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501 in addition to requirements specified and approved or accepted (as applicable) submittals.

B. Fastening to In-Place Construction:
   1. Remove protective plastic immediately before installing.
   2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building or structure as follows:
      a. Anchor posts in concrete by providing sockets set and anchored into concrete floor slab. Provide closure secured to bottom of sleeve. Before installing posts, remove debris and water from sleeves. Verify that reinforcing bars or tubes have been inserted into posts before installation. Do not install posts without reinforcing bar. For all non-removable handrail and railing systems sections, after posts have been inserted into sockets, fill annular space between posts and sockets solid with grout as specified in Section 03000, Concrete. Crown the grout and slope grout to drain away from posts.
      b. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop-connected to posts and bolted to steel supporting members. Flanges shall be as recommended by manufacturer. Verify that reinforcing bars are inserted into posts before installation. Do not install posts without reinforcing bar.

c. Side-mount posts by fastening them securely in brackets attached to steel or concrete fascia as shown and in accordance with approved or accepted (as applicable) submittals.
d. Provide removable railing sections where shown. Provide removable railing system posts with friction-fitted reinforcing bar in each post. Provide sockets with socket covers stored in extruded toeboard. Provide aluminum pipe collars for all removable posts. Accurately locate sleeves to match post spacing.
e. Provide posts set in concrete with an aluminum floor cover flange.

3. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

C. Cutting, Fitting, and Placement:

1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.
2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade surfaces of units that have been finished after fabrication, and are intended for field connections.
3. Make permanent field splice connections using stainless steel blind rivets and five-inch minimum length connector sleeves. Tight press-fit field splice connectors and install in accordance with manufacturer's written instruction. Install two blind rivets per joint on 180-degree centers.
4. Make splices as near as possible to posts, but not exceeding 12 inches from nearest post.
5. Field welding is not allowed. Make splices using pipe splice lock employing a single allen screw to lock joint.
6. Provide hinged gates as shown.
7. Provide chain sections as shown. Provide one chain length with fastening accessories for top and each intermediate rail.
8. Secure handrails to walls with wall brackets and end fittings as shown. Drill wall plate portion of the bracket to receive one bolt, unless otherwise shown for concealed anchorage. Locate brackets as shown or, if not shown, at not more than five feet on centers. Provide flush type wall return fittings with same projection shown for wall brackets. Secure wall brackets and wall return fittings to building or structure. Refer to Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
9. Securely fasten toeboards in place with not more than 1/4-inch clearance above floor level.
10. Drill one 15/64-inch diameter weep hole not more than 1/4-inch above top of location of solid reinforcing bar or tube in each post.

D. Fastening to Existing Construction:
   1. Provide heavy-duty floor flange and anchorage devices and fasteners where necessary for securing handrail and railing systems components to existing construction; including stainless steel threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required. Refer to Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   2. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

E. Expansion Joints:
   1. Provide slip joint with internal sleeve extending not less than two inches beyond joint on each side.
   2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
   3. Locate joints within six inches of posts.

F. Protection from Dissimilar Materials:
   1. Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09900, Coatings.
   2. Do not extend coating beyond contact surfaces. Remove coating where exposed-to-view in the finished Work.

3.3 CLEANING AND REPAIRING

A. Cleaning:
   1. Clean exposed surfaces of handrail and railing systems after completion of installation. Comply with recommendations of both handrail and railing system manufacturer and finish manufacturer. Do not use abrasives or unacceptable solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique.
   2. Remove stains, dirt, grease, and other substances by washing handrails and railings systems thoroughly using clean water and soap; rinse with clean water.
   3. Do not use acid solution, steel wool, or other harsh abrasives.
   4. If stain remains after washing, remove defective sections and replace with new material complying with this Section.

B. Handrails and railings shall be free of dents, burrs, scratches, holes, and other blemishes. Replace damaged or otherwise defective Work with new material that complies with this Section at no additional cost to COUNTY.

C. Prior to Substantial Completion, replace adjacent work marred by the Work of this Section.

+ + END OF SECTION + +

SECTION 05532

ALUMINUM GRATING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install aluminum grating and frames.
   2. The Work includes:
      a. Providing grating, frames, and appurtenances.
      b. Providing openings in aluminum grating to accommodate the Work under this and other Sections, and attaching to aluminum grating all items such as sleeves, bands, studs, fasteners, and items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum grating Work.

C. Related Sections:
   1. Section 09900, Coatings.
   2. Section 05511, Pre-engineered Aluminum Stairs

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA Aluminum Design Manual.
   2. ASTM B210, Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
   3. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   4. NAAMM MBG 531, Metal Bar Grating Manual.
   5. NAAMM MBG 533, Welding Specifications for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years experience manufacturing products substantially similar to those required and shall be able to submit

documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all products and materials included in this Section regardless of component manufacturer from a single aluminum-grating manufacturer.
   2. Aluminum grating manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all products and materials furnished under this Section.
   3. Components shall be suitable for the specified service conditions and be integrated into overall assembly by aluminum grating manufacturer.
   4. Provide only one type of aluminum grating exclusively throughout the Project.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection of all Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
      b. Setting drawings and templates for location and installation of anchorage devices.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices to be embedded in cast-in-place concrete in ample time to prevent delaying the Work.

B. Storage and Protection:
   1. Protect materials from corrosion and deterioration.
   2. Do not store materials in contact with concrete or other materials that might cause corrosion, staining, scratching, or damage materials or finish.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Aluminum Grating: Provide aluminum grating complying with the following:

1. Grating Design Loads: Uniform live load shall be as shown or indicated in the Contract Documents. Where live load is not shown or indicated, uniform live and concentrated loads shall be as indicated in the table below, whichever results in the greater design stresses.

	Live Load	Concentrated Load
a.	100 psf	500 lbs. per foot of grating width at center of span

2. Maximum Clear Span Deflection for Uniform Live Loads: 1/120 of span, but not more than 1/4-inch.
3. Maximum Fiber Stress: 12,000 psi.
4. Do not install aluminum grating in areas subject to vehicular traffic.
5. Minimum Size of Members:
   a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
   b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
6. Banding bar shall be 1/4-inch thick minimum. Top of banding bar shall be flush with top of grating, unless otherwise shown or indicated. Banding bar shall be 1/4-inch shorter than the bearing bar height.
7. Comply with requirements of AA Aluminum Design Manual.

B. Stair Treads: Provide stair treads complying with the following:
   1. Stair Tread Design Loads: Concentrated live load shall be:
      a. 300 pounds on front-most five inches of tread at center of tread of span up to 5.5 feet.
      b. 300 pounds on front-most five inches of tread at the one-third points of tread of span greater than 5.5 feet.
   2. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but not more than 1/4-inch.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Minimum Size of Members:
      a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
      b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.

5. Carrier plate shall be 1/4-inch thick minimum. Top of carrier plate shall be flush with top of tread, unless otherwise shown or indicated. Provide carrier plate with hole and slot for attachment to stringer.
6. Comply with requirements of AA Aluminum Design Manual.

2.2 MANUFACTURERS

A. Grating, Products and Manufacturers: Provide one of the following:
   1. Swage-Locked I-Bar Grating, by IKG Industries.
   2. Swage-Locked I-Bar Grating, by AMICO.
   3. Or equal.

B. Stair Treads, Products and Manufacturers: Provide one of the following:
   1. I-Bar Treads, by IKG Industries.
   2. I-Bar Treads, by AMICO.
   3. Or equal.

2.3 MATERIALS

A. Bearing Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

B. Cross Bars or Bent Connecting Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with either ASTM B221 or ASTM B210.

C. Frames: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

D. Stud anchors welded to steel supports and other fasteners shall be Type 316 stainless steel.

2.4 FABRICATION

A. Use materials of minimum depth and thickness specified and required to comply with performance criteria in the Contract Documents.

B. Provide grating as follows:
   1. Grating Type: Aluminum I-bar with swage-locked cross bars at right angles to bearing bars.
   2. Depth: One-inch minimum.
   3. Bearing Bars: Aluminum I-bar minimum of one-inch spaced at 1-3/16-inch on centers.
   4. Cross-Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
   5. Surface: Grooved.
   6. Finish: Mill.

C. Provide stair treads as follows:
   1. Tread Type: Aluminum I-bar with swage-locked cross bars at right angles to bearing bars.
   2. Depth: One-inch minimum.
   3. Bearing Bars: Aluminum I-bar minimum one-inch spaced at 1-3/16-inch on centers.
   4. Cross Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
   5. Surface: Grooved.
   6. Nosing: Cast aluminum abrasive nosing.
   7. Finish: Mill.

D. Provide cutouts in grating for passage of piping, electrical conduit, valve stems, columns, ducts, and similar work. Where more than two bearings bars are included in a cut out, provide banding bars of same dimensions as bearing bars around opening welded to grating component parts.

E. Gratings shall be accurately fabricated, free from warps, twists, and other defects that would affect grating appearance and grating serviceability.

F. Welding shall conform to requirements of NAAMM MBG 533. Welds shall be ground smooth at top surfaces and bearing surfaces.

G. Openings in and edges of gratings sections shall be banded with banding bars. Weld bands to intersecting members.

H. Size each section of grating to weigh not more than 100 pounds, unless otherwise indicated in the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which Work is to be performed and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Check all dimensions at the Site after piping and equipment are in place and determine exact locations of openings and cutouts.

3.2 INSTALLATION

A. Fastening to In-Place Construction:

1. Use anchorage devices and fasteners to secure aluminum grating to supporting members or prepared openings, as recommended by manufacturer.
2. Weld Type 316 stainless steel stud bolts to receive saddle clip or flange block anchors to supporting steel members. Drill for machine bolts when supports are aluminum.

B. Cutting, Fitting, and Placing:
1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true, and free of rack. Do not use wedges or shimming devices.
2. Where gratings are penetrated by piping, electrical conduit, ducts, structural members, or similar protrusions, cut openings neatly and accurately to size and attach banding bar as specified.
3. Divide panels into sections only to extent required for installation where aluminum grating is to be installed around previously installed piping, electrical conduit, ducts, structural members, or similar protrusions.

C. Aluminum gratings in concrete floors shall be removable and arranged in sizes to be readily lifted. Provide aluminum gratings in concrete with aluminum angle frames with mitered corners and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected for flush fit.

D. Clearance at ends or between sections of grating shall be a maximum of 1/4-inch.

E. Tops of aluminum gratings shall be set flush with surrounding construction.

F. Aluminum gratings shall be set with full and uniform end bearing on frames to preclude rocking movement; do not use wedges or similar shimming devices.

G. Protection of Aluminum from Dissimilar Materials: Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel, or other metals, in accordance with Section 09900, Coatings.

+ + END OF SECTION + +

SECTION 05542

FLOOR ACCESS HATCH COVERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install floor access hatch covers.
   2. The Work also includes:
      a. Providing openings in and attachments to floor access hatch covers to accommodate the Work under this and other Sections, and providing for floor access hatch covers items such as anchorage devices, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items to be installed with or before floor access hatch covers Work.

C. Related Sections:
   1. Section 03431, Precast Concrete Vaults.
   2. Section 09900, Coatings

1.2 REFERENCES

A. Standards referenced in this Section:
   1. AASHTO Standard Specifications for Highway Bridges.
   2. MIL-P-21035B, Military Specification, Paint, High Zinc Dust Content Galvanizing Repair.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have not less than five years experience producing products substantially similar to those specified and, upon ENGINEER's request, shall submit documentation of not less than five satisfactory installations in place for not less than five years each.

B. Component Supply and Compatibility:
   1. Obtain all sizes of each type of access hatch cover regardless of the component manufacturer from a single floor access hatch covers manufacturer. Furnishing covers from more than one manufacturer is unacceptable.
   2. Floor access hatch covers manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for all components furnished under this Section.
   3. Components shall be suitable for specified service conditions and shall be integrated into the overall assembly by the floor access hatch covers manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed plans and other drawings showing location of products and direction of door swing; floor access hatch cover schedules indicating cover location, material, type, loading capacity, and other information; and fabrication details for the access hatch covers Work, including materials, thickness of metals, finishes, latching or locking provisions, type of anchorages, and accessory items.
   2. Product Data:
      a. Copies of manufacturer's literature and specifications for each type of floor access hatch incorporated in the Work.

B. Informational Submittals: Submit the following:
   1. Supplier Instructions:
      a. Installation data, including setting drawings and templates.
   2. Qualifications Statements:
      a. Manufacturer, when requested by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping:
   1. Protect mill finish and other finish during shipping and installation by an attached, adhesive-backed vinyl material that is removable during and after installation of the access hatch cover.

B. Storage and Protection:
   1. Protect steel members and packaged materials from corrosion and deterioration.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive COUNTY of other rights or remedies COUNTY may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranties:
   1. Furnish manufacturer's written three-year warranty from date of substantial completion against failure to meet requirements of this specification or faulty workmanship of the floor access hatch covers. Services during the warranty period shall include repair or replacement, and all costs related to visits to site, as necessary to remedy defects.

PART 2 – PRODUCTS

2.1 GENERAL

A. General:
   1. Provide manufacturer's standard fabricated access hatch cover units, modified when necessary to comply with the Contract Documents. Where standard units are not available for the sizes and types required, provide custom-fabricated units of the same quality as manufacturer's similar standard-sized units.
   2. Fabricate each access hatch cover unit in the shop, complete with anchors, gaskets, hardware, and accessory items, as required.

2.2 CHANNEL-FRAME TYPE ACCESS HATCH COVERS

A. Aluminum Floor Access Hatch Covers – Channel Frame Type:
   1. Design Live Load: 300 pounds per square foot.
   2. Products and Manufacturers: Provide one of the following:
      a. Single-Leaf Door Aluminum Access Hatch Cover:
         1) Model TPS, by U.S.F Fabrication, Inc.
         2) Type J-AL, by The Bilco Company.
         3) Or equal.
      b. Double-Leaf Door Aluminum Access Hatch Cover:
         1) Model TPD, by U.S.F. Fabrication, Inc.
         2) Type JD-AL, by The Bilco Company.
         3) Or equal.
   3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover. Provide flush drop-handle for lifting the cover.

4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around perimeter for anchorage to concrete.
5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.
6. Gasket: EPDM gasket mechanically attached to the channel frame.
7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper-resistant bolts.
8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door) with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.
9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
10. Fall-Through Prevention System: Provide access hatch cover manufacturer's standard safety grating of FRP or aluminum, constructed for live load capacity of not less than 300 psf. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
11. Finish: Mill finish.

B. Aluminum Floor Access Hatch Covers (H-20 Loading) – Channel Frame Type:
   1. Design Live Load: H-20 truck loading in accordance with AASHTO Standard Specifications for Highway Bridges, intended for use in off-street locations that may occasionally be subject to H-20 wheel loads.
   2. Products and Manufacturers: Provide one of the following:
      a. Single-Leaf Door Aluminum Access Hatch Cover:
         1) Model THS, by U.S.F Fabrication.
         2) Type J-AL H-20, by The Bilco Company.
         3) Or equal.
      b. Double-Leaf Door Aluminum Access Hatch Cover:
         1) Model THD, by U.S.F Fabrication.
         2) Type JD-AL H-20, by The Bilco Company.
         3) Or equal.
   3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover with stiffener plates, as required. Provide flush drop-handle for lifting the cover.
   4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around the perimeter for anchorage to concrete.
   5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.

6. Gasket: EPDM gasket mechanically attached to the channel frame.
7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper resistant bolts.
8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door) with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.
9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
10. Fall-Through Prevention System: Provide access hatch cover manufacturer's standard safety grating of FRP or aluminum, constructed for live load capacity of not less than 300 psf. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
11. Finish: Mill finish.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which floor access hatch cover Work will be performed and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install floor access hatch covers in accordance with approved Shop Drawings and other approved submittals, the Contract Documents, and manufacturer's instructions.

B. Set floor access hatch covers level and true to line or grade, without warp or rack.

C. Drain Piping for Channel Frames:
   1. Provide drain piping from the floor access match cover channel frame routed as shown or indicated on the Drawings.
   2. After installation, fill drain piping with water. Drain piping shall be free of visible leaks.

D. Protection of Aluminum from Dissimilar Materials: Coat surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, steel, and other metals in accordance with Section 09900, Coatings.

3.3 ADJUSTING AND CLEANING

A. Adjust leafs of floor access hatch covers as necessary to provide proper operations.

B. Remove stains, concrete splatter, oils, grease, and other foreign materials necessary and provide clean, finished surfaces.

+ + END OF SECTION + +

SECTION 07920

SECTION 07920

JOINT SEALANTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install joint sealants.
   2. Extent of each type of calking and sealant is shown or indicated and includes the following:
      a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before joint sealants.
   2. Coordinate final selection of joint sealants so that materials are compatible with all calking and sealant substrates specified.

C. Related Sections:
   1. Section 03251, Concrete Joints.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
   3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
   4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   5. ASTM C920, Specification for Elastomeric Joint Sealants.
   6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
   7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
   8. ASTM C1193, Guide for Use of Joint Sealants.

9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
10. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
11. FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Engage a single installer, approved by product manufacturer, regularly engaged in calking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of joint sealants installation, indication each specific surface where calking or sealants are to be provided and the material proposed for each application.
   2. Product Data:
      a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, calking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each product complies with the Contract Documents and is intended for the applications shown or indicated.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with the following:
   1. Delivery of Products:
      a. Deliver products in calking and sealant manufacturer's original unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.
      b. Include the following information on label:
         1) Name of material and Supplier.
         2) Formula or Specification Section number, lot number, color and date of manufacture.
         3) Mixing instructions, shelf life, and curing time, when applicable.
   2. Storage of Products:

a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
b. Do not use materials that are outdated as indicated by shelf life.
c. Store sealant tape in manner that will not deform tape.
d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
e. When high temperatures prevail, store mixed sealants in a cool place.

3. Handling:
   a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.6 JOB CONDITIONS

A. Environmental Conditions:
1. Do not install joint sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
2. Proceed with the Work when forecasted weather conditions are favorable for proper cure and development of high-early bond strength.
3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of calking, sealants, and painting Work, and areas where COUNTY's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that joint sealants and other Work are unaffected by exhaust.

1.7 WARRANTY

A. Provide written warranty, signed by manufacturer and CONTRACTOR, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.

