

PROJECT MANUAL

FOR THE

**WESTERN REGIONAL WATER SUPPLY FACILITY
IMPROVEMENTS – PHASE 3A – PART 2**

Volume 1 of 2

Prepared For:



Prepared By:

**Tetra Tech
201 E. Pine Street, Suite 1000
Orlando, Florida 32801**

July 2019

ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE 3A – PART 2

TABLE OF CONTENTS

VOLUME 1

| <u>Section</u> | <u>Title</u> |
|---|---|
| <u>DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS</u> | |
| <u>DIVISION 1 - GENERAL REQUIREMENTS</u> | |
| 01000 | Project Requirements |
| 01010 | Summary of Project |
| 01025 | Measurement and Payment |
| 01041 | Project Coordination |
| 01050 | Field Engineering |
| 01065 | Permits and Fees |
| 01070 | Abbreviations and Symbols |
| 01091 | Reference Specifications |
| 01100 | Special Project Procedures |
| 01152 | Applications for Payments |
| 01200 | Project Meetings |
| 01310 | Progress Schedules |
| 01340 | Shop Drawings, Working Drawings, and Samples |
| 01370 | Schedule of Values |
| 01380 | Construction Photographs |
| 01390 | Color DVD Preconstruction Record |
| 01400 | Document Control System Software – Web Based System |
| 01410 | Testing and Testing Laboratory Services |
| 01500 | Temporary Facilities |
| 01505 | Mobilization |
| 01525 | Construction Aids |
| 01568 | Temporary Erosion and Sedimentation Control |
| 01580 | Project Identification and Signs |
| 01600 | Material and Equipment |
| 01650 | Start-Up and Demonstration |
| 01700 | Contract Closeout |
| 01710 | Cleaning |
| 01720 | Project Record Documents |
| 01730 | Operating and Maintenance Data |
| 01740 | Warranties and Bonds |
| 01800 | Miscellaneous Work and Cleanup |

**ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE 3A – PART 2**

TABLE OF CONTENTS (Continued)

| <u>Section</u> | <u>Title</u> |
|---|---------------------------------|
| <u>DIVISION 2 - SITEWORK</u> | |
| 02050 | Demolition |
| 02140 | Dewatering |
| 02200 | Earthwork |
| 02822 | Solid Sodding |
| <u>DIVISION 3 - CONCRETE</u> | |
| 03300 | Cast-in-Place Concrete |
| 03345 | Concrete Finishes |
| <u>DIVISION 4 - MASONRY</u> | |
| 04220 | Concrete Unit Masonry |
| 04230 | Reinforced Unit Masonry |
| <u>DIVISION 5 - METALS</u> | |
| 05400 | Cold-Formed Metal Framing |
| 05500 | Miscellaneous Metal |
| 05521 | Pipe and Tube Railings |
| <u>DIVISION 6 - WOOD AND PLASTICS</u> | |
| 06100 | Rough Carpentry |
| <u>DIVISION 7 - THERMAL AND MOISTURE PROTECTION</u> | |
| 07100 | Water Repellent Masonry Coating |
| 07210 | Building Insulation |
| 07900 | Joint Sealers |

**ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE 3A – PART 2**

TABLE OF CONTENTS (Continued)

| <u>Section</u> | <u>Title</u> |
|---|------------------------------------|
| <u>DIVISION 8 - DOORS AND WINDOWS</u> | |
| 08110 | Steel Doors and Frames |
| 08330 | Overhead Coiling Doors |
| 08410 | Aluminum Entrances and Storefronts |
| 08710 | Door Hardware |
| 08800 | Glass and Glazing |
| <u>DIVISION 9 - FINISHES</u> | |
| 09250 | Gypsum Drywall |
| 09510 | Acoustical Ceilings |
| 09653 | Resilient Base and Accessories |
| 09671 | Resinous Flooring |
| 09900 | Painting |
| VOLUME 2 | |
| <u>DIVISION 10 - SPECIALTIES</u> | |
| 10140 | Signage Systems |
| 10200 | Aluminum Louvers and Vents |
| 10522 | Fire Extinguishers and Accessories |
| 10800 | Toilet Accessories |
| <u>DIVISION 11 - EQUIPMENT (NOT USED)</u> | |
| <u>DIVISION 12 - FURNISHINGS (NOT USED)</u> | |
| <u>DIVISION 13 - SPECIAL CONSTRUCTION</u> | |
| 13300 | Instrumentation and Controls |
| <u>DIVISION 14 - CONVEYING SYSTEMS (NOT USED)</u> | |

**ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE 3A – PART 2**

TABLE OF CONTENTS (Continued)

| <u>Section</u> | <u>Title</u> |
|---------------------------------|---|
| <u>DIVISION 15 - MECHANICAL</u> | |
| 15000 | Mechanical – General Requirements |
| 15041 | Disinfection of Piping and Structures |
| 15044 | Pressure Testing of Piping |
| 15058 | Common Motor Requirements for HVAC and Plumbing Equipment |
| 15061 | Steel Pipe and Fittings |
| 15062 | Ductile Iron Pipe and Fittings |
| 15093 | Sleeves and Sleeve Seals for HVAC and Plumbing Piping |
| 15098 | Escutcheons for HVAC and Plumbing Piping |
| 15100 | Valves and Appurtenances |
| 15101 | Gate Valves |
| 15103 | Butterfly Valves |
| 15116 | Valve Boxes |
| 15120 | Piping Specialties |
| 15126 | Pipe Hangers & Supports |
| 15128 | Wet Taps & Temporary Line Stops |
| 15129 | Couplings and Connectors |
| 15140 | HVAC Plumbing Supports and Anchors |
| 15150 | Vibration Controls for HVAC |
| 15190 | HVAC and Plumbing Piping and Equipment Identification |
| 15256 | HVAC Plumbing Piping and Insulation |
| 15258 | Ductwork Insulation |
| 15400 | Plumbing System |
| 15502 | Condensate Piping |
| 15504 | Refrigerant Piping |
| 15566 | Electric Unit Heaters |
| 15700 | Split System Air-Conditioning Units |
| 15754 | Centrifugal Fans |
| 15810 | Ductwork |
| 15941 | Sequence of Operations for HVAC DDC |
| 15955 | Temperature Controls |
| 15980 | Testing, Adjusting, and Balancing |

**ORANGE COUNTY
WESTERN REGIONAL WATER SUPPLY FACILITY IMPROVEMENTS
PHASE 3A – PART 2**

TABLE OF CONTENTS (Continued)

| <u>Section</u> | <u>Title</u> |
|---------------------------------|--|
| <u>DIVISION 16 - ELECTRICAL</u> | |
| 16010 | Basic Electrical Requirements |
| 16050 | Basic Electrical Materials and Methods |
| 16110 | Raceways |
| 16120 | Conductors |
| 16450 | Grounding |
| 16500 | Lighting |
| 16722 | Fire Alarm System |
| 16740 | Access Control System |
| 16950 | Electrical Testing |
| Appendix A: | Appendix ‘D’ – Orange County Utilities List of Approved Products |

DIVISION 0

BIDDING AND CONTRACT REQUIREMENTS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01000

PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

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

3. Public Utility Installations and Structures:

- a. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies, or privately owned by individuals, firms, or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water, or other public or private property which may be affected by the Work shall be deemed included hereunder.
- b. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition, and extent of all such installations and structures as may be encountered and as may affect the construction operations.
- c. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor shall be repaired by the Contractor, at his expense. No separate payment shall be made for such protection or repairs to public utility installations or structures.
- d. Public utility installations or structures owned or controlled by the Owner or other governmental body which are shown on the Drawings to be removed, relocated, replaced, or rebuilt by the Contractor shall be considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract Items. No separate payment shall be made therefor.
- e. Where public utility installations or structures owned or controlled by the Owner or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement, or rebuilding is necessary to complete the Work under this Contract, such Work shall be

accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously, and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement, or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the Agreement.

- f. The Contractor shall, at all times in performance of the Work, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage, or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.
- g. The Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least 48-hours in advance of breaking ground in any area or on any unit of the Work.
- h. The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

1.02 DRAWINGS AND PROJECT MANUAL

- A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.
- B. Supplementary Drawings:
 - 1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer, and the Contractor will be furnished one (1) complete set of reproducible Drawings (24 inches by 36 inches) and one (1) reproducible copy of the Project Manual.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

C. Contractor to Check Drawings and Data:

1. The Contractor shall verify all dimensions, quantities, and details shown on the Drawings, Supplementary Drawings, schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction, or improper operation resulting therefrom, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.
2. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

D. Specifications: The Technical Specifications consist of three (3) parts: General, Products, and Execution. The General part of a Specification contains General Requirements for the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.