1. Provide manufacturer warranty for period of three years from date of Substantial Completion of joint sealants Work.
2. Provide installer warranty for period of three years from date of Substantial Completion of joint sealants Work.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide colors selected by COUNTY from calking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

2.2 MATERIALS

A. Exterior and Interior Horizontal and Vertical Joints; Submerged and Intermittently Submerged in Potable Water or Water That Will be Treated to Become Potable:
   1. One-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex-1a by Sika Corporation.
         2) Or equal.

B. Miscellaneous Materials:
   1. Joint Cleaner: As recommended by calking and sealant manufacturer.
   2. Joint Primer and Sealer: As recommended for compatibility with calking and sealant by calking and sealant manufacturer.
   3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with calking and sealant by calking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of calking and sealant. Provide self-adhesive tape where applicable.
   4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with calking and sealant by calking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly-compressible backer to minimize possibility of sealant extrusion when joint is compressed.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and conditions under which calking and sealant Work will be performed, and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with calking and sealant Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protection: Do not allow joint sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or calking and sealant materials.

B. Joint Surface Preparation:
   1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions as shown on approved Shop Drawings.
   2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior to applying primer or sealant.
   3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce a dull sheen.

3.3 INSTALLATION

A. Install joint sealants after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure calking and sealant joints will not be soiled. Replace calking and sealant joints soiled after installation.

B. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.

C. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

D. Confirm that compressible filler is installed before installing sealants.

E. Do not install sealants without backer rods and bond breaker tape.

F. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.

G. Employ only proven installation techniques that will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

H. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
   1. For horizontal joints in sidewalks, pavements, and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
   2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

I. Remove excess and spillage of compounds promptly as the Work progresses.

J. Cure calking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.4 ADJUSTING AND CLEANING

A. Where leaks and lack of adhesion are evident, replace sealant.

B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.

C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.5 PROTECTION

A. During and after curing period, protect joint sealants from contact with contaminating substances and from damage resulting from construction operations or other causes, so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

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SECTION 09900

SECTION 09900

COATINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and apply paint systems.
      a. CONTRACTOR is responsible for surface preparation and painting of all new and existing interior and exterior items and surfaces throughout the Project areas included under this and other Sections.
   2. Extent of painting includes the Work specified below. Painting shown in schedules may not provide CONTRACTOR with complete indication of all painting Work. Refer to Article 2.2 of this Section where all surfaces of generic types specified are specified for preparation and painting according to their status, intended function, and location, using the painting system for that surface, function, and location as specified, unless specifically identified on the Drawings as a surface not to receive specified painting system.
      a. All new and specifically identified existing surfaces and items except where natural finish of material is specified as a corrosion-resistant material not requiring paint; or is specifically shown as indicated by written note, or specified as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.
      b. Surface preparation and painting of all new surfaces, both interior and exterior, including items furnished by COUNTY, are included in the Work, except as otherwise shown or specified.

B. Coordination:
   1. Review installation, removal, and demolition procedures under other Sections and coordinate them with the Work specified in this Section.
   2. Coordinate painting of areas that will become inaccessible once equipment and similar fixed items have been installed.
   3. Furnish information to ENGINEER on characteristics of finish materials proposed for use and ensure compatibility with prime coats used. Provide barrier coats over incompatible primers or remove and repaint as required. Reprime equipment primed in factory and other factory-primed items that are damaged or scratched.

C. Related Sections:
   1. Section 07920, Joint Sealants.

D. Work Not Included: The following Work is not included as painting Work, or are included under other Sections or in other contracts:
   1. Shop Priming: Shop priming of structural metal, miscellaneous metal fabrications, other metal items and fabricated components such as shop-fabricated or factory-painted process equipment, plumbing equipment, heating and ventilating equipment, electrical equipment, and accessories shall conform to applicable requirements of this Section but are included under other Sections.
   2. Pre-finished Items:
      a. Items furnished with such finishes as baked-on enamel, porcelain, and polyvinylidene fluoride shall only be touched up at Site by CONTRACTOR using manufacturer's recommended compatible field-applied touchup paint.
      b. Items furnished with finishes such as chrome plating or anodizing.
   3. Concealed Surfaces: Non-metallic wall or ceiling surfaces in areas not exposed to view, and generally inaccessible areas, such as furred spaces, pipe chases, duct shafts, and elevator shafts.
   4. Concrete surfaces below elevation 35.5 feet, unless otherwise shown or specified.
   5. Concrete floors, unless specifically shown as a surface to be painted.
   6. Face brick, glazed structural tile, and prefaced, ground-faced or split-faced concrete unit masonry.
   7. Exterior face of architectural precast concrete.
   8. Collector bearings, shafts and chains, wood flights, wood stop logs, and wood or fiberglass baffles.
   9. Corrosion-Resistant Metal Surfaces: Where the natural oxide of item forms a barrier to corrosion, whether factory- or Site-formed, including such materials as copper, bronze, muntz metal, terne metal, and stainless steel.
   10. Operating Parts and Labels:
      a. Do not paint moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sensing devices, interior of motors, and fan shafts.
      b. Do not paint over labels required by governing authorities having jurisdiction at Site, or equipment identification, performance rating, nameplates, and nomenclature plates.
      c. Cover moving parts and labels during the painting with protective masking. Remove all protective masking upon completion of Work. Remove all paint, coatings, and splatter that comes in contact with such labels.
   11. Structural and miscellaneous metals covered with concrete need not receive primers, intermediate, or finish coats of paint.

12. Existing structures, equipment, and other existing surfaces and items unless otherwise shown or specified.

E. Description of Colors and Finishes:
   1. Color Selection:
      a. COUNTY reserves the right to select non-standard colors for paint systems specified within ability of paint manufacturer to produce such non-standard colors. Provide such colors at no additional expense to COUNTY.
   2. Color Coding of Pipelines, Valves, Equipment, and Ducts:
      a. Color-coding of pipelines, valves, equipment and ducts shall comply with applicable standards of ANSI A13.1, ANSI Z535.1, CFR 1910.144, Recommended Standards for Water Works, and Recommended Standards for Wastewater Facilities. For piping and equipment not covered by the above standards, conform to COUNTY's color standards.
      b. For equipment located on roofs and equipment that is exposed-to-view, color will be selected by COUNTY.

1.2 REFERENCES

A. Referenced Standards: Standards referenced in this Section are:
   1. ANSI A13.1, Scheme for Identification of Piping Systems.
   2. ANSI Z535.1, Safety Color Code.
   3. ASTM D16, Terminology for Paint, Related Coatings, Materials and Applications.
   4. ASTM D2200, Pictoral Surface Preparation Standards for Painting Steel Surfaces.
   5. ASTM D4262, Testing Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
   6. ASTM D4263, Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   7. ASTM D4541, Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion-Testers.
   8. ASTM E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
   9. Great Lakes Upper Mississippi River Board of Public Health and Environmental Managers (GLUMRB) Recommended Standards for Water Works.
   10. GLUMRB, Recommended Standards for Wastewater Facilities.
   11. Ozone Transport Commission, (OTC), OTC Model Rule for Architectural and Industrial Maintenance Coatings.
   12. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
   13. SSPC VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.

14. SSPC VIS 2, Method of Evaluating Degree of Rusting/Painted Steel Surfaces.
15. SSPC Volume 2, Systems and Specifications.

1.3 DEFINITIONS

A. Coating terms defined in ASTM D16 apply to this Section.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications:
   1. Engage a single applicator regularly performing installation of painting systems, with documented skill and successful experience in installing types of products required and agrees to employ only tradesmen trained, skilled, and with successful experience in installing types of products specified.

B. Testing Agency Qualifications: Provide independent testing agency with experience and capability to satisfactorily conduct testing specified in accordance with ASTM E329. Testing agency shall be selected by COUNTY and paid for by CONTRACTOR.

C. Source Quality Control:
   1. Obtain products from manufacturers that will provide services of a qualified manufacturer's representative at Site at commencement of painting Work to advise on products, mock-ups, installation, and finishing techniques, at completion of the Work to advise ENGINEER on acceptability of completed Work, and during course of Work as requested by ENGINEER.
   2. Submit "or equal" products, when proposed, with direct comparison to products specified, including information on durability, adhesion, color and gloss retention, percent solids, VOC's grams per liter, and recoatability after curing.
   3. "Or equal" manufacturers shall furnish same color selection as manufacturers specified, including intense chroma and custom pigmented colors in painting systems.
   4. Color Pigments: Provide pure, non-fading, applicable types to suit surfaces and services indicated. Comply with the following:
      a. Lead and Chromate: Lead and chromate content shall not exceed amount allowed by authorities having jurisdiction.
      b. Through CONTRACTOR, paint manufacturer shall notify ENGINEER of colors that are not suitable for long-term color retention in areas subject to hydrogen sulfide fume exposure.
      c. Manufacturer shall identify colors that meet requirements of authorities having jurisdiction at Site for use in locations subject to

contact with potable water or water that will be treated to become potable.

d. Comply with paint manufacturers' recommendations on preventing coating contact with levels of carbon dioxide and carbon monoxide that may cause yellowing during application and initial stages of curing of paint coatings.

D. Regulatory Requirements:
1. Comply with VOC content limits of Ozone Transport Commission (OTC), Model Rule for Architectural and Industrial Maintenance Coatings.

E. Pre-Painting Conference:
1. Conduct a pre-painting conference at the Site to review specified requirements. Meeting attendees shall include painting applicator and its foreman, paint manufacturer's technical representative, installers of other work in and around painting that must follow painting Work, ENGINEER, and other representatives directly concerned with performance of painting Work.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
1. Product Data:
a. Copies of manufacturer's technical data sheets, including surface preparation, number of coats, dry film thickness, test performance data including paint analysis, VOC and chemical component content in comparison to maximum allowed by the Contact Document, and application instructions for each product proposed for use
b. Submit proof of acceptability of proposed application techniques by paint manufacturer selected.
c. Copies of CONTRACTOR's proposed protection procedures in each area of the Work explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption, and for maintaining acceptable application, curing, and environmental conditions during and after painting systems application.
d. List each material and cross-reference to the specific painting system and application, including a list of site-specific surfaces to which painting system will be applied. Identify by manufacturer's catalog number and general classification. State number of gallons of each product being purchased for delivery to Site and square foot area calculated to be covered by each painting system specified based on theoretical loss of 20 percent. Where actual area to be covered by

paint system exceeds area submitted to ENGINEER for that system, proof of additional material purchase shall be provided to ENGINEER. Calculated coverage shall be as specified for each component of each painting system specified. This requirement does not take precedence over CONTRACTOR's responsibility to provide dry film thickness required for each component of each painting system.

e. Identify maximum exposure times allowable for each paint system component before next coat of paint can be applied. Submit proposed methods for preparing surfaces for subsequent coats if maximum exposure times are exceeded.

f. Information on curing times and environmental conditions that affect curing time of each paint system component and proposed methods for accommodating variations in curing time. Identify this information for each painting system in the Work.

g. Specification for spray equipment with cross-reference to paint manufacturer's recommended equipment requirements.

2. Samples:

a. Copies of manufacturer's complete color charts for each coating system.

B. Informational Submittals: Submit the following:

1. Certificates:

a. Certificate from paint manufacturer stating that materials meet or exceed Contract Documents requirements.

b. CONTRACTOR shall provide notarized statement verifying that all painting systems are compatible with surfaces specified. All painting systems components shall be reviewed by an authorized technical representative of paint manufacturer for use as a compatible system. Verify that all painting systems are acceptable for exposures specified and that paint manufacturer is in agreement that selected systems are proper, compatible, and are not in conflict with paint manufacturer's recommended specifications. Show by copy of transmittal form that a copy of letter has been transmitted to paint applicator.

2. Test Reports:

a. Certified laboratory test reports for required performance and analysis testing in compliance with ASTM E329.

b. Adhesion testing plan and procedures.

c. Results of adhesion testing on existing surfaces containing paints or other coatings to be topcoated with paint systems specified. Prior to adhesion testing, submit a testing plan establishing methods, procedures and number of tests in each area where existing coatings are to remain and become substrate for painting Work. Based on results of adhesion testing, recommend methods, procedures, and painting system modifications, if necessary, for proceeding with Work.

d. Locations of and test methods for soil sampling before beginning Work and after Substantial Completion.
e. Proposed methods for testing, handling, and disposal of waste generated during Work.
f. Results of alkalinity and moisture content tests performed per ASTM D4262 and ASTM D4263.
g. Results of film thickness, holidays, and imperfections tests.

3. Manufacturer's Instructions: Provide paint manufacturer's storage, handling, and application instructions prior to commencing painting Work at Site.
4. Manufacturer's Site Reports: Provide report of paint manufacturer's representative for each visit to Site by paint manufacturer's representative.
5. Special Procedure Submittals:
   a. Proposed protection procedures for each area of Work, explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption.
   b. Site-specific health and safety plan.
   c. Procedures for maintaining acceptable application, curing and environmental conditions during and after painting systems application.
   d. Procedures for providing adequate lighting, ventilation, and personal protection equipment relative to painting Work.
6. Qualifications:
   a. Applicator.
   b. Testing laboratory

C. Closeout Submittals: Submit the following:
   1. Maintenance Manual: Upon completion of the painting Work, furnish ENGINEER five copies of detailed maintenance manual including the following information:
      a. Complete and updated product catalog of paint manufacturer's currently available products including complete technical information on each product. Identify product names and numbers of each product used in the painting Work.
      b. Name, address, e-mail address and telephone number of manufacturer, local distributor, applicator and technical representative.
      c. Detailed procedures for routine maintenance and cleaning.
      d. Detailed procedures for light repairs such as dents, scratches and staining.
   2. Statement of Application: Upon completion of the painting Work, submit a notarized statement to ENGINEER signed by CONTRACTOR and painting applicator stating that Work complies with requirements of the Contract

Documents and that application methods, equipment, and environmental conditions were proper and adequate for conditions of installation and use.

1.6 DELIVERY, STORAGE AND HANDLING

A. Product Delivery Requirements: Deliver products to Site in original, new, and unopened packages and containers, accurately and legibly and accurately labeled with the following:
   1. Container contents, including name and generic description of product.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Grams per liter of volatile organic compounds.
   6. Thinning instructions, where recommended.
   7. Application instructions.
   8. Color name and number.

B. Product Storage Requirements:
   1. Store acceptable materials at Site.
   2. Store in an environmentally controlled location as recommended in paint manufacturer's written product information. Keep area clean and accessible. Prevent freezing of products.
   3. Store products that are not in actual use in tightly covered containers.
   4. Comply with health and fire regulations of authorities having jurisdiction at Site.

C. Product Handling Requirements:
   1. Handle products in a manner that minimizes the potential for contamination, or incorrect product catalyzation.
   2. Do not open containers or mix components until necessary preparatory work has been completed and approved by COUNTY and painting Work will start immediately.
   3. Maintain containers used in storing, mixing, and applying paint in a clean condition, free of foreign materials and residue.

1.7 SITE CONDITIONS

A. Site Facilities:
   1. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas being painted. Properly locate and vent heat sources to exterior so that paint systems and personnel are unaffected by exhaust products.

B. Existing Conditions:
   1. Existing surfaces to receive painting Work shall have their surfaces prepared to meet requirements of painting systems specified. Prior to initiating painting Work, perform adhesion tests on existing surfaces to be painted. Perform testing per ASTM D4541 or other method acceptable to ENGINEER. Number and location of tests shall be sufficient to determine the condition of existing coatings and suitability of existing coatings to remain to provide an acceptable substrate for new coatings. Submit testing plan prior to testing and provide ENGINEER the adhesion test results.
   2. Provide abrasive blasting, scraping, or other abrading or surface film removal, or preparatory techniques accepted by ENGINEER.
   3. Before commencing painting in an area, surfaces to be painted and floors shall be cleaned of dust using commercial vacuum cleaning equipment equipped with high-efficiency particulate air (HEPA(filters and dust containment systems.
   4. After painting operations have started in a given area, cleaning only with commercial vacuum cleaning equipment with high-efficiency particulate air (HEPA) filters and dust containment systems.

C. Environmental Requirements:
   1. Comply with manufacturer's published requirements.

D. Protection:
   1. Cover or otherwise protect finished Work of other trades and those surfaces not being painted concurrently and not to be painted.
   2. During surface preparation and painting, facility shall remain in operation. Use procedures that prevent contamination of process or cause or require facility shutdown.
   3. Coordinate and schedule surface preparation and painting to avoid exposing personnel to hazards associated with painting Work. Provide required personnel safety equipment per requirements of authorities having jurisdiction at Site.
   4. Submit protection procedures to be employed. Do not begin surface preparation and painting Work until ENGINEER accepts protection techniques proposed by CONTRACTOR.
   5. When working with flammable materials, provide fire extinguishers and post temporary signs warning against smoking and open flame.

PART 2 - PRODUCTS

2.1 PAINTING SYSTEM MANUFACTURERS

A. Products and Manufacturers: Where referenced under painting systems, provide painting systems manufactured by the following:
   1. Tnemec Company, Incorporated (TCI).
   2. The Carboline Company, part of StonCor Group, an RMP Company (TCC).
   3. Sherwin-Williams Company (SWC).
   4. Or equal.

2.2 PAINTING SYSTEMS

A. New and Existing Exterior Cast-In-Place Concrete, Including Water Storage Tanks, Concrete Unit Masonry, and Wood, Smooth Finish; Above-Grade, Exterior:
   1. Surface Preparation: Refer to Paragraphs 1.5.A.2., 3.2.A., 3.2.B.1., 3.2.B.2., 3.2.B.3., 3.2.B.5., 3.2.B.6., 3.2.B.7., and 3.2.B.8..
   2. Cast-In-Place Concrete and Unit Masonry Primer:
      a. Generic Components:
         1) Minimum 49 percent volume solids, flexible, high-build, single-component, modified waterborne acrylate coating that can fill and bridge minor hairline cracks; 96 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series 156 Enviro-Crete (TCI); Sanitile 100 (TCC); PrepRite Block Filler (SWC): One coat, 6.0 to 8.0 dry mils.
   3. Finish: Matt:
      a. Generic Components:
         1) Minimum 36 percent volume solids, flexible, high-build, single-component, modified waterborne acrylate, acrylic epoxy, or waterborne acrylic coating that can fill and bridge minor hairline cracks; 138 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series 156 Enviro-Crete (TCI); Carbocrylic 3359 (TCC); Epo-Plex Multi-Mil Low-Luster (SWC): One coat, 6.0 to 8.0 dry mils.

B. New and Existing Ferrous Metals, Non-Ferrous Metals and Exterior Surfaces of Piping; Submerged or Intermittently Submerged, including up to 4.0 above liquid surface; Interior and Exterior:
   1. Surface Preparation: Refer to Paragraphs 1.5.A.2., 3.2.A., 3.2.C.1.,.
   2. Factory Primer:
      a. Generic Components:
         1) Minimum 67 percent solids, two-component, cycloaliphatic amine- catalyzed epoxy or polyamido-amine epoxy; 334 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series N69 Hi-Build Epoxoline (TCI); Carboguard 954 HB

(TCC); Macropoxy HS Epoxy (SWC): One coat, 4.0 dry mils.

3. Shop Prime/Touch-Up/Finish, Satin:
   a. Generic Components:
      1) Minimum 100 percent volume solids, high-build, two-component, polyamide-catalyzed epoxy or polyamido-amine epoxy; 10 grams per gallon VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series N69 Hi-Build Epoxoline (TCI); Carboguard 890 LT (TCC); Dura-Plate UHS (SWC): Three coats, 8.0 to 15.0 dry mils, per coat.

C. New and Existing Ferrous Metals, Non-Ferrous Metals, and Galvanized Metals, including Water Storage Tanks; Non-Submerged, Exterior:
   1. Surface Preparation: Refer to Paragraphs 1.5.A.2., 3.2.A., 3.2.C.1., and 3.2.D.
   2. Ferrous Metal Shop Primer:
      a. Generic Components:
         1) Minimum 67 percent solids, polyamidoamine epoxy; 296 grams per liter, VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series V69 Hi-Build Epoxoline (TCI); Carboguard 954 (TCC); Macropoxy HS (SWC): One coat, 4.0 to 6.0 dry mils.
   3. Intermediate (Ferrous Metals Only):
      a. Generic Components:
         1) For Low-temperature Curing Conditions: Minimum 75 percent solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
         2) For Warm-temperature Curing Conditions: Minimum 75 percent volume solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) For Low-temperature Curing Conditions: Series 136, Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC); Macropoxy HS (SWC): One coat, 10.0 dry mils.
         2) For Warm-temperature Curing Conditions: Series 166 Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC); Macropoxy HS (SWC): One coat, 6.0 dry mils.
   4. Finish: Semi-Gloss:
      a. Generic Components:
         1) Minimum 65 percent solids, aliphatic acrylic polyurethane; 340 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series V73 Endura-Shield (TCI); Carbothane 133 VOC (TCC); Hi-Solids Aliphatic Acrylic Polyurethane (SWC): Two coats, 2.0

dry mils, per coat, 310 square feet per gallon.

D. New and Existing PVC and CPVC Piping and Fiberglass Insulation Covering; Non-submerged, Interior:
   1. Surface Preparation: Refer to Paragraphs 1.5.A.2., 3.2.A. and 3.2D.
   2. Primer:
      a. Generic Components:
         1) Minimum 37 percent volume solids single-component, self-cross linking acrylic primer-sealer; 226 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series 115 Uni-Bond DF (TCI); Carbocrylic 3358 (TCC); DTM Acrylic Primer/Finish (SWC): One coat, 2.0 to 4.0 dry mils.
   3. Finish: Satin:
      a. Generic Components:
         1) Minimum 37 percent volume solids, single component, self-cross linking acrylic; 226 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series 116 Uni-Bond (TCI); Carbocrylic 3358 (TCC); DTM Acrylic Primer/Finish (SWC): One coat, 2.0 to 4.0 dry mils.

2.3 CALKING AND SEALANTS

A. Refer to Section 07920, Joint Sealants.

2.4 INSTRUMENTS

A. Instruments:
   1. Provide one new dry-film thickness gauge for checking film thickness, one holiday detector to detect holidays or holes in the coating, and one set of visual standards to check surface preparation. Calibrate dry film thickness gauge at Site using Bureau of Standards standard shim blocks.
   2. Products and Manufacturers: Provide the following:
      a. Film Thickness Testers: Model FM-III manufactured by Mikrotest, or equal.
      b. Holiday detector shall be Model M-1 as manufactured by Tinker & Rasor, or equal.
      c. Visual Standards: ASTM D2200, Swedish Standards, SSPC VIS 1.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which painting Work is to be performed and notify COUNTY in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to COUNTY.

B. Do not paint over existing paint where there is no assurance that existing paint will provide an acceptable surface for long-term adherence and durability of painting systems specified, or where paint manufacturer requires removal of all existing paint to recommend use of specified painting system.

3.2 SURFACE PREPARATION

A. General:
   1. Comply with paint manufacturer's published recommendations for products, surface condition, and surface preparation.

B. Cast-In-Place Concrete, Precast Concrete and Masonry Surfaces:
   1. Prepare surfaces of concrete unit masonry to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and other contamination using soap and water. Surfaces shall be clean and dry at time of paint system application.
   2. Concrete unit masonry that cannot be adequately cleaned using soap and water shall be acid etched with a commercial solution of 15 percent muriatic acid.
   3. Prepare and clean cast-in-place concrete and precast concrete surfaces per ASTM D4259 to provide a uniform and continuous anchor profile of approximately one mil. Provide mechanical abrading and abrasive blasting per ASTM D4259. Use 40 to 80-mesh abrasive and clean, dry, compressed air. Compressed air cleanliness shall be per ASTM D4285. Pressure at blasting nozzle shall not exceed 80 pounds per square inch. Do not concentrate blast on surface; instead, move at a fairly rapid rate to provide a surface free of laitants and contaminants. Provide post-surface preparation cleaning per ASTM D4258 to remove loose material. Surface preparation shall open all surface air holes by removing laitance shoulders surrounding air holes. Vacuum surfaces to remove dust and sand, and wash with potable water.
   4. Where paint system is for chemical containment barrier protection, repair cracks and expansion joints in concrete and provide 2-inch radiused cove base fillets at equipment pads and containment walls as part of complete chemical containment paint system Work. Use materials and techniques recommended by manufacturers of the paint and concrete repair products.
   5. Remove from cast-in-place concrete fins, projections, and other surface irregularities that would protrude above level of finished intermediate fillers

and surfacers. Remove by chipping and scarification by mechanical abrasion.

6. Using specified filler and surfacer, patch cast-in-place concrete and precast concrete surfaces as required to completely fill surface air holes and honeycombing. Level all protrusions, grind filler and surfacing compounds smooth, and level with adjacent surfaces.
7. Perform tests per ASTM D4262 and ASTM D4263 to verify alkalinity and moisture content of surfaces to be painted, and report findings to ENGINEER. If, in ENGINEER's opinion, surfaces are sufficiently alkaline to cause blistering and burning of paint, correct the condition before applying paint. Provide suitable testing materials for alkalinity and moisture tests. Do not paint surfaces where the moisture content exceeds eight percent.
8. Where a concrete unit masonry block filler is specified, spot patch holes and cracks with a putty knife using specified block filler. Apply to large surfaces by airless spray and backroll uniformly using a roller with a synthetic nap cover. Follow with a rubber squeegee to provide a smooth finish.

C. Ferrous Metals:
   1. Ductile and Cast Iron:
      a. Comply with paint manufacturer's recommendations and NAPF 500-03 for type and size of abrasive to provide a surface profile meeting paint manufacturer's requirements for type, function and location of surface. Verify that paint manufacturer-recommended profiles are achieved on prepared surfaces.
      b. Clean submerged and non-submerged ductile and cast iron surfaces to be shop-primed of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.
      c. Clean submerged ductile and cast iron that have not been shop-coated or that have been improperly shop-coated of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.
      d. Touch-up shop-applied prime coats that are damaged or have bare areas with primer recommended by paint manufacturer, after power tooling complying with NAPF 500-03 at the time of painting system application.

D. PVC and CPVC Piping and Fiberglass: Lightly sand and clean surfaces to be painted. Fiberglass surfaces shall be prepared by solvent washing to remove wax

and other contaminants, before abrading surfaces with 60- to 80-mesh sandpaper to provide an anchor pattern with scratches no further apart than 1/16-inch.

3.3 PROTECTION OF PROPERTY AND STRUCTURES

A. Protect property and structures adjacent to the Work from waste residues resulting from cleaning, surface preparation, and painting Work.

B. Use shrouding, vacuum blasting, or other acceptable methods for cleaning and surface preparation of exterior surfaces.

C. During blast cleaning and surface preparation of interior and exterior surfaces, control exhausting of dust and grit using shrouding, negative-pressure containment/dust collection systems, or other means to protect adjacent property and structures and prevent dust and grit from escaping. Similarly, control removal and temporarily store residues to protect adjacent property and structures.

D. For painting of exterior surfaces, use rollers, shrouding, or other acceptable methods as required to protect adjacent property and structures from wind-blown paint residues.

E. Submit proposed procedures for cleaning, surface preparation, and paint application that describe in detail methods to be used to protect adjacent property and structures from residues. Do not proceed with cleaning, surface preparation, or painting until proposed procedures are accepted by ENGINEER.

3.4 MATERIALS PREPARATION

A. General: Mix and prepare painting products in strict accordance with paint manufacturer's product data sheets.

3.5 APPLICATION

A. General:
   1. Apply paint systems by brush, roller, or airless spray per paint manufacturer's recommendations and in compliance with Paint Application Specifications No. 1 in SSPC Volume 2, where applicable, and in strict accordance with paint manufacturer's product data sheets.
   2. Surfaces of items not normally exposed-to-view do not require same color as other components of system of which they are a part, but require same painting system specified for exposed surfaces of system.
   3. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint before final installation of registers or grilles.

4. Paint backs of access panels and removable or hinged covers to match exposed surfaces.
5. Omit field-applied primer on metal surfaces that have been primed in the shop. Touch-up paint to shop-primed coats and pre-finished items only when approved by ENGINEER using compatible primers and paint manufacturer's recommended compatible field-applied finishes.
6. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

B. Minimum/Maximum Paint Film Thickness: Comply with manufacturer's published recommendations for coating type and surface.

C. Scheduling Surface Preparation and Painting: Comply with manufacturer's published recommendations for coating type and surface.

D. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to result in a finish coat with no burn-through or other defects caused by insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

F. Brush Application:
1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are unacceptable. Neatly draw all glass and color break lines.
2. Brush-apply all primer or first coats, unless otherwise allowed to use mechanical applicators.

G. Mechanical Applicators:
1. Use mechanical methods for applying paint when allowed by applicable ordinances, paint manufacturer, and approved by ENGINEER.
2. Limit roller applications, if approved by ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide equivalent hiding as brush-applied coats.
3. Where spray application is used, apply each coat to provide equivalent hiding of brush-applied coats. Do not double back with spray equipment for purpose of building up film thickness of two coats in one pass.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by ENGINEER.

3.6 FIELD QUALITY CONTROL

A. ENGINEER reserves right to invoke the following product testing procedure at any time, to a maximum of five times, during field painting Work:
   1. CONTRACTOR shall engage service of an independent testing laboratory to sample paints used. Samples of materials delivered to Site shall be taken, identified, and sealed, and certified as to being the material actually applied to surfaces in each area, in presence of CONTRACTOR.
   2. A testing laboratory selected by COUNTY and paid by CONTRACTOR at no extra cost to COUNTY will perform appropriate tests for any or all of the following characteristics:
      a. Abrasion resistance.
      b. Apparent reflectivity.
      c. Flexibility.
      d. Washability.
      e. Absorption.
      f. Accelerated weathering.
      g. Dry opacity.
      h. Accelerated yellowness.
      i. Recoating.
      j. Skinning.
      k. Color retention.
      l. Alkali resistance.
      m. Quantitative materials analysis.
   3. If test results show that product being used does not comply with specified requirements, CONTRACTOR may be directed to stop painting and remove non-complying paint; and prepare and repaint surfaces painted with rejected paint with products complying with the Contract Documents.

B. Notify COUNTY after completing each coat of paint. After inspection and checking of film thickness, holidays, and imperfections, and after acceptance by COUNTY, proceed with succeeding coat. Perform testing using testing instruments specified in Article 2.4 of this Section.

C. For magnetic substrates, measure thickness of dry film nonmagnetic coatings following recommendations of SSPC PA-2. These procedures supplement manufacturers' approved instructions for manual operation of measurement gauges and do not replace such instructions.

D. Record time, location, number of coats, dry film thickness, holidays, and other imperfections and submit testing results to ENGINEER.

3.7 PROTECTION

A. Provide "Wet Paint" signs as required to protect newly painted finishes. After completing painting Work, remove temporary protective wrappings provided for protection of the Work.

3.8 ADJUSTMENT AND CLEAN-UP

A. Correct damage to work of other trades by cleaning, repairing or replacing, and repainting, as acceptable to COUNTY.

B. During progress of the Work, remove from Site all discarded paint products, rubbish, cans, and rags at end of each workday.

C. Upon completion of painting, clean paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

D. At completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces as determined by COUNTY.

3.9 SCHEDULES

A. The schedules listed below, following the "End of Section" designation, are a part of this Specification section.
   1. Table 09900-A, Painting Schedule.

+ + END OF SECTION + +

TABLE 09900-A
PAINTING SCHEDULE

Facility or Surface *	Room No.	Painting System **	Remarks
Lake Filter Piping – Exterior	-	C	
Sodium Hypochlorite Feed System Piping – Interior	-	D	
Lake Filter Retaining Wall	-	A	
Lake Intake Structure Piping	-	B	
Backwash Lift Station Wetwell Piping	-	B	
Backwash Lift Station Valve Vault		C	

* Refer to Drawings for facility locations and for facilities not listed above.

** Refer to Article 2.2 of this Section.

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SECTION 10400

SECTION 10400

IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install identification devices.
      a. CONTRACTOR shall be responsible for all identification devices throughout the project and as specified herein.
   2. Extent of identification devices is shown and, where indicated, as specified.
   3. Types of products required include the following:
      a. Health, safety, warning, floor loading and fire extinguisher location signs.
      b. Pipeline identification signs, tags, and equipment nameplates.
      c. Right-to-know labels, signs and tags.
      d. Room identification.

B. Coordination:
   1. Review installation procedures under other sections and coordinate the installation of items that must be installed with, or before, the identification devices.
   2. Coordinate adhesives and fasteners with mounting surfaces. Review to other sections in order to insure compatibility of identification device mounting accessories for the various surfaces.

C. Related Sections:
   1. Section 09900, Coatings.

1.2 QUALITY ASSURANCE

A. Identification Devices Manufacturers:
   1. Engage firms specializing in the production of the types of products specified, in compliance with specified standards, with a documented record of successful in-service performance, and who can provide sufficient production capacity to avoid delaying the work.
   2. Colors shall be brilliant, distinctive shades, matching the safety colors specified in ANSI Z535.1 and OSHA 1910.144.

B. Performance Criteria:
   1. Details for identification devices shown, such as alphabet representation, letter spacing, borders designs, and other graphic features, are generic and intended to establish text, general positions and symbols only.
   2. Submit for approval complete, camera-ready, color graphic layouts based on specified requirements and recommendations from manufacturer.

C. Allowable Tolerances:
   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

D. Requirements of Regulatory Agencies:
   1. All accident prevention signs and tags shall comply with OSHA 1910.145.
   2. All health, safety and warning signs shall comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3 and OSHA 1910.144 and 1910.145, unless otherwise specified. The colors shall be those of opaque glossy samples as specified in Table 1 of ANSI Z535.1. Safety symbol pictograms shall be incorporated into each sign, in addition to text.

E. Codes: Comply with applicable requirements of The 2007 Florida Building Code with 2008 and 2009 Supplements including accessibility requirements.

F. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:
   1. ASTM A167, Stainless Steel and Heat-Resisting Chromium-Nickel; Steel Plate, Sheet and Strip.
   2. ASTM B26, Aluminum-Alloy Sand Castings.
   3. ASTM B584, Copper Alloy Sand Castings for General Applications.
   4. ASTM E527, Numbering Metals and alloys (UNS).
   5. ANSI A13.1, Scheme for the Identification of Piping Systems.
   6. ANSI A117.1, Accessible and Usable Buildings and Facilities.
   7. ANSI Z535.1, Safety Color Code.
   8. ANSI Z535.2, Environmental and Facility Safety Signs.
   9. ANSI Z535.3, Criteria for Safety Symbols.
   10. ANSI Z535.4, Product Safety Signs and Labels.
   11. ANSI Z535.5, Accident Prevention Tags (for Temporary Hazards).
   12. NFPA 704, Standard system for the Identification of the Hazards of Materials for Emergency Response.
   13. OSHA 1970, Title 29, Code of Federal Regulations Part 1910, Subpart Z, Toxic and Hazardous Substances.
   14. OSHA 1970, Title 29, Code of Federal Regulations Part 1910.144, Safety Color Code for Marking Physical Hazards.

15. OSHA 1970, Title 29, Code of Federal Regulations Part 1910.145, Accident Prevention Signs and Tags.
16. Chemical Abstracts Service, CAS Registry Numbers for Specific Chemical Identity.
17. Copper Development Association, CDA, Properties of Cast Copper Alloys.
18. The Aluminum Association, AA SAA-46, Standards for Anodized Architectural Aluminum.
19. The Aluminum Association, AA DSA-45, Designation System for Aluminum Finishes.

1.3 SUBMITTALS

A. Samples: Submit for approval the following:
   1. Each color and finish of exposed materials and accessories required for identification devices.
   2. ENGINEER'S review of samples will be for color and texture only. Compliance with all other requirements is the responsibility of CONTRACTOR.

B. Shop Drawings: Submit for approval the following:
   1. Copies of manufacturer's technical data for each product specified including fabrication and erection information for all identification devices. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.
   2. Complete selection of each specified manufacturer's standard and custom colors, alphabetic styles, graphic layouts and pictograms. Include full-size graphic layouts for plaques, individual dimensional letters and numbers and other items where final graphic appearance must be established prior to fabrication, incorporating all required graphic features specified or shown.

1.4 PROJECT CONDITIONS

A. Scheduling:
   1. Coordinate the delivery of templates, instructions and directions for installation of anchorage devices with other work to avoid delay.

PART 2 – PRODUCTS

2.1 HEALTH, SAFETY, WARNING, FLOOR LOADING AND FIRE EXTINGUISHER LOCATION SIGNS

A. Product Description: Provide rigid fiberglass reinforced plastic signs with fade-resistant embedded graphics.

B. Size and Thickness: 0.125-inches thick; 10-inches by 14-inches, unless otherwise specified.

C. Exposure: Recommended by the manufacturer for both indoor and outdoor use and with an upper service temperature limit of 1990 degrees F. Average durability for outdoor use shall be 15 years.

D. Safety Instruction Signs: Standard color of the background shall be white; and the panel, green with white letters. All letters used against the white background shall be black.

E. Caution Signs: Standard color of the background shall be yellow; and the panel, black with yellow.

F. Danger Signs: Standard color of the background shall be white; and the panel black with red insert containing white letters. All letters used against the white background shall be black.

G. Warning Signs: Standard color of the background shall be orange; and the panel black with orange insert containing white letters. All letters used against the orange background shall be black.

H. No Smoking Signs: Standard color of the background shall be white. All letters used against the white background shall be red.

I. Floor Loading Signs: Standard color of the background shall be white, and the panel blue with white letters. All letters used against the white background shall be black.

J. Fire Extinguisher Location Signs (surface-mounted units only): Standard color of the background shall be red with white letters. Each sign shall incorporate an international fire extinguisher pictogram and a directional arrow indicating location of fire extinguisher.

K. Auxiliary Products:
   1. Mounting Brackets: Provide manufacturer's standard mounting brackets for hanging, projected or double-sided signs.

L. Product and Manufacturer: Provide one of the following:
   1. Graphic Blast Work and Picture Series by Best Manufacturing Sign Systems, Incorporated.
   2. Or approved equal.

2.2 EXTERIOR / INTERIOR PANEL SIGNS

A. Interior Signage
   1. Provide plaque signs at each space adjacent to door (latch side) for typical room identification sign and as shown on drawings. Signage shall be plastic with Room Number or other required designation specified as described below or matching description in Paragraph 2.1 above.

B. General: Comply with the manufacturer's requirements for each type of signs for each portion of the building.

C. Fabrication:
   1. Fabricate panel signs to comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.
   2. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of ± 1/16-inch measured diagonally from corner to corner.
   3. Panel Signage: Room Identification:
      a. One piece plastic laminate with raised chemically welded type letters and numbers and braille, with colored background (to meet handicap/ADA code), set in bed of sealant and drilled for concealed screw attachment.
         1) Provide room number sign as indicated on the drawings. Provide room number sign at each door if multiple entries.
         2) Provide a room name sign, in addition to the room number sign, as indicated on the drawings.
      b. Special name places (same construction as "a" above). Symbols shall be positioned center-center. Wording shall be 3-dimensioned to meet handicap/ADA requirements. Provide the following and install where shown on drawings; wall mounted:
         1) *Toilets: Provide a universal "Men" and/or "Women" figure with handicap symbols as applicable to the rooms listed below.
         2) Fire Alarm.

D. Graphic Image Process:
   1. Graphic Content and Style:
      a. Provide sign copy to comply with requirements indicated for sizes, styles, spacings, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices. Helvetica medium - all upper case.
   2. Subsurface Copy:
      a. Apply copy to back face of clear acrylic sheet forming panel face by

process indicated to produce precisely formed opaque image, free from rough edges.

b. Use Photo-mechanically reproduced and reverse silk-screen process to print copy; overspray copy with opaque background color coating.

2.3 PIPELINE IDENTIFICATION SIGNS

A. Pipeline Identification Signs:
   1. Lettering of Titles:
      a. Letter size shall be as indicated in the following table:

LETTER SIZE TABLE

Outside Diameter of Pipe or Covering*	Size of Legend Letters
3/4-inches to 1-1/4 inches	1/2-inches
1-1/2-inches to 1-7/8--inches	3/4-inches
2-inches to 5-7/8-inches	1-1/4-inches
6-inches to 9-7/8-inches	2-1/2-inches
10-inches and Over	3-1/2-inches

*Outside diameter shall include pipe diameter plus insulation and jacketing.

      b. Text and symbols shall be Standard Helvetica Medium, all upper case. Signs shall include text with separate arrow signs indicating direction of flow and be located as specified in Part 3 of this Section.
   2. Sign Materials: Provide the following:
      a. Signs shall be coiled construction, polyester with ultraviolet light-resistant, sealed, subsurface color graphics, recommended by the manufacturer for both indoor and outdoor use and for service temperature range from -40 degrees F to 248 degrees F.
      b. Provide manufacturer's full selection of standard and custom sizes, colors and graphics.
      c. Where large pipe diameters preclude overlap of pipeline sign material, provide Type 304, 1/4-inch wide stainless steel banding straps; two per sign, lengths as required by circumference of pipe or covering. Provide manufacturer's recommended banding tools for stainless steel banding.
   3. Coordinate the text, color, and abbreviations on the pipeline identification signs with the COUNTY and ENGINEER.

B. Product and Manufacturer: Provide one of the following:
   1. Custom B-689 High Performance Pipe Markers by Brady USA, Incorporated Signmark Division.

2. Or approved equal.

2.4 EQUIPMENT NAMEPLATES

A. Equipment Nameplates:
   1. Titles for Equipment:
      a. Titles shall be provided on all equipment using 1-inch high letters. Equipment titles shall be coordinated with COUNTY.
      b. Text and symbols shall be Standard Helvetica Medium, all upper case.
   2. Left-justify multiple line titles.
   3. Size and Material: Provide the following:
      a. Size: 1-1/2 inches by 4-inches, minimum.
      b. Material: Type 304 stainless steel; screen printed; 0.015-inches thick.
   4. Legend for Nameplates:
      a. Nameplates for equipment, operating stands for valves and sluice gates shall be in the same color combinations as the medium they service. Legends for nameplates shall follow the terminology designated. The nameplates shall include, but not be limited to, the following representative list of nameplate legends and appropriate color combinations to which the equipment identification numbers shall be added.

SCHEDULE OF EQUIPMENT NAMEPLATES*

Legend		Color Code	
First Line	Second Line	Lettering	Background
Disk Filters	**	Black	White
Sodium Hypochlorite Metering Pumps	**	Black	White
Sodium Hypochlorite Storage Tank	**	Black	White
Backwash Reject Lift Station	**	Black	White

* Where equipment is mounted on roofs or where exposed to the public view such as in lobby or office areas, the color shall be selected by COUNTY.

** The legend on these nameplates shall also include the appropriate number designation for such equipment as furnished by COUNTY.

*** Closed loop and Open loop

B. Products and Manufacturers: Provide one of the following:
   1. Screen Printed Stainless Steel Equipment Tags by Brady USA, Incorporated Signmark Division.

2. Or approved equal.

2.5 VALVE AND PIPELINE TAGS

A. Metal Tags:
   1. For all valves and pipelines smaller than 3/4-inch in diameter provide permanently legible metal tags, 2-inch diameter round, Type 304 stainless steel tags with engraved lettering filled with black enamel. Provide all valve tags with a 3/16-inch diameter hole located so as not to interfere with legend.
   2. Legend for Valve Tags:
      a. CONTRACTOR shall submit to ENGINEER, no less than 150 days before start-up, a Valve Schedule containing all required valves.
      b. The Valve Schedule shall contain for each valve, the location, type, a number, words to identify the valve's function, type of operator and the normal operating position. CONTRACTOR shall coordinate valve information with COUNTY and ENGINEER.
   3. Miscellaneous Valve and Small Pipeline Tag Accessories:
      a. Stainless Steel Wire: Nylon coated; outside diameter 0.048-inches.
      b. Clamps: Brass.
      c. Lead Seals: Monel; 4 ply, 0.014-inches by 10-inches long; for attaching all tags.
      d. Hand Sealing Press: As recommended by tag manufacturer for crimping lead seals.

B. Products and Manufacturers: Provide one of the following:
   1. Custom Engraved Stainless Steel Valve Tags by Brady USA, Incorporated, Signmark Division.
   2. Or approved equal.

2.6 RIGHT-TO-KNOW LABELS, SIGNS AND TAGS

A. Labels: Provide right-to-know polyester labels for each hazardous chemical container. Provide 7-inch by 10-inch labels with information pre-printed by manufacturer. Provide labels with 2-mil polyester overlaminate and with a complete line of all standard and custom pictograms.

B. Tags: Provide right-to-know 15-mil vinyl tags with self-adhering clear polyester overlaminate. Tags shall be constructed of laminated plastic and furnished with nylon tie fasteners. Provide 3-inch by 5-3/4-inch tags with two chamfered corners with reinforced 3/16-inch grommeted hole.

C. Product and Manufacturer: Provide one of the following:

1. Custom B-302 Pressure Sensitive Polyester Right-To-Know Labels, Front No. 1/Back No. 1 B-871 Right-To-Know Accident Prevention Tags and Right-To-Know Pictograms by Brady USA, Incorporated Signmark Division.
2. Or approved equal.

2.7 AUXILIARY MATERIALS

A. Very-High-Bond High-Performance Bonding Tape:
   1. Provide all surface-mounted identification devices with very-high-bond foam tape backing except where specifically specified as requiring mechanical fasteners.
   2. Provide a very-high-bonding pressure sensitive joining system consisting of double-coated conformable acrylic foam tape and release liners:
   3. Thickness: 0.045-inch.
   4. Tape Width: 1-1/2-inches.
   5. Color: Dark grey.
   6. Bonding Adhesive: Acrylic; very-high-bond, solvent and shear resistance.
   7. Primer: High-performance tape manufacturers recommended acrylic primer.
   8. Products and Manufacturers: Provide one of the following:
      a. Scotch Brand (Very-High-Bond) 4942 VHB Double Coated Acrylic Foam Tape and No. 94 Acrylic Primer by 3M Industrial Tape and Specialties Division.
      b. Or approved equal.

B. Mounting Brackets: Provide manufacturer's standard mounting brackets for hanging, projected or double-sided signs.
   1. Furnish inserts, and mechanical and adhesive anchoring devices as specified for the installation of identification devices.

C. Fasteners: Provide fasteners of non-magnetic stainless steel of size and type required and recommended by individual identification device manufacturers.

D. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts. Use toothed stainless steel or lead expansion bolts for drilled-in-place anchors.

2.8 FABRICATION

A. Shop Assembly:
   1. Fabricate and preassemble items in the shop to the greatest extent possible.
   2. Disassemble units only to the extent necessary for shipping and handling limitations.
   3. Clearly mark units for reassembly and coordinated installation.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and his installer shall examine the substrates and conditions under which the identification devices are to be installed and notify ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

A. General:
   1. Install identification devices and components at the locations shown or, if not shown, as directed by COUNTY, securely mounted with concealed very-high-bond acrylic foam tape or mechanical/chemical fasteners where specified. Attach signs to surfaces in accordance with the manufacturer's instructions, unless otherwise shown.
   2. Mount exit signs in locations shown. Surface mount signs above all exit doors, unless otherwise shown.
   3. Lightly mark and locate the position of all identification devices. Obtain COUNTY'S approval of all locations before mounting. Install level, plumb, and at the proper height. Repair or replace damaged units as directed by COUNTY.
   4. Install very-high-bond acrylic foam tape on back of identification devices using a full perimeter of specified tape. Leave no gaps in tape perimeter at back of identification devices; peel off second release liner and press onto surfaces.
   5. Install level, plumb, and at the specified height.

B. Room Identification, Directional and Information Signs:
   1. Where permanent identification is provided for rooms and spaces, install signs on the wall adjacent to the latch side of the door.
   2. Where there is no wall space on the latch side of the door, including at double leaf doors, install signs on the nearest adjacent wall.
   3. Mounting height shall be 5 feet - 0 inches above the finish floor to the centerline of the sign. Mount such signage so that a person may approach within 3-inches of the sign without encountering protruding objects or, when reading sign, be forced to stand within the swing of a door.

C. Pipe and Equipment Identification Signs, Nameplates and Tags:
   1. The name of the materials in each pipeline and, alongside this, an arrow indicating the direction of flow of fluids, shall be indicated on each pipeline system.
   2. Titles shall not be located more than 30 linear feet apart and shall also appear directly adjacent to each side of all walls penetrated by pipeline, adjacent to each

side of all valve regulators, flowcheck, strainer cleanouts, and all pieces of equipment. Arrows shall be located at intervals not to exceed 15 linear feet apart.

3. Titles shall identify contents by complete name. Identification title locations shall be determined by COUNTY, but in general they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering when they are overhead. Title shall be clearly visible from operating positions especially those adjacent to control valves.
4. Signs on large valves shall be located on or adjacent to the valve itself. Tags for smaller valves shall be attached to bonnet or flange bolts. Do not attach tags or signs to handwheels of valves.
5. Locate nameplates on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures as to prevent damage to the nameplate.

D. Right-To-Know Signs, Labels and Tags:
   1. Locate tags at 20 feet maximum center to center distance along chemical pipelines and fill pipelines and on each side of all locations where pipes emerge from penetrations with other materials.
   2. Install tank signs on all tanks shown to receive signage at quarter-points on tank circumference, 5 foot - 0 inches above finished floor.

3.3 PROTECTION AND CLEANING

A. After installation, clean soiled identification device surfaces according to manufacturer's instructions.

B. Protect units from damage until Final Completion.

3.4 SPARE PARTS AND ACCESSORIES

A. Samples: Submit for approval the following:
   1. Furnish extra materials from the same manufactured lot as the materials installed.
   2. CONTRACTOR shall furnish the following spare parts and accessories:
      a. For every 20 pipeline identification signs installed:
         1) one complete mounting assembly.
      b. For every 20 nameplates installed:
         1) one complete nameplate mounting assembly.
      c. For every 20 identification tags:
         1) one stainless steel cable and splice and store in a secure area at the site as directed by COUNTY.
   3. Do not provide partial containers or packages of materials. Round-up quantities to furnish only complete, unopened and undamaged containers and packages;

with legible labels accurately representing contents of container or package indicating compliance with approved samples and shop drawings, and matching materials actually installed.

a. All spare parts and accessories shall be suitably boxed and marked for storage and reordering.

B. Submit quantities of each system component required for the work, based on actual purchase order to manufacturer for materials to be used on this project, with calculations establishing quantity of extra materials to be furnished to COUNTY.

+ + END OF SECTION + +

SECTION 11240

SECTION 11240

CHEMICAL INJECTORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install injectors as shown.

B. Related Sections:
   1. Division 11, Equipment.
   2. Division 15, Mechanical.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall have experience in manufacturing chemical injectors for chemical systems of the same or larger size than the devices specified. The Manufacturer shall show evidence of substantially similar installations for which injectors have been in satisfactory operation for a minimum of 5 years with the specified chemicals.

B. All chemical injectors provided under this Section shall be obtained from a single manufacturer who, with the CONTRACTOR, shall assume full responsibility for the completeness of the system. The manufacturer shall be the source of information on all chemical injectors.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. Occupational Safety and Health Administration (OSHA) Standards for General Industry, Subparts 1910.1200 Hazard Communication (July 1986).
   2. National Fire Protection Association (NFPA) Standard 704 - Label System.

1.3 SUBMITTALS

A. Shop Drawing submittals shall conform with Section 01340, Shop Drawings, Project Data, and Samples, and include the following:
   1. Illustrations, specifications and engineering data including: dimensions, materials, size, and weight for all piping, valves, and appurtenances including pipe supports, pipe restraints, coatings, etc.

2. Manufacturer's instructions and recommendations for installation of each type of pipe joint, valve and special items.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to insure uninterrupted progress of the Work. Transportation of equipment shall be in accordance with Section 01600, Material and Equipment.

B. Items that are damaged will not be acceptable. Protect all bolt threads, etc. from damage and corrosion.

C. Store materials to permit easy access for inspection and identification. Protect equipment including packaged materials from corrosion and deterioration. Storage of equipment shall be in accordance with Section 01620, Storage and Protection.

1.5 WARRANTY

A. All material supplied under these Specifications shall be warranted by the Contractor and the manufacturers for a period of (3) years. Warranty period shall commence on the date of COUNTY acceptance.

B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the COUNTY.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty or guarantee period. No exception to this provision shall be allowed. The Contractor shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications.

D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of COUNTY acceptance, the Contractor shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the Contractor of the three-year warranty starting at the time of COUNTY acceptance of the equipment.

PART 2 - PRODUCTS

2.1 CHEMICAL INJECTORS

A. Chemical Injector: Injector configuration shall provide for a single feed point into water main. Materials of construction of wetted components shall be compatible with chemical solution and be capable of withstanding maximum pump discharge line pressure, output capacity, and water main pressure. Concentrations of chemicals that will be injected:
   1. 12.5% Sodium Hypochlorite.
   2. Polymer

B. Water Main Connection: Threaded corporation stop connection shall be NPT or AWWA inlet and capable of withstanding maximum water main pressure of 150 psi. Connection must include an acceptable safety device to prevent accidental withdrawal of Injector Tube while under pressure and/or surge conditions.

C. Injector Tube: Materials of construction shall be Hastelloy C 276 for 12.5% Sodium Hypochlorite. Materials of construction shall be compatible with chemical for Polymer. Injector tube shall be sized to match chemical feed line.

D. A stainless steel safety chain shall be included to prevent accidental withdrawal of solution tube past corporation stop. Safety chain length shall be preset by manufacturer. Operator shall be able to safely withdraw or insert Injector tube into center of water main while under pressure and without having to shut down the main. Injector shall allow for rodding in place.

E. Chemical feed line Connection to Injector: As shown on drawings.

F. Flexible hose shall be clear, reinforced polypropylene tubing capable of a burst pressure of 200 psi.

G. The injector assembly must withstand a maximum operating pressure of 150 psi and shall be manufactured by Saf-T-Flo, or approved equal.

2.2 MANUFACTURERS

A. Product and Manufacturer: Provide from the following
   1. Saf-T-Flo
   2. Or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Field Inspection Prior to and During Installation:
   1. Inspect and verify that structures or surfaces on which the equipment will be

installed have no defects which would adversely affect the installation.

2. The CONTRACTOR shall promptly report, in writing, defects which may affect the Work to the COUNTY. A copy of the manufacturer's field report shall be provided to the ENGINEER.

3.2 INSTALLATION

A. Installation of the injectors and appurtenances shall be in accordance with the Drawings and with the manufacturer's instructions and recommendations. Conflicts of information shall be called to the attention of the ENGINEER.

B. Inspect all chemical injectors prior to installation; if damaged, notify the COUNTY and manufacturer promptly. Do not install damaged equipment until repairs are made in accordance with manufacturer's written instructions.

3.3 MANUFACTURER'S FIELD SERVICES

A. A factory trained manufacturer's representative shall be provided for installation as specified, to ensure that installation of the chemical injectors complies with manufacturer's recommendations and requirements.

B. The representatives shall make the following minimum visits:
   1. Installation assistance and checking completed installation; one four hour visit

C. Manufacturer's representative shall verify that the equipment conforms to the specification requirements. Representative shall visit the site as often as necessary until all trouble is corrected and the equipment or system is entirely satisfactory.

D. All costs, including travel, lodging, meals and incidentals, shall be at no cost to the COUNTY.

++ END OF SECTION ++

SECTION 11312

LAKE GRAVITY DISK FILTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown on the Drawings, specified, and required to furnish and install three gravity disk filters, complete and operational for filtration of water being pumped from the reclaimed water storage lake facilities.
   2. Each filter unit includes, but is not limited to:
      a. 304 stainless steel tank
      b. Filter disks with 316 stainless steel filter mesh
      c. Two 3 hp disk drives
      d. 7.5 hp backwash pump with pressure reducing valve upstream
      e. Internal spray wash piping and nozzles
      f. Automatic sludge Valve
      g. 304/304L stainless steel filter disks
      h. Ball valves and gauges as required
      i. NEMA compliant local relay logic control panel with stainless steel enclosure, 480 VAC, 60 hz, 3 Phase
      j. Chain and sprocket drive system
      k. Filter Level Control Sensor
      l. 304 stainless steel covers with two handles per section

B. Related Sections:
   1. Section 03000, Cast-In-Place Concrete.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 09900, Painting.
   4. Division 13, Applicable Sections on Instrumentation and Controls.
   5. Division 15, Applicable Sections on Piping, Valves and Appurtenances.
   6. Division 16, Electrical.

C. Coordination:
   1. The equipment supplier shall provide all parts, equipment, materials and components, including instrumentation and controls.
   2. The equipment supplier shall visually inspect the installed equipment and perform initial field testing as appropriate, to certify proper installation.
   3. CONTRACTOR shall be responsible for installation of equipment furnished by the equipment supplier.
   4. The equipment supplier shall coordinate the installation of the system by

CONTRACTOR and provide written and verbal instruction to ensure proper installation. Equipment supplier shall review installation of equipment prior to commissioning of equipment.

D. The site, mechanical, structural, HVAC, instrumentation and electrical design have been based on a filter system manufactured by Nova Water Technologies. The cost of any changes and modifications to site, mechanical, structural, HVAC, instrumentation or electrical facilities necessary to adapt alternate equipment to the layout and design shown shall be borne by the CONTRACTOR. Clearances shown shall be maintained. Any such proposed changes or modifications are subject to review and acceptance by the ENGINEER in accordance with the Special Provisions and Section 01600, Material and Equipment.

1.2 QUALITY ASSURANCE

A. Equipment Supplier's (Manufacturer's) Qualifications:
   1. Manufacturer shall have previous experience in producing substantially similar equipment and shall show evidence of a minimum of 25 installations in satisfactory operation with a minimum of five of these installations of similar size and service.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single gravity disk filter equipment manufacturer.
   2. The gravity disk filter equipment manufacturer shall review and approve or shall prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically designed for tertiary filtration of municipal wastewater and shall be integrated into the overall equipment design by the equipment manufacturer.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. National Electric Code.
   2. Standards of National Electrical Manufacturers Association.
   3. Institute of Electrical and Electronic Engineers.
   4. AWS D1.1, Structural Welding Code.
   5. IEEE 112, Test Procedure for Polyphase Induction Motors and Generators.
   6. IEEE 522, Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating Current Electric Machines.
   7. IEEE 841, Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 370 KW (500 HP).
   8. IEEE 1043, Recommended Practice for Voltage Endurance Testing of Form-Wound Bars and Coils.

9. NEMA MG 1, Motors and Generators. (This Section's references to NEMA MG 1 followed by a hyphen and number, such as "NEMA MG 1-20.14", indicate the associated NEMA MG 1 paragraph reference.)
10. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems
11. SSPC, Structures Painting Council Standards for Blast Cleaning Surface Preparations and Painting of Steel Surfaces.
12. UL 674, Electric Motors and Generators, for Use in Division 1 Hazardous (Classified) Locations.
13. UL 1004, Electric Motors.
14. ASTM A276-08 – Standard Specifications for Stainless Steel Bars and Shapes.
15. American Welding Society (AWS)
16. American Institute of Steel Construction (AISC)

1.3 SUBMITTALS

A. Shop Drawings: In addition to the requirements of Section 01340, Shop Drawings, Project Data, and Samples, submit for approval prior to release to fabrication the following:
   1. Manufacturer's literature, data sheets, fabrication, assembly, and mounting drawings of all gravity disk filter components and appurtenances, showing materials and significant dimensions in sufficient detail to demonstrate compliance with specified requirements.
      a. Provide a stock list or bill of materials including functional name, manufacturer's name, manufacturer's model number, and quantity for all gravity disk filter components and appurtenances.
   2. Documentation of experience and installation list including contact names and telephone numbers.
   3. Backwash pump information including design point determined by Manufacturer. Pump information shall include dimensions, materials, size, weight, performance data and curves showing overall pump efficiencies, required net positive suction head, allowable suction lift, flow rate, head, brake horsepower, motor horsepower, speed, and shut-off head.
   4. Complete installation data including setting drawings, templates, and instructions for the installation of anchor bolts and other anchorages.
   5. Descriptive information including catalog cuts and manufacturer's specifications for all components.
   6. Electrical schematics and layouts.
   7. Drawings and information for control panels and instruments in accordance with the requirements of Division 13.
   8. Information for sizing and materials of anchor bolts required for complete installation of gravity disk filter equipment and appurtenances specified herein.

B. Informational Submittals:
   1. Source Quality Control Submittals:
      a. Written reports presenting results of required motor shop testing per Paragraph 2.7. Motor Shop test reports shall be dated and signed by motor manufacturer.
      b. Certified pump shop tests as described in Paragraph 2.7.
   2. Field Quality Control Submittals:
      a. Written reports presenting results of required field testing and inspections. Field testing reports shall be dated and signed by CONTRACTOR.
      b. Submit documentation in accordance with Section 01751, Starting and Placing Equipment in Operation.

C. Manufacturer's Reports:
   1. Submit written report of the results of each visit by manufacturer's service personnel, including purpose and time of visit, tasks performed and results obtained.

D. Operation and Maintenance Manuals: Submit complete manuals including:
   1. Copies of all Shop Drawings, test reports, maintenance data and schedules, description of operation and spare parts information.
   2. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01730, Operating and Maintenance Data.

E. Record Drawings
   1. Comply with the requirements of Section 01720, Project Record Documents.
   2. After acceptance of the gravity disk filters, revise all Shop Drawings to reflect as-built conditions and resubmit drawings as needed to replace any drawings in previously submitted O&M manuals.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Product delivery shall be per Section 01600, Material and Equipment. Storage and Handling shall be per Section 01620, Storage and Protection.

B. All boxes, crates, and packages shall be inspected by CONTRACTOR upon delivery to the site. CONTRACTOR shall notify COUNTY of any loss or damage to equipment or components. Replace losses and repair damage to new condition, in accordance with manufacturer's instructions.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

1.5 WARRANTY

A. All material supplied under these Specifications shall be warranted by the CONTRACTOR and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of COUNTY acceptance.

B. Manufacturer shall provide a three (3) year service agreement pertaining to the filters and all ancillary equipment discussed in this Section. This agreement shall consist of monthly service calls by the Manufacturer. Necessary spare parts will be supplied as required.

C. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the COUNTY.

D. The manufacturer's warranty period shall run concurrently with the CONTRACTOR's warranty or guarantee period. No exception to this provision shall be allowed. The CONTRACTOR shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications.

E. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of COUNTY acceptance, the CONTRACTOR shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the CONTRACTOR of the three-year warranty starting at the time of COUNTY acceptance of the equipment.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. General: The gravity disk filters shall be designed as described herein and as shown on the Drawings.
   1. The gravity disk filter equipment shall be installed on concrete support pads having dimensions as shown on the Drawings.
   2. The gravity disk filter equipment shall be suitable for outdoor installation with temperature range between 25 and 120 degrees F.

B. Design Criteria:
   1. The 3 gravity disk filter units shall be designed according to the configuration below and as shown on the drawings:
      a. Number of Filters: 3
      b. Number of Disks per Filter: 16

2. Gravity disk filters shall meet the performance criteria listed below:
   a. Source Water: Reclaimed Water Storage Lakes
   b. Design Peak Flow: 15.0 mgd.
   c. Design Average Flow: 7.5 mgd.
   d. Hydraulic Maximum Flow: 24.0 mgd.
   e Average Daily Backwash Reject: ≤ 1% of the Average Daily Flow
   f. Maximum Instantaneous Backwash Reject Flow: ≤ 5% of filter influent flow
   g. Maximum Wash Water header volume: 14.375 gpm
   h. Maximum Wash Water Pressure Required: 80 psi
   i. Maximum Wash Water per Unit: 125 gpm
3. The filters shall operate continuously, always presenting new filtering media surfaces to the incoming flow at all times. Backwash shall be initiated when the differential level indicator reaches a preset limit.

2.2 PRODUCT AND MANUFACTURER

A. Product and Manufacturer: Provide the following:
   1. Nova Water Technologies, LLC. Ultrascreen Disk Filter, Model UL1608CS.
   2. Or approved equal.

2.3 DETAILS OF CONSTRUCTION

A. General:
   1. All components shall be designed for continuous duty and long operating life in an environment of 100 degrees F and 95 percent relative humidity. All motors and pumps shall be 460 volt, 60 hertz, 3 phase. Motor starters shall be mounted in the control panel and shall conform to the requirements of Division 16.
   2. Gravity disk filter manufacturer shall be responsible for providing appropriate fasteners, washers, nuts, and hardware required for complete installation of gravity disk filter equipment and appurtenances specified herein. All fasteners, anchor bolts, bolts, washers, nuts, and hardware shall be in accordance with Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. The filter flow path shall be from the inside of the disk to the outside with each disk independently sealed to allow visual and physical inspection of both influent and effluent chambers as well as both sides of the media.
   4. Reclaimed water produced at the plant shall be used for backwashing.

B. Gravity Filter Disk Tank:
   1. Each tank shall be constructed of AISI 304 stainless steel and have a minimum thickness of 4 mm.
   2. Each gravity filter disk tank shall include light weight covers that allow easy access for maintenance and inspection. Covers shall have two handles per

section and be made from all 304 stainless steel. The cover retaining frame shall be manufactured from 304 Stainless Steel.

C. Drive Assembly:
   1. Drive system shall be of the Chain & Sprocket type for energy efficiency and equipped with an individual gear drive, maximum of 3.0 hp. All drive components, including the Chain & Sprocket, must be located outside of the tank.
   2. The gear drive motor must be equipped with an internal VFD. The drive manufacturer is to be ISO 9001 certified. The motor shall be of the "energy efficient" type offering a minimum service factor of 1.1, F class insulation, utilizing RS-485 communications for control, a temperature rise of minus 20 to plus 40 degrees Celsius and an IP 65 or higher rated enclosure. The drive motor must be inverter duty rated and be Totally Enclosed Fan Cooled (TEFC) with a pressed-steel fan guard.
   3. The drive system must be capable of adjusting speed through the HMI or touch pad located at the filter's control panel.

D. Mounting Brackets and Hardware:
   1. All hardware, bolts, and nuts shall be 304 SS.

E. Center Axle Assembly:
   1. The center axle on which the disks are mounted shall be made of AISI 304 stainless steel. The axle assembly, including the disks, is to be designed so it can be removed from the tank. All internal hardware is to be AISI 304 stainless steel.
   2. The filtration disks shall be driven by a solid stainless steel drive shaft. Disk filters based on hollow shafts with trunnion wheels will not be approved.
   3. All drive shaft support bearings will be above the water level. Filter designs that incorporate submerged bearings or submerged bushings will not be approved.

F. Filter Disk Assemblies:
   1. Each disk frame is to be constructed entirely of AISI 304 stainless steel. Materials other than grade 304 stainless steel will not be approved.
   2. The mesh panel mounting will allow panel replacement from outside the filter by a single staff member. The filtration mesh is to be a 316 Stainless Steel weave with nominal 20 micron apertures or manufacturer's Title-22 certified media, assemblies and frames must still be constructed in 304 stainless steel.
   3. There shall be simple shoulder seals at the edges of each disk and the wall of the filtrate zone. These seals shall be made of industrial grade EPDM rubber for long life.
   4. Each disk, in a dynamic tangential filter, is to have a minimum filtration area of 22 ft^2 and must be able to support a layer of biological accumulation. This model has 16 disks and a filtration area of 352 ft^2.

5. The filtration panels shall be accessible from outside the filter by a single staff mechanic. Filter designs that require multiple staff or staff entry into the filter unit will not be approved.

G. Backwash/Sludge Discharge Installation:
   1. The backwash piping is to be constructed of 304L stainless steel 2 inch diameter, and include 14 flat-jet quick release nozzles per spray header. All hardware shall be 304 stainless steel.
   2. Backwash Pump
      a. Backwash pump design flow and total dynamic head shall be determined by Manufacturer. Manufacturer shall coordinate with the COUNTY on pressure conditions on the suction side of the pump to help determine the size of the pump.
      b. Manufacturer shall provide a pressure reducing valve upstream of the backwash pump to provide consistent pumping conditions to meet their design.
      c. The pump casing shall be back pull-out design with ANSI class 150 flanged suction and discharge connections and shall be constructed of AISI TYPE 316L stainless steel material.
      d. The pump discharge nozzle shall be center line oriented to allow simplified system design and installation.
      e. The complete pump unit shall be supported by the motor.
      f. Pump casing drain shall be provided with stainless steel plugs.
      g. A replacement labyrinth type suction wear ring of AISI TYPE 316L stainless still she be provided and held securely by means of an interference fir in the casing suction
      h. The pump impeller shall be enclosed design, and key driven.
      i. The pump impeller shall be constructed of AISI TYPE 316L stainless steel material. A stainless steel bolt and washer shall provide positive attachment of the impeller to the motor shaft.
      j. The seal housing shall be constructed of AISI TYPE 316L stainless steel material and shall hold the stationary seat of the mechanical shaft seal. The seal housing shall be clamped in place over a machined fit on the motor adapter by the pump casing to maintain component alignment and is "O-ring" sealed to insure against leakage.
      k. The pump shaft seal shall be a John Crane Type 21 mechanical seal, or approved equal.
      l. The pump shaft sleeve shall be constructed of AISI TYPE 316L stainless steel and shall be of the hook type design. Locked in place by the impeller without necessity of other mechanical locking devices. The sleeve design must allow the motor shaft to remain dry during pump operation.
      m. The rigid motor adapter of ASTM A48 CL20 case iron construction shall support the pump liquid end and maintain pump to motor alignment. A bottom port shall be provided to allow condensation or

seal leakage to drain and not to be retained within the adapter.

n. Motor - The backwash pump will be driven by a maximum 7.5 HP constant speed motor, Baldor Reliance or equal. The motor shall be of the (energy efficient) type offering a service factor of 1.15, F class insulation, NEMA design class B, a temperature rise of minus 20 to plus 40 degrees Celsius. Note: the backwash pump will never be required to run into the service factor region.

H. Sedimentation Valve:

1. Each filter shall come equipped with one (1) electrically actuated valve with a 3 inch diameter disk for draining accumulated solids from the bottom of the influent well. The Electric actuator shall include the electric motor, reduction gearing, valve stem drive nut/bushing, position limit switches, mechanical overload torque switches, ductile iron gear case and automatic declutchable handwheel.
2. The Motor speed reduction shall be by means of a gear train consisting of hardened steel spur gears and self-locking warm and worm gear set. The worm shall be heat treated alloy steel and have worm thread surface rolled or ground. The worm gear shall be bronze. Non-metallic gears in the power train are not acceptable.
3. All gearing and shafting shall be supported on anti-friction bearings. All thrust components shall be supported by use of tapered roller bearings.
4. The actuator shall be furnished with a handwheel located in a 90 degree plane from the actuator output drive, with a maximum rim pull requirement of 60 pounds for valve travel loads. An external manual declutch lever shall be included to place actuator in the manual mode. The lever shall not require more than a 10 pound force to engage even when the valve has been tightly seated. The lever is to be padlockable in either handwheel or motor mode. Operation by motor shall not cause the handwheel to rotate, or operation of the handwheel shall not cause the motor to rotate. Handwheel shall operate in the clockwise direction to close.
5. All gearing and bearings shall be grease lubricated and suitable for year-round service based on prevailing ambient temperature conditions.
6. Electric motors shall be specifically designed for valve actuator service, and be totally enclosed, nonventilated. The enclosure shall meet NEMA 4 (weatherproof) as required by the project. Motor shall be capable of operation under maximum specified loads when voltage to the motor is +/- 10% of the nominal voltage. Motor shall have Class F insulation with thermal overload sensors imbedded in the motor windings.
7. Limit switches shall be geared to the drive mechanism and in step with actual valve position at all times, whether operation is by power or manual mode. Switches shall be activated by a rotor type design. Contact shall be silver and have a rating of 10 amps at 120VAC. A minimum of (3) N.O. and (3) N.C. contact shall be present to prevent entrance of foreign matter or wire entanglement. Use of cams or screws to set switches or designs requiring

batter back-up methods to ensure position control in the event of a power failure, are unacceptable.

8. The actuator shall include an adjustable torque switch to interrupt the motor power circuit when an obstruction is encountered in either direction of travel or when torque seating of valves is required for tight shut off. The torque switch shall have a calibrated dial for adjustment and have means to ensure maximum actuator rating in not exceeded. Contacts shall be same construction and rating as limit switches. Mechanical torque springs for load control shall be field replaceable without need of actuator dismantling or removal of the worm assembly.

I. Filter Tank Piping Connections
   1. The gravity disk filter piping connections include:
      a. Filter Effluent – 20 in.
      b. Filter Influent – 20 in.
      c. Overflow – 20 in.
      d. Sediment drain – 3 in.
      e. Backwash reject – 4 in.
      f. Maintenance drain – 2 ½ in.
      g. Washwater feed – 2 in.
   2. The gravity disk filter piping connections shall be 304 stainless steel flanged and conform to the requirements of ANSI Specification B 16.1, Class 125

2.4 CONTROLS AND INSTRUMENTATION

A. Level Sensing Device:
   1. A set of (5) conductivity probes shall be used to operate the filter while in "AUTO" mode. The probes shall control the start/stop of the filter gear drive and backwash pump cycles. The fifth probe shall be used as a high level (overflow) indicator. An overflow event shall energize a beacon light at the control panel and sound an audible alarm. A remote "dry" contact shall be available for alarm indication to plant SCADA.

B. Control Panel:
   1. General
      a. The control panel and panel components shall comply with Sections 13430, Panels and Enclosures, and 13440, Panel Mounted Instruments.
      b. Provide a flange-mounted main disconnect on the control panel.
      c. Electrical service to the control panel shall be 480V, 3 phase, 60 Hz. Provide all needed control power transformers for 120V power.
      d. Provide NEMA horsepower rated combination motor starters with motor circuit protectors and electronic overload relays in accordance to NEMA ICS 2 and NEMA 250.
      e. Alarm horn and strobe light shall be mounted for fault annunciation.
   2. Panel Components:

a. Power Distribution Fusing:
   1) General: Provide fusing for primary and secondary protection of transformers and overload protection for each motor starters supplied in enclosures. Each fuse shall be equipped with a thermoplastic cover to protect against accidental contact.
   2) Required Features:
      a) Dual element, time delay fuses shall have current rating as required.
      b) UL Listed.
      c) Product and Manufacturer:
         - FLNR fuses by LittelFuse, for service up to 250 volts AC.
         - FLSR fuses by LittelFuse, for service up to 600 volts AC.
         - Or Equal.

b. Circuit Breakers: main, control power, filter gear drive, backwash pump
c. Motor Starters: filter gear drive, backwash pump. Adjustable, solid state overloads are included.
d. Pilot Lights: "RUN", "OVERLOAD" and "FAIL" for gear drive and backwash pump; main power "ON"; "High Level Overflow", "Emergency Stop" depressed, in accordance to Section 16144, Control Stations.
e. Pushbuttons: "Emergency Stop", "Alarm Silence", Motor Fail "RESET", Emergency Stop "RESET" in accordance to Section 16144, Control Stations.
f. H-O-A selectors: filter gear drive, backwash pump, sludge discharge valve, plant wash water solenoid, in accordance to Section 16144, Control Stations.
g. Elapse Time Meters: filter gear drive and backwash pump.
h. Dry Contacts for Plant SCADA: "OVERLOAD", "RUN", "FAIL" for filter gear drive and backwash pump, "HIGH LEVEL OVERFLOW" and "COMMON ALARM" and "BACKWASH ON" for filter.

3. Emergency Stop/Junction Box
   a. Each filter shall be supplied with an equipment mounted Emergency Stop/Junction box in a NEMA 4X, 304 stainless steel enclosure. The junction box shall be UL listed and designed for outdoor use in corrosive environments. The junction box shall include terminal blocks for all filter mounted equipment such that the installing contractor will only have to run field wiring to one centralized location. The junction box shall also include a NEMA 4X, 30mm, mushroom head, Emergency Stop button located on the outer door of the enclosure.

2.5 SURFACE PREPARATION AND SHOP PAINTING

A. Equipment and appurtenances that require painting shall be coated in accordance with Section 09900, Painting.

B. Surface preparation and painting shall conform to the requirements of Section 09900, Painting.

C. CONTRACTOR shall certify, in writing, that the shop prime and finish paint

system is compatible with the finish coating system in accordance with Section 09900, Painting.

2.6 SPARE PARTS

A. Furnish and deliver the following spare parts carefully boxed or packaged and labeled by quantity, item description, and part number for reorder.
   1. Forty nozzles
   2. One basket strainer.

B. CONTRACTOR shall store and safeguard spare parts until completion of the Work, at which time they shall be inventoried, delivered, and placed in an area designated by COUNTY.

C. Provide one set of any special tools required for normal operation and maintenance.

2.7 SOURCE QUALITY CONTROL

A. Motor Shop Tests:
   1. Perform shop testing on the motors at the manufacturer's facility. Shop test shall be in accordance with NEMA MG 1, UL 674, and UL 1004 and shall demonstrate that the motors tested comply with the Contract Documents.
   2. Submit shop test reports identifying tests performed and results obtained.
   3. Motors shall be given Routine Test in accordance with NEMA MG 1-12.55 and IEEE 112. Test shall include the following:
      a. Measurement of winding resistance.
      b. No-load readings of current and speed at normal voltage and frequency.
      c. Current input at rated frequency with rotor at standstill for squirrel-cage motors (locked rotor amperes).
      d. High-potential test.
      e. Bearing inspection.

B. Pump Shop Tests:
   1. Pump casings shall be hydrostatically tested to twice the discharge head or 1-1/2 times the shutoff head, whichever is greater.
   2. Running Test: Pump assembly shall be operated from zero to maximum capacity as shown on the approved curve. Results of the test shall be shown in a plot of test curves showing head, flow, horsepower, efficiency, and current. Readings shall be taken at a minimum of five evenly spaced capacity points including shut-off, design point and minimum head for which pump is designed to operate.

PART 3 – EXECUTION

3.1 INSPECTION

A. Inspection:
   1. Inspect and verify that structures or surfaces on which the equipment will be installed have no defects which will adversely affect installation.
   2. Inspect all equipment prior to installation.
   3. Promptly report defects which may affect the Work to COUNTY.

3.2 INSTALLATION, SYSTEM CHECKOUT AND START-UP, TRAINING

A. Installation shall be in strict accordance with the manufacturer's instructions. Installation shall include furnishing the required oil and grease for initial operation.

B. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three visits, minimum 16 hours on-Site for each visit. The first visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of ENGINEER and verify that the equipment conforms to the requirements. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

C. Set anchoring devices using templates provided by the manufacturer and in accordance with manufacturer's instruction and approved manufacturer's drawings.

D. Manufacturer's representative shall conduct a complete system inspection, checkout, and adjustment, including calibration of all instruments, tuning of control loops, checking operational functions, and testing of final control actions. This representative shall be present for the system checkout of both filters. All problems encountered shall be promptly corrected to prevent any delays in start-up.

E. Field Quality Control:
   1. Inspect motors prior to energizing equipment. Do not energize equipment without COUNTY's permission. Inspections shall include the following:
      a. Inspect motor and equipment for physical damage.
      b. Inspect motor for proper anchorage, mounting, grounding, connection, and lubrication.

c. Check for unusual noise and indications of overheating during initial or test operation.

2. Pump Tests:
   a. Running Tests:
      1) After installation of pumping equipment, each pump shall be given a running test in the presence of ENGINEER to demonstrate its ability to operate within vibration and bearing temperature limits specified herein and to pump over the range and at the points indicated and specified. Make observations of head, capacity, amperage draw, and kW draw at full speed and at minimum five operating points and plots performance characteristics of the pumps.
      2) Run the pump for a minimum of four hours taking bearing temperature readings of the pumps and motors every 15 minutes. The bearing housing temperature shall not exceed 160 degrees F.
   b. Vibration Tests:
      1) Carry out field vibration tests to verify compliance with the limits given in the Hydraulics Institute (ANSI/ HI 9.6.4). Tests shall be carried out at each bearing housing using an accelerometer or velocity probe. Pumps showing excessive vibration shall be rectified or replaced at the COUNTY'S discretion.

F. The manufacturer's representative shall provide a written statement that all of the gravity disk filter equipment components have been properly installed in accordance with approved Shop Drawings and this Specification.

G. CONTRACTOR shall prepare and submit calibration certificates for all field instruments and devices.

H. Comply with requirements of Section 01751, Starting and Placing Equipment in Operation.

I. Comply with specific requirements shown in Section 01821, Instruction of Operations and Maintenance Personnel, regarding instruction of operations and maintenance personnel.

J. All costs, including travel, lodging, meals and incidentals, shall be considered as included in the CONTRACTOR'S contract price.

++ END OF SECTION ++

SECTION 11322

PACKAGE NON-CLOG SUBMERSIBLE LIFT STATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall furnish all labor, materials, equipment and incidentals as shown, specified and required to provide a package duplex non-clog submersible lift station complete and operational with pumps, motors, FRP wetwell, control panel and equipment, and accessories as shown and specified. Lift station shall provide service for Lake Gravity Filters backwash reject system.

B. Related Work Specified Elsewhere:
   1. Section 03300, Cast-in-Place Concrete.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts
   3. Section 05542, Floor Access Hatch Covers
   4. Division 13, Sections on Instrumentation and Controls.
   5. Section 15051, Buried Piping Installation.
   6. Section 15060, Ductile Iron Pipe and Fittings
   7. Section 15068, Thermoplastic Pipe.
   8. Section 15100, Valves – 4-Inch and Larger
   9. Division 16, Electrical.

1.2 REFERENCES

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. Standards of the Hydraulic Institute, (HI).
   2. National Electric Code, (NEC).
   3. Standards of National Electrical Manufacturers Association, (NEMA).
   4. Institute of Electrical and Electronic Engineers, (IEEE).
   5. American National Standards Institute, (ANSI).
   6. Standards of American Water Works Association, (AWWA).
   7. American Society for Testing Materials, (ASTM).
   8. National Sanitation Foundation, (NSF).
   9. Anti Friction Bearing Manufacturers Association (AFBMA).
   10. IEEE 112, Test Procedure for Polyphase Induction Motors and Generators.
   11. IEEE 522, Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating Current Electric Machines.

12. IEEE 841, Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 370 KW (500 HP).
13. IEEE 1043, Recommended Practice for Voltage Endurance Testing of Form-Wound Bars and Coils.
14. NEMA MG 1, Motors and Generators. (This Section's references to NEMA MG 1 followed by a hyphen and number, such as "NEMA MG 1-20.14", indicate the associated NEMA MG 1 paragraph reference.)
15. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems
16. UL 674, Electric Motors and Generators, for Use in Division 1 Hazardous (Classified) Locations.
17. UL 1004, Electric Motors.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment, and shall be able to show evidence of at least ten installations in the Continental United States and in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single provider.
   2. The package non-clog submersible lift station provider shall prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the package non-clog submersible lift station manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop drawings and Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data including: dimensions, materials, size, weight, performance data and curves showing overall pump efficiencies, flow rate, head, brake horsepower, motor horsepower, speed and shut-off head.
      b. Warranty.
      c. Shop pump and motor tests and data as described in this Part 2.6.
   2. Shop Drawings:
      a. Installation drawings and requirements for grinder pump station.

b. Fabrication, assembly, control panel layouts, installation and wiring diagrams for pump and control panel.

3. Quality Control:
   a. Manufacturer shall provide signed and sealed calculations (From a licensed structural engineer in the State of Florida) showing that the FRP wetwell meets the structural requirements listed in Part 2.3.E.
   b. Reports for running tests performed in the field certifying that pump is fully operational according to the design requirements.

B. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.
      b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01730, Operating and Maintenance Data.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
   2. Transportation of equipment shall be in accordance with Section 01600, Material and Equipment.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Storage of equipment shall be in accordance with Section 01620, Storage and Protection

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify COUNTY, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 WARRANTY

A. All material supplied under these Specifications shall be warranted by the CONTRACTOR and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of COUNTY acceptance.

B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the COUNTY.

C. The manufacturer's warranty period shall run concurrently with the CONTRACTOR's warranty or guarantee period. No exception to this provision shall be allowed. The CONTRACTOR shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications.

D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of COUNTY acceptance, the CONTRACTOR shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the CONTRACTOR of the three-year warranty starting at the time of COUNTY acceptance of the equipment.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Description:
   1. Duplex non-clog submersible lift station complete and operational with pumps, motors, electrical connections, control equipment, FRP wetwell and valve vault, and accessories as shown and specified.

B. Operating Conditions:
   1. The pumps shall be capable of delivering raw, unscreened sewage at a flow rate of 260 GPM against a total dynamic head of 16 feet.
   2. Pump Efficiency at design point: Minimum of 60%
   3. Maximum motor size: 5 HP
   4. Discharge Nozzle dia. (maximum): 4-inch
   5. Shut off Head: 30 feet
   6. RPM: 1800
   7. Motor Voltage/Phase/Hertz: 460 V/3/60
   8. Minimum Sphere Diameter: 3-inches

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Barney's Pumps.
   2. ITT Flygt
   3. Or approved equal.

2.3 DETAILS OF CONSTRUCTION

A. Safety: The completely assembled and wired non-clog submersible lift station in its tank shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.

B. Pump Materials and Construction:
   1. General:
      a. Construct pumps for fluid service specified.
      b. Construct pumps and appurtenances, including cable, for continuous submerged operation without leakage in specified depth of water.
      c. Pump body shall include lifting eye or stainless steel bail suitable for bearing weight of pump unit during removal and installation.
   2. Castings: Cast iron.
   3. Impeller: Cast iron, non-clog.
   4. External Hardware: Type 316 stainless steel.
   5. Seals: Double-mechanical type seals, with independent springs, running in an oil chamber to provide lubrication.
   6. Shaft: Stainless steel.

C. Pump Motors:
   1. Housing: Cast iron.
   2. Cable Connection: Provide with strain relief.
   3. Voltage, phase, and frequency shall be as specified under "Design and Performance Criteria" in this Section.
   4. Motors shall have over-temperature sensors in motor windings.
   5. Motor shall be non-overloading for entire pump operating curve, shall have 1.15 service factor, and shall provide full rated horsepower with a voltage unbalance of three percent.
   6. Motors shall be in accordance with all current applicable standards of NEMA, IEEE and ANSI. Motors for use with variable frequency drives shall have insulation system constructed in compliance with or exceeding NEMA MG-1 Part 31.
   7. Motors shall be capable of carrying full load current continuously without injurious temperature rise under all conditions of submersible operation.
   8. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of pump operation from zero head to shut-off.

D. Accessories: Provide the following for each pump unless otherwise specified.
   1. Anchor bolts and anchorage devices per Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   2. Discharge Elbow and piping: Conforming to Section 15060.
   3. Pump Removal System:

a. Pumps shall automatically and positively mate with associated discharge piping when pump is lowered into place. Pumps shall be removable for inspection or service without requiring removal of bolts, nuts, or other fastenings.
b. Provide for each pump guide rails of Schedule 40 Type 316 stainless steel.
c. Provide each pump with chain of high-tensile strength, proof-tested, stainless steel chain. Provide sufficient length of chain for removing pump from wet well without requiring supplementary cords, cables, or chains. Connect chain to lifting eye or bail on pump with stainless steel, adjustable closure D-ring or similar hardware acceptable to ENGINEER. On opposite end of chain from pump, provide stainless steel, adjustable closure D-ring or similar hardware acceptable to ENGINEER. Chain and hardware shall be sized to sustain all tensile stresses during lifting of pump. For each pump, provide one suitable hook or bracket on wall just below operating floor to which chain will be hooked when not used for hoisting.
d. Package non-clog submersible lift station manufacturer shall provide guide rail brackets, self sealing flange, stainless steel cable or chain (as applicable) holder with support grip, and other items necessary for complete guide-in, pump removal system.

E. FRP Wetwell and Valve Vault:
1. Provide FRP wetwell and valve vault per the dimensions shown on the drawings.
2. FRP wetwell shall be made from a commercial grade unsaturated polyester or vinyl ester resin. The reinforcing materials shall be commercial Grade "E" type glass in the form of continuous roving and chop roving, and shall have a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
3. The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010 to 0.020 inches thick. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5 inch (13 mm) to maximum length of 2.0 inches (50.8 mm) and shall be applied uniformly to an equivalent weight of 3 oz/ft2. Each pass of chopped roving shall be well-rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inch (2.5 mm).
4. The interior surface shall be free of crazing, delamination, blisters larger than 0.5-inch in diameter and wrinkles of 0.125-inch or greater in depth.
5. FRP wetwell and valve vault wall shall be constructed with chop and continuous strand filament wound manufacturing process which insures continuous reinforcement and uniform strength and composition.

6. Wetwell and valve vaults shall be provided with resin fiber-reinforced bottoms.
7. Wetwell bottom shall have an anti-flotation ring and reinforced concrete anti-flotation footer with dimensions as shown on the drawings.
8. Wetwell and valve vault bottom shall be designed to resist all pressures induced by water, soil and wheel loads with a maximum deflection of 1/4-inch.
9. No hardware shall penetrate the wetwell walls. The wetwell wall shall include built / molded in channel supports for every 8 feet of vertical discharge piping for mounting pipe support braces and for mounting both guide rails and hooks tohang float balls, pump lifting chains, etc. at the top of the wet well.
10. All pipe openings shall have resilient pipe to wetwell seals.
11. The 1:1 bottom fillet shall be molded FRP.
12. All fiberglass and plastic wetwells and valve vaults located such that a vehicle may run over it shall have a minimum dynamic-load rating of 16,000 lbs. when tested in accordance with ASTM D3753. To establish this rating, the complete wetwell and valve vault shall not leak, crack, or suffer other damage when load tested to 40,000 lbs. and shall not deflect vertically downward more than 0.25 in. at the point of load application when loaded to 24,000 lbs.
13. Thickness of fiberglass and plastic wetwells and valve vaults shall be determined by calculations provided by package non-clog submersible lift station manufacturer.
14. Each wetwell and valve vault shall be designed and built to meet all required ASTM D3753 designations for dimensional requirements, hardness, chemical resistance, and workmanship.
15. The CONTRACTOR shall set sections vertical and in true alignment. The finished wetwell and valve vault shall not be out of plumb by more than 3/8-inch per 10 feet of height.
16. Each wetwell and valve vault shall be marked on the inside and outside with the following information: Manufacturer's name or trademark, factory location, serial or model number and total length.
17. The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly providing low profile mounting and water-tight capability.
18. The accessway shall include a single NEMA 6P electrical quick disconnect for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight.
19. Electrical quick disconnect shall be factory installed and include 25 feet of electrical supply cable to connect to the alarm panel.
20. The accessway shall include a 2 inch PVC vent with mesh screen to prevent sewage gases from accumulating in the tank.

F. Wetwell and Valve Vault Access Hatch: The lift station wetwell and valve vault shall be equipped with an aluminum access hatch.
   1. The wetwell and valve vault dimension shall be per drawings.
   2. Access hatches shall be provided per Section 05542, Floor Access Hatch Covers.

2.4 CONTROLS

A. Provide pumps with the following accessories and controls:
   1. Pumps shall be controlled based on fluid level in wet well. Level measurement system shall be furnished by pump Supplier and shall be level floats. Instruments shall meet the requirements of Section 13420, Primary Sensors and Field Instruments.
   2. Electrical Controls: Provide for each pump system an automatic pump control center in NEMA 4X enclosure for operation on a 480 volt, 3-phase, 60 Hertz electrical power supply. Provide each pump with individual thermal magnetic circuit breaker, three-phase electronic overload protection with manual reset and NEMA magnetic contactor in accordance with NEMA ICS 2 and NEMA 250.. Provide 120 volt control circuit transformer with disconnect and overload protection. Provide automatic electrical sequence for each pump system comprised of more than one pump.

B. Monitoring Equipment:
   1. General:
      a. Provide power and control cables and motor protective control devices as specified in Paragraph 2.4.A.2, above of this Section, 2.4.B.2 and 2.4.C.2.d, below, of this Section.
      b. Instrumentation and control system operational functional requirements relative to pump applications are shown and specified in applicable instrumentation and control Specifications in Division 13.
   2. Motor Protective Control Devices:
      a. For each pump motor assembly:
         1) Provide solid-state monitoring controller with SPDT dry contact control outputs for:
            a) Stator winding over temperature.
            b) Stator housing leakage sensor.
         2) Install solid-state monitoring controller in control panel

C. Pump Control Panel: Provide duplex pump (lead- lag) control panel as shown and specified.
   1. Pump control based on wet well fluid level shall be measured floats.
   2. Provide Wet Well/Pump Control panel with the following features:
      a. Panel shall house pump motor starters, pump controller, selector switches, indicating lights, main disconnect switch, and appurtenances.

b. Control panel enclosure shall be rated NEMA 4X with white finish. Panel construction shall be per Section 13430, Panels and Enclosures; devices shall conform to Section 13440, Panel Mounted Instruments. Panel dimensions shall not exceed the dimensions shown on the Drawings.
c. Incoming power shall be 480-volt, three-phase, 60 Hertz. Provide main three-phase ammeter and phase select switch.
d. Fused control circuit power at 120 vac.
e. Relay type alternator and circuitry.
f. Identification Devices: Black phenolic engraved nameplates and metal legend nameplates on outside of panel in accordance with Section 16075, Electrical Identification.
g. Complete, as-built, plastic laminated panel wiring diagrams and bill of materials, located in pocket on panel door, plus two spare copies.
h. Mounting hardware and brackets in accordance with Section 16070, Supporting Systems.
i. Elapsed run-time meter for each motor.
j. For each pump, provide a Hand-Off-Auto (H-O-A) switch, start pushbutton, and lockable stop pushbutton (used then H-O-A switch is in "Hand" position) in accordance with Section 16144, Control Stations.

3. Indicating Lights and Pushbuttons:
   a. Provide Wet Well/Pump Control Panel with status-indicating push-to-test type lights (green indicating "on", red indicating "off", and amber indicating "alarm") as specified in accordance with Section 16144, Control Stations. "Run" and "Fail" conditions shall be transmitted to the Site's Main PLC via dry contacts for status monitoring only.
   b. Provide pilot light test pushbutton in accordance with Section 16144, Control Stations.
   c. Provide pilot lights to indicate: panel power; high level in wet well; low level in wet well; pump no. 1, 2 run (two lights); pump no. 1, 2 stop (two lights); and pump no. 1, 2 overload (two lights).
   d. Provide "Next Pump to Start" pilot light for each pump. Based on automatic sequence, these lights will indicate pump to start next.
4. Remote Control and Monitoring:
   a. All wet well/pump control system parameters shall be monitored by the plant supervisory control and data acquisition (SCADA) system. Provide dry contacts for the following signals to the SCADA system:
      1) Pump Run
      2) Pump In Auto
      3) Pump Overload
      4) Pump Seal Fail
      5) Pump Motor Overtemp
      6) High Wet Well Level

b. Hardware and SCADA software configuration required is not included in this Section.

5. Wet Well/Pump Control Description:
   a. As fluid level in wet well rises, lead and lag pumps shall be started automatically at successively higher wet well levels until both pumps are running. Wet well fluid level at which controller starts each pump is per set point elevations based on wet well operating levels noted below.
   b. Wet well/pump operating levels shall be:

Wet Well Operating Levels	
Description	**Elevation**
Alarm	28.00
Lag Pump On	27.50
Lead Pump On	27.00
All Pumps Off	21.69
Wet Well Bottom	19.69

   c. Each pump's associated H-O-A switch shall function as follows: "H" position shall start the pump; "O" position shall stop the pump; "A" shall cause the pump to start and stop automatically based on the level floats. Pumps shall automatically alternate lead-lag status on each successive level control cycle when selector switch is in the "A" position. If control panel power is interrupted, timer circuit shall prevent simultaneous starting of pump motors when power is restored.

2.5 COATINGS

A. Shop Finishing:
   1. At the factory, pumps, motors, and appurtenances shall receive manufacturer's standard finish paint system suitable for service conditions specified in this Section.
   2. Coat machined, polished, and non-ferrous surfaces with corrosion prevention compound.

B. Field painting shall conform to Section 09900, Coatings. Touch-up of factory-applied finishes shall be compatible with factory-applied finish and specified service conditions.

2.6 SOURCE QUALITY CONTROL

A. Pump Shop Tests: Shop Test all pumps provided under this Section.

1. Hydrostatically test pump bodies per ANSI/HI 1.6, to the greater of: twice specified pump discharge head at Design Point No. 1, or 1.5 times pump's shutoff head.
2. Performance Test: Operate each pump assembly from zero to maximum capacity as shown on pump curve in approved Shop Drawing. Present results of test in plot of test curves showing head, flow, horsepower, efficiency, and current. Obtain data at minimum of five evenly spaced capacity points along curve including shut-off, design points, and minimum head for which pump is designed to operate. Conduct tests per ANSI/HI 1.6 and ANSI/HI 11.6.
3. Do not ship products from factory until ENGINEER has accepted test results.

B. Motor Tests and Data:
1. For each motor, provide an inspection report for job motor or a previously tested electrically duplicate motor. Provide the following minimum data:
   a. Running light current.
   b. Locked rotor current.
   c. Winding resistance measurement.
   d. High potential test.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in complete accordance with manufacturer's instructions and recommendations and shall conform to requirements of the National Electrical Code.

B. Package Non-Clog Submersible Lift Station shall be installed on a minimum 6-inch inch layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8-inch or more than 3/4-inch. Layer of stone shall extend 1-foot beyond diameter of station.

C. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the Specification.

D. Support piping independent of pump.

3.2 INSPECTION

A. CONTRACTOR shall verify that structures, pipes and equipment are compatible.

B. Make adjustments required to place system in proper operating condition.

3.3 FIELD QUALITY CONTROL

A. Following installation, CONTRACTOR and qualified field service representative of equipment manufacturer shall conduct operating tests of all equipment, functions, and controls at Site, in presence of COUNTY. Should tests result in malfunction, make necessary repairs, revisions, and adjustments and restart test from beginning. Repeat tests and repairs, revisions, and adjustments until, in opinion of ENGINEER, installation is complete and equipment is functioning properly and accurately, and is ready for permanent operation.
   1. Field Operating Test:
      a. Field test equipment and its controls in local mode, followed by demonstrating proper operation and controls in automatic mode. Demonstrate that each part and component of system individually and all parts and components together function properly in manner intended. Total duration of testing shall be 3 days, continuous and uninterrupted, in automatic mode. All testing equipment and manpower shall be by CONTRACTOR.
      b. Conform to applicable provisions of ANSI/HI 9.6.5.

B. Inspect motors prior to supplying electricity to (energizing) equipment. Do not energize equipment without COUNTY's permission. Inspections shall include the following:
   1. Inspect motor and equipment for physical damage.
   2. Inspect motor for proper anchorage, mounting, grounding, connection, and lubrication.
   3. Check for unusual noise and indications of overheating during initial or test operation.

C. Manufacturer's representative shall make a minimum of 3 site visits, with a minimum of 8 hours onsite for each visit. First visit shall be for assistance in installing equipment; second visit shall be for checking completed installation and start-up of system; third visit shall be to instruct operations and maintenance personnel. Representative shall revisit the Site as often as necessary until installation is acceptable.

D. Training: Furnish services of qualified factory trained specialists from manufacturer to instruct COUNTY's operations and maintenance personnel in recommended operation and maintenance of products. Training requirements, duration of instruction, and other qualifications shall be per Section 01821, Instruction of Operations and Maintenance Personnel.

E. Manufacturer's representative shall test operate the system in the presence of the COUNTY and verify that the equipment conforms to the specification requirements. Representative shall visit the site as often as necessary until all trouble is corrected

and the equipment or system is entirely satisfactory.

F. All costs, including travel, lodging, meals and incidentals, shall be at no cost to the COUNTY.

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SECTION 11402

SKID MOUNTED DIAPHRAGM CHEMICAL METERING PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall provide all labor, materials, services, equipment and incidentals required to furnish, install, test and place in satisfactory operation, diaphragm metering pump skids as shown and as specified herein. All pump skids in this Section shall be supplied by a single manufacturer.

B. Related Divisions and Sections:
   1. Section 15068, Thermoplastic Pipe.
   2. Section 15112, Chemical Valves and Appurtenances.
   3. Division 13, Applicable Sections on Instrumentation and Controls.
   4. Division 15, Applicable Sections on Piping, Valves and Appurtenances.
   5. Division 16, Electrical.

1.2 QUALITY ASSURANCE

A. All equipment provided under this Section shall be obtained from a single supplier or manufacturer who, with the CONTRACTOR, shall assume full responsibility for the completeness of the system. The supplier or manufacturer shall be the source of information on all equipment furnished regardless of the manufacturing source of that equipment.

B. System shall be designed completely in CAD prior to fabrication. All piping shall be fabricated to CAD based production drawings that detail all pipe nipples, fittings, valves, metering accessories, clamp locations, etc.

C. Qualifications: The equipment supplier or the manufacturer shall have experience in manufacturing diaphragm chemical metering pump skids of the same or larger size to the units specified. For an equipment supplier or manufacturer to be determined acceptable for providing diaphragm chemical metering pump skids on this project, it must show evidence of ten separate, substantially similar installations in the Continental United States that have been in satisfactory operation for a minimum of five years for each required chemical.

   For a manufacturer to be determined acceptable for providing diaphragm chemical metering pumps on this project, it must show evidence of ten separate,

substantially similar installations in the Continental United States that have been in satisfactory operation for a minimum of five years for each required chemical.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American Society for Testing and Materials (ASTM).
   2. American National Standards Institute (ANSI).
   3. National Electric Code (NEC).
   4. Standards of National Electrical Manufacturers Associations (NEMA).
   5. Anti-Friction Bearing Manufacturers Association (AFBMA).
   6. Standards of American Water Works Association (AWWA).
   7. Institute of Electrical and Electronic Engineers (IEEE).
   8. American Gear Manufacturer's Association (AGMA).
   9. Instrument Society of America (ISA)
   10. Standards of Joint Industrial Council (JIC)
   11. American Welding Society
   12. OSHA, Safety standards concerning personnel, protection when operating machinery, and the handling of dangerous chemicals
   13. IEEE 112, Test Procedure for Polyphase Induction Motors and Generators.
   14. IEEE 522, Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating Current Electric Machines.
   15. IEEE 841, Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 370 KW (500 HP).
   16. IEEE 1043, Recommended Practice for Voltage Endurance Testing of Form-Wound Bars and Coils.
   17. NEMA MG 1, Motors and Generators. (This Section's references to NEMA MG 1 followed by a hyphen and number, such as "NEMA MG 1-20.14", indicate the associated NEMA MG 1 paragraph reference.)
   18. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems
   19. UL 674, Electric Motors and Generators, for Use in Division 1 Hazardous (Classified) Locations.
   20. UL 1004, Electric Motors.

E. Shop Tests:
   1. General:
      a. Tests shall be conducted on the actual pumps, control panels, and skid components being provided for the project.
      b. Each pump skid must be tested prior to shipment. The test shall be performed with water and not with the chemical. The system shall be operated throughout the entire operating range of the pumps, in all automatic and manual modes.

c. Pump skid supplier shall make temporary electrical connections between the control panel and the pump skid to perform the tests.

2. Metering Pumps: Test each pump in the shop as follows:
   a. Calibration test.
   b. Inspect all components prior to and during shop testing.
   c. Capacity/head tests, including pump's minimum and maximum rated flow rates.
3. Motors: Perform following shop tests:
   a. Perform shop testing on the motors at the manufacturer's facility. Shop test shall be in accordance with NEMA MG 1, UL 674, and UL 1004 and shall demonstrate that the motors tested comply with the Contract Documents.
   b. Submit shop test reports identifying tests performed and results obtained.
   c. Motors shall be given Routine Test in accordance with NEMA MG 1-12.55 and IEEE 112. Test shall include the following:
      1) Measurement of winding resistance.
      2) No-load readings of current and speed at normal voltage and frequency.
      3) Current input at rated frequency with rotor at standstill for squirrel-cage motors (locked rotor amperes).
      4) High-potential test.
      5) Bearing inspection.
4. Controls: Test controls in the shop as follows:
   a. Verify operation in all operating modes.
   b. Inspect control components and panels for defects.
   c. Perform manufacturer's standard quality tests. Test entire control panel in the factory.
5. Valves: Test valves and appurtenances in the shop as follows:
   a. Inspect components for defects.
   b. Perform manufacturer's standard quality tests.
6. Piping: Test piping and appurtenances in the shop as follows:
   a. Inspect components for defects.
   b. Perform manufacturer's standard quality tests.
   c. All piping shall be hydrostatically tested to a pressure of 150 psi without leakage.
7. All tests shall be witnessed by a Registered Professional Engineer, who may be an employee of the skid supplier/manufacturer. The engineer shall prepare, sign, and seal a report for each skid, certifying that the tests took place and documenting the results.

1.3 SUBMITTALS

A. Shop Drawings and Data: Complete fabrication, assembly, foundation, and installation drawings, pump curves, and operation, maintenance and storage instructions, together with detailed specifications and data covering materials used, pump and motor assemblies, parts, devices and other accessories forming a part of the equipment furnished, shall be submitted for review for each separate pumping unit, in accordance with the procedures and requirements set forth in Section 01340, Shop Drawings, Project Data, and Samples. Data and specifications for the equipment shall include, but shall not be limited to, the following:

1. Manufacturer's literature, illustrations, specifications and engineering data including: dimensions, materials, size, weight, performance data and curves showing overall pump efficiencies, flow rate, head, turndown, brake horsepower, motor horsepower and speed.
2. Data sheets on chemical compatibility of the wet end materials being furnished.
3. 3D CAD drawings showing system design and fabrication
4. Shop drawings showing: fabrication, assembly, installation and wiring diagrams. Wiring diagrams shall conform to JIC Standards.
5. Provide protective coating data as per manufacturer's recommendations.
6. Motor Tests and Data: Provide shop tests according to 1.2.D for each motor. Furnish a certified motor data sheet for the actual motor or for a previously manufactured electrically duplicate motor that was tested.

B. Equipment supplier's and manufacturer's Qualifications: Submit equipment supplier's and manufacturer's qualifications in accordance with the requirements of Part 1.2.B.

C. Shop Tests: Submit shop test reports in accordance with the requirements of Part 1.2.D.

D. Field Tests: Submit field test reports in accordance with the requirements of Part 3.3.

E. Operation and Maintenance Manuals: Submit complete installation, operation and maintenance manuals including copies of all approved shop drawings as required by Section 01730, Operating and Maintenance Data.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work in accordance with Section 01600, Material and Equipment. Deliver

anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification in accordance with Section 01620, Storage and Protection. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Equipment that is damaged will not be acceptable.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify COUNTY, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.5 WARRANTY

A. All materials supplied under these Specifications shall be warranted by the CONTRACTOR and the manufacturers for a period of three (3) years. Warranty shall commence on the date of COUNTY acceptance.

B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the COUNTY.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty or guarantee period. No exception to this provision shall be allowed. The CONTRACTOR shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications.

D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of COUNTY acceptance, the Contractor shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty starting at the time of COUNTY acceptance of the equipment.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. The CONTRACTOR shall furnish diaphragm chemical metering pump skids, with all accessories, fittings, appurtenances, specialty items and all supports and anchors required for complete and operating pumping systems.

B. All parts and mechanisms shall be amply proportioned for all stresses that may occur during fabrication, shipping, erection, and intermittent or continuous operation. All units shall be constructed such that dismantling and repairing can be accomplished without difficulty.

2.2 PERFORMANCE

A. The pumping units shall operate without vibration or excessive noise over the operating speed range.

B. Pumping system vibration shall not exceed the acceptable field vibration limits given in the standards of the Hydraulic Institute.

C. All wetted surfaces of the diaphragm chemical metering pumps and appurtenances shall be suitable for continuous exposure to sodium hypochlorite.

D. Pumping units shall perform according to the following parameters:
   1. The pumping units shall be able to perform in the temperature range of 32 degrees Fahrenheit to 104 degrees Fahrenheit.
   2. The pumping units shall have disc style diaphragms. No tube diaphragms will be allowed.
   3. The number of strokes per minute (spm) shall be in the range of 15 to 175 at maximum delivery. Any modifications to piping and system layouts to provide more available net positive suction head are the responsibility and cost of the CONTRACTOR.
   4. Pumping units shall be capable of providing a turndown ratio of at least 20:1.

E. The pumping units shall be provided in accordance with the schedule included at the end of this Section.

2.3 DETAILS OF CONSTRUCTION

A. Pumps shall be positive displacement, mechanically actuated diaphragm type. This specification addresses skid mounted chemical metering pump systems complete with the skid assembly containing chemical metering pumps, all necessary piping, valves, fittings, supports, electrical controls, and accessories as specified herein. The metering pump skid shall contain the following items.

1. Skid with drip lip
2. Metering pumps
3. Pump motors.
4. Calibration column.
5. Pulsation dampeners.
6. Pressure gauges.
7. Vented true-union ball valves
8. Accumulator (where required).
9. Pressure relief valves.
10. Backpressure valve.
11. Strainer.
12. Controls.
13. All piping, valves, gaskets, supports, hardware, wiring, junction boxes, and accessories necessary for a fully functioning skid. Piping with isolation valves shall be terminated within 2 inches from the edge of skid. Electrical cables shall terminate in the control panel.

B. The pump skids shall be specially designed, constructed and installed for the service intended and shall comply with the conditions listed below. The CONTRACTOR shall submit compatibility data from the manufacturer being supplied to confirm the materials of construction.

Chemical Service	Sodium Hypochlorite
Chemical Concentration, percent	12.5
Specific Gravity (68°F)	1.20

C. Metering Pump Construction:
1. The liquid end for sodium hypochlorite shall be constructed of PVC or other compatible material.
2. The liquid end shall be physically separated from the drive unit by air gap and back plate with weep hole. The diaphragm shall have a PTFE or steel core in nylon-reinforced EPDM with PTFE-faced for the fluid contact surface.

D. The skid mounting of the metering pumps shall conform to the following requirements:
1. The chemical feed system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the Drawings and shall include the metering pumps, calibration column, piping, valves, piping accessories (pulsation dampeners, strainers, etc.), and wiring. The chemical feed system supplier shall be responsible for providing all equipment, valves and piping within the skid boundary, as well as a

remotely mounted control panel as specified below.

2. Pumps shall be oriented so the diaphragms are perpendicular to the back of the skid, allowing maintenance personnel convenient access to the pump head. The skids shall be constructed of fusion welded plastic sheet (PVC or polypropylene). Rotationally molded, skeletal frame, or bolted construction is not acceptable. Fork lift truck cut outs and anchor bolt holes shall also be provided.
3. All components of the skid mounted system (pumps, piping and controls) shall be tested prior to shipment as described in Part 1.2.D.
4. Skids shall be sized to utilize as small a footprint as possible while providing convenient maintenance access to all equipment. Layout will be verified in the Shop Drawing review.
5. Skid size shall not exceed a footprint of 48" (length) by 30" (width).
6. Minimum 12" shall be provided between pumps.

E. Motors:
   1. Motors for each metering pump shall be of permanent magnet type rated for inverter duty AC, 120V VAC, 1 phase, with a maximum speed of 1,750 rpm. Motors shall be totally enclosed, suitable for chemical duty, and shall operate without excessive heating at ten percent base speed.

F. Calibration Chamber:
   1. For each skid, provide one clear, plastic calibration chamber with vent for use in calibrating the metering pumps. The calibration chamber shall be piped to each metering pump so that each pump shall be able to utilize the calibration chamber.
   2. Calibration chamber shall be sized for a 60-second drawdown at maximum rated pump capacity.

G. Pulsation Dampeners:
   1. Pulsation dampeners shall be of the single diaphragm design, capable of arresting water hammer in the pump discharge lines created by the metering pumps.
   2. Pulsation dampeners shall be provided with valves, pressure gages and fittings necessary for maintaining required air pressure in the air chamber.
   3. Size: Per manufacturer's recommendations to obtain a 95 percent reduction in pulsations at maximum rated pump capacity.
   4. Extent: Provide one on discharge side of each metering pump.
   5. Materials of construction of diaphragm and body shall be corrosion resistant to the chemical being pumped.

H. Pressure Relief Valves:

1. System Description: Provide for each metering pump skid external, diaphragm-type pressure relief valves to protect piping systems from over-pressures.
2. Materials of construction of diaphragm and body shall be corrosion resistant to the chemical being pumped.
3. Valves shall be factory set, as recommended by metering pump manufacturer.
4. Valve pressure setting shall be field adjustable without removing valve from piping.
5. Capacity at Set Pressure: Equal to or greater than pumping head capacity of associated metering pump.

I. Pressure Gages:
1. Provide each discharge pipe for each metering pump under this Section with diaphragm-seal pressure gage as shown and indicated in the Contract Documents, in accordance with Section 13420, Primary Sensors and Field Instruments.

J. Backpressure Regulator Valve:
1. Provide each pump with external backpressure valve. Backpressure valve shall prevent backflow or siphoning of chemicals and provide sufficient backpressure for accurate operation of metering pumps.
2. Valve pressure setting shall be factory set and field adjustable without removing valve from piping.
3. Capacity: Equal to or greater than pumping head capacity of associated metering pump at set pressure.

K. Piping, Valves and Appurtenances:
1. Pipe shall be Schedule 80 PVC with socket or flanged ends. Cement shall be Weld-on 724.
2. Isolation valves shall be provided at all equipment connections. Seals shall be compatible with the chemicals serviced.
3. All piping shall conform to Section 15068, Thermoplastic Pipe.
4. All valves shall conform to Section 15112, Chemical Valves and Appurtenances.
5. Piping on skid shall include a flushing inlet on the suction side of the pumps that allows pumps to use water source as a means of flushing the discharge line.
6. Piping on skid shall include a flushing outlet on discharge side of the pumps to allow for flushing of pumps and skid piping.

L. Controls:
1. Local Control Unit - Each chemical metering pump shall have a microprocessor based local control unit, integral to the drive assembly.

Each control unit shall meet the following requirements:

a. Operate on a 120-volt, single phase, 60 Hz power supply.
b. Pump Drive: Variable Frequency Drive (VFD) operated 120-volt, single phase, pump drive motor.
c. Accept 4-20mA analog signals for local and remote speed control.
d. Discrete contact for metering pump fault detection.
e. Digital display and key pad on the local control unit to provide for:
    1) Pump mode selection (LOCAL/REMOTE).
    2) Start/Stop.
    3) Pump Speed (feed rate) adjustment.
f. Control unit circuitry shall provide a stable operation over an ambient temperature range of 32 degrees Fahrenheit to 104 degrees Fahrenheit, a voltage variation of -10 percent to a +10 percent.

2. Local NEMA 4X Terminal Junction Box (TJB) - A NEMA 4X terminal box shall be provided on the skid back panel for termination of all wiring. A corrosive resistant electrical receptacle with weatherproof inuse cover shall be provided for the metering pumps . The inside cover of the terminal box shall include a wiring diagram detailing the function of all terminals. A breaker disconnect switch shall be provided in the terminal junction box for the metering pump receptacle. Surge protection shall be provided locally in the skid mounted terminal junction box. Protection shall be provided for the main power supply as well as all analog and discrete signals. Surge protection devices shall be as manufactured by EDCO Inc. of Florida. The NEMA 4X TJB shall provide the following I/O at a minimum:
    a. Terminals for 120VAC power (local heavy duty surge protection included).
    b. 15A Breaker for receptacle
    c. LOR Selector Switch for each pump.
    d. DI = Remote On/Off for each pump.
    e. AI = Remote Speed Reference for each pump (local surge protection included).
    f. DO = Run Status for each pump.
    g. DO = Remote Status for each pump.
    h. DO = Fault Status for each pump.

2.4 TOOLS, SPARE PARTS AND MAINTENANCE MATERIALS

A. One set of the following spare parts shall be furnished per skid:
    1. Special tools required for operation and maintenance.

2. One maintenance kits for each chemical metering pump. Maintenance kits shall include but not be limited to diaphragm, check valve seats, gaskets and o-rings.
3. One maintenance kit for each pressure relief valve for each pump skid.
4. One maintenance kit for each backpressure valve for each pump skid.
5. One spare bladder for each pulsation dampener for each pump skid.
6. One spare valve of each size for each pump skid.
7. One parts list for all serviceable components.

B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to COUNTY at the completion of the project.

2.5 PAINTING

A. All equipment shall receive the manufacturer's standard finish paint system prior to shipment, suitable for the particular chemical.

B. Machined, polished and non-ferrous surfaces shall be coated with corrosion prevention compound.

C. Field painting shall be in complete accordance with requirements of Section 09900, Coatings.

2.6 NAMEPLATES

A. Each pump and motor shall be furnished with a stainless steel nameplate securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the following:
1. Equipment number.
2. Manufacturer's name and model number.
3. Serial number.
4. Rated maximum flow capacity.
5. Maximum head.
6. Horsepower.
7. Speed.
8. Armature voltage.
9. Armature amps.
10. Field voltage.
11. Field amps.
12. Power and service factors.

2.7 MANUFACTURER

A. Provide diaphragm chemical metering pump skids and appurtenances as manufactured by one of the following:
   1. Prominent Fluid Controls, Inc.
   2. Blue Planet Environmental Systems, Inc.
   3. Or Approved Equal.

B. Provide pumps and appurtenances as manufactured by one of the following:
   1. Prominent Fluid Controls, Inc. Sigma pump.
   2. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which products are to be installed and notify COUNTY in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install materials and equipment in conformance with Laws and Regulations, applicable standards, manufacturer's instructions and recommendations, and the Contract Documents.

B. Skid and equipment shall be installed in the areas shown and secured with anchor bolts in accordance with the manufacturer's recommendations.

C. General:
   1. Perform drilling and fitting required for installation. Set equipment accurately in location, alignment, and elevation, plumb, true, and free of rack.
   2. Making plate cutouts or openings at the Site is not allowed.
   3. Fit exposed connections accurately together to form tight hairline joints.
   4. Provide utility connections in accordance with the Contract Documents.
   5. Align and adjust equipment including motors, belts, drives, support stands, and appurtenances in presence of COUNTY.
   6. Prior to energizing electric motor drive equipment, rotate drive motor by an external source to demonstrate free operation of all mechanical parts. Do not energize equipment until safety devices are installed, connected, and functional.
   7. Install valves in accordance with applicable provisions of Section 15112, Chemical Valves and Appurtenances.

D. Conform to Section 01751, Starting and Placing Equipment in Operation.

3.3 FIELD QUALITY CONTROL

A. Site Tests:
   1. Following installation, CONTRACTOR and qualified field service representative of pump skid supplier/manufacturer shall conduct operating tests of all equipment, functions, and controls at the Site in presence of COUNTY and ENGINEER.
   2. Comply with Section 01751, Starting and Placing Equipment in Operation.
   3. Field Operating Test:
      a. Field test equipment and its controls in local mode, followed by demonstrating proper operation and controls in automatic mode. Demonstrate that each part individually and all parts together function properly in manner intended. Total duration of testing shall be four hours, continuous and uninterrupted, in automatic mode. All testing equipment and labor shall be by CONTRACTOR.
      b. Should tests result in malfunction, make necessary repairs, revisions, and adjustments and restart test from the beginning. Repeat tests and repairs, revisions, and adjustments until, in opinion of COUNTY, installation is complete and equipment is functioning properly and accurately, and is ready for permanent operation.
      c. Inspect motors prior to supplying electricity to (energizing) equipment. Do not energize equipment without COUNTY's permission. Inspections shall include the following:
         1) Inspect motor and equipment for physical damage.
         2) Inspect motor for proper anchorage, mounting, grounding, connection, and lubrication.
         3) Check for unusual noise and indications of overheating during initial or test operation.

B. Manufacturer's Services: Provide a qualified, factory trained serviceman to perform the following:
   1. Instruct CONTRACTOR in installing equipment.
   2. Supervise installation of materials and equipment.
   3. Inspect, calibrate, adjust, and test equipment after installation and ensure proper operation.
   4. Instruct COUNTY'S personnel in operating and maintaining the equipment.
   5. Manufacturer's representative shall make a minimum of two visits, with minimum of eight hours at the Site for each visit. The visit(s) shall be for instructing CONTRACTOR and supervising installation of equipment; checking, adjusting, and calibrating completed installation and starting up the

system; instructing operations and maintenance personnel. Representative shall revisit the Site as often as necessary until installation is acceptable.

6. Training: Furnish services of pump skid supplier's/manufacturer's qualified factory trained specialists to instruct COUNTY'S operations and maintenance personnel in recommended operation and maintenance of materials and equipment. Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01821, Instruction of Operations and Maintenance Personnel.
7. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.4 PUMP SCHEDULE

Parameter	Sodium Hypochlorite
Number of Pumps	2 (one duty/one in-line standby)
Expected Feed Rate Range (gph)	2.0-21.0
Maximum Capacity (gph)	21.0
Turndown	10
Minimum Pump Design Pressure (psig)	50
Maximum Stroke Speed (spm)	200
Maximum Motor hp	0.5
Skid Inlet Size (inches)	1
Skid Outlet Size (inches)	3/4

+ + END OF SECTION + +

SECTION 13205

SECTION 13205

DOUBLE WALL HIGH DENSITY POLYETHYLENE CHEMICAL TANKS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install double wall cross-linked high density polyethylene (HDXLPE) tanks with linear polyethylene liners. The tanks shall be for the storage of 12.5 percent of sodium hypocholorite.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with polyethylene tanks.
   2. Size and location of manways, pipe connections, etc. shall be coordinated with the requirements of applicable chemical feed systems.

C. Related Sections:
   1. Section 03300, Cast-in-Place Concrete.
   2. Section 03600, Grout.
   3. Division 15, Sections on Piping and Valves.
   4. Division 16, Electrical.

1.2 SUBMITTALS

A. Shop Drawings: Comply with Section 01340, Shop Drawings Project Data, and Samples, and the additional requirements below: Submit for approval the following:
   1. Layout and all critical dimensions, including thickness of tank wall.
   2. Materials of construction.
   3. Fitting locations and details.
   4. Accessories.
   5. Anchor and hold-down details.
   6. Manway design.
   7. Manufacturer's literature, illustrations, chemical compatibility data, calibration charts, specifications, engineering data and installation instructions.
   8. Tank color.

9. Chemical compatibility sheet chemical to be stored, percentage of chemical, and temperature of chemical.

B. Test Reports: Submit copies of test reports required by paragraph 1.3.C.

C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01821, Instruction of Operations and Maintenance Personnel. The Operation and Maintenance Manuals shall include, but not be limited to, the following:
   1. Manufacturer's written instructions for unloading, handling, and storing HDXLPE tanks and appurtenances.
   2. Installation instructions for installing tank on a concrete slab.

D. Local Service Representative: Provide name, address and telephone number of manufacturer and local, factory-trained service representative.

E. Manufacturer's Qualifications: Submit documentation in accordance with requirements of Section 1.3.B.

F. Quality Assurance Report that includes the following:
   1. Tank Description.
   2. Nominal Gallonage & Diameter.
   3. Material.
   4. Specific Gravity & Hoop Stress Design.
   5. Color.
   6. Review of Audit for Wall Thickness.
   7. Fitting Placement Sign Off.
   8. Accessory Inspection.
   9. Tank Visual Inspection.

1.3 QUALITY ASSURANCE

A. Reference Standards: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise shown or specified:
   1. ASTM D 1998-06, Polyethylene Upright Storage Tanks
   2. ASTM D 618, Conditioning Plastics and Electrical Insulating Materials for Testing
   3. ASTM D D638, Tensile Properties of Plastics
   4. ASTM D 790, Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
   5. ASTM D 883, Definitions of Terms Relating to Plastics
   6. ASTM D 1505, Density of Plastics by the Density-Gradient Technique
   7. ASTM D 1525, Test Method for Vicat Softening Temperature of Plastics

8. ASTM D 1693, Test Method for Environmental Stress-Cracking of Ethylene Plastics
9. ASTM D 1998, Standard Specification for Polyethylene Upright Storage Tanks
10. ASTM D 2765, Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
11. ASTM D 2837, Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
12. ASTM D 3892, Practice for Packaging/Packing of Plastics
13. ASTM F 412, Definitions of Terms Relating to Plastic Piping Systems
14. ARM (Association of Rotational Molders) Standards: Low Temperature Impact Resistance (Falling Dart Test Procedure)
15. ANSI Standards: B-16.5 Pipe Flanges and Flanged Fittings
16. OSHA Standards: 29 CFR 1910.106 Occupational Safety and Health Administration, Flammable and Combustible Liquids
17. UBC CODE: Uniform Building Code 2006 Edition
18. IBC CODE: International Building Code 2006 Edition
19. CBC Code: California Building Code 2007 Edition
20. NSF/ANSI Standard 61 – Drinking Water System Components (Type II resin)
21. 40 CFR-264.193

B. Manufacturer's Qualifications: Manufacturer shall have at least 10 years of experience in producing double wall HDXLPE tanks of similar size for 12.5% sodium hypochlorite and shall show evidence of at least 10 installations in the Continental United States and in satisfactory service for a minimum of 5 years.

C. Source Quality Control:
1. All dimensions will be taken with the tank in the vertical position, unfilled. Tank dimensions will represent the exterior measurements.
   a. The tolerance for the outside diameter, including out of roundness, shall be per ASTM D 1998-06.
   b. The tolerance for fitting placements shall be +/- 0.5 in. in elevation and 2 degrees radial at ambient temperature.
2. Test specimens shall be taken form fitting location areas or piggy-back test molds.
3. Low Temperature Impact Test - ARM Standard:
   a. Test specimens shall be conditioned at -40 degrees Fahrenheit for a minimum of 2 hours.
   b. The test specimens shall be impacted in accordance with ARM Standard Test Method. Test specimens <2" thickness shall be tested at 100 ft.-lb. Test specimens > 2" thickness shall be tested at 200 ft.-lb.
4. Hydrostatic Water Test:

a. The hydrostatic water test shall consist of filling the tank to full capacity with all tank connections sealed from the outside for a minimum of four hours and conducting a visual inspection for leaks, from tank and tank connections.

5. Degree of Crosslinking Test (if applicable):
   a. The test method is to be the o-xlene insoluble fraction (gel test) per ASTM D 2785 Method C. This test method is for determination of the ortho-xlene insoluble fraction (gel) of crosslinked polyethylene.
   b. The percent gel level for tanks on the inside 1/8 in. of the wall shall be a minimum of 65%.

D. Each tank shall be inspected for defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delaminations that will impair the serviceability of the vessel. All cut edges where openings are cut into the tanks shall be trimmed smooth.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. In general, tanks shall be:
   1. Chocked and tied down to prevent being blown by wind.
   2. Vented to allow for temperature changes that may affect their integrity.
   3. Provided with opening protection to exclude foreign matter.
   4. Protected from sunlight (UV) degradation.
   5. Stored on site in cradles, if storage is required prior to installation.

B. Delivery of Materials:
   1. Refer to Section 01600, Material and Equipment, and supplementary requirements below.
   2. Deliver materials to the site to insure uninterrupted progress of the Work.
   3. Deliver anchor bolts and anchorage devices that are to be embedded in cast-in-place concrete in ample time not to delay that Work.
   4. Tanks delivered to the job site shall be inspected by the CONTRACTOR for damage, unloaded and stored with a minimum of handling.
   5. All fittings shall be installed, removed and shipped separately.

C. Storage of Materials:
   1. Refer to Section 01620, Storage and Protection, and supplementary requirements below.
   2. Store materials to permit easy access for inspection and identification. Protect equipment including packaged materials from weather, corrosion, and deterioration.