E. Intent:

1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only

the best general practice is to prevail and that only material and workmanship of the best quality is to be used, the interpretation of these Specifications shall be made upon that basis.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request and at the Engineer's option, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. Any two (2) or more pieces of material or equipment of the same kind, type, or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.
2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one (1) complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.
2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.
3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract Prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test, and place in operation, the equipment in conformity with the Contract Documents.
2. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General:

1. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Five (5) copies of the reports shall be submitted, and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.
2. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof, and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the Work and replace it with acceptable material, without cost to the Owner.
3. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with the recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.
4. The Contractor shall be fully responsible for the proper operation of equipment during testing and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

B. Costs:

1. All inspection and testing of materials furnished under this Contract will be provided by the Contractor, unless otherwise expressly specified.
2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor, and such costs shall be deemed to be included in the Contract Price.
3. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests of materials and equipment which are rejected for non-compliance.

C. Certificate of Manufacture:

1. Contractor shall furnish to Engineer authoritative evidence in the form of a certificate of manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents.
2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

D. County's Work Schedule:

1. The County reserves the right to have their Resident Project Representative (RPR) or their designee present to witness and inspect all Work performed by the Contractor. Working hours for the RPR are an 10-hour period between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday. Any Work beyond the 10-hour period shall be considered overtime and shall be requestd in writing 24 hours prior. Contractor, with verbal permission of the RPR, may work 24 hours a day to provide clean-up, maintenance of vehicles and equipment, and other such items without the RPR present.
2. Any Work required on Saturday or Sunday shall be considered overtime and shall be requested in writing 48 hours in advance. All requests must be approved by County in advance. Under emergency situations a verbal request may be made with a follow-up written request.

3. County observes the following holidays: New Year's Day, Martin Luther King Day, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving, and Christmas Day.
4. **Contractor shall pay for the RPR's overtime.** Overtime shall be defined as time beyond the 10-hour working period between 7:00 a.m. and 7:00 p.m. on Monday through Friday, and all time on Saturdays, Sundays, and on holidays observed by the County. **Hourly rates for the Resident Project Representatives shall be \$50 per hour.**

E. Shop Tests:

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.
2. Five (5) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be submitted to the Engineer for approval.
3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

F. Start-up Tests:

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

G. Demonstration Tests:

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

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

1.05 LINES AND GRADES

A. Grade:

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
2. Adjustments of grades shown on Drawings may be necessary to conform to actual field conditions or to maintain cover under proposed future grades. Such adjustments shall be considered part of the job conditions and no extra compensation will be allowed for such changes, except where specifically otherwise noted in the Drawings or Specifications. Such adjustments must be approved by the Engineer prior to being made.
3. The Engineer will establish bench marks and baseline controlling points. Reference marks for lines and grades as the Work progresses will be located by the Contractor to cause as little inconvenience to the prosecution of the Work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. He shall remove any obstructions placed by him contrary to this provision.

B. Surveys:

1. The Contractor shall furnish and maintain, at his own expense, stakes and other such materials.
2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies.
3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review by the Engineer.

C. Safeguarding Marks:

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

1.06 OPERATION OF EXISTING FACILITIES

- A. The existing treatment plant must be kept in continuous operation throughout the construction period in accordance with the requirements of Section 01041. The Contractor shall submit a Contractor's Assistance Request (C.A.R) for Access to County Facilities at least 7 days in advance for entering buildings or other restricted areas or equipment, or any work that may affect plant operations.

1.07 CONNECTION TO EXISTING FACILITIES

- A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from County or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.
- B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the County or the owning Utility.

1.08 CLEANING UP

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

- B. Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.
- C. Volatile wastes shall be properly stored in covered metal containers and removed daily. Wastes shall not be buried or burned on the Site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the Site and disposed of in a manner complying with local ordinances and antipollution laws.
- D. Adequate cleanup will be a condition for recommendation of progress payment applications.
- E. Contractor shall use water sprinkling, temporary enclosures, and other suitable methods necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with governing regulations.
- F. Contractor shall maintain sod and mow areas as needed during construction activities.

1.09 SITE ADMINISTRATION

- A. Contractor shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to County or others. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except County's employees) to observe the same regulations as Contractor requires of its employees.
- B. Access to the Site will be limited to the main gate off Lakeville Road unless specific alternate arrangements are made with the Owner. Contractor shall supply a list, and periodically update it, that contains the names of all personnel with driver licenses numbers and license plate numbers of all vehicles that will be on-site during construction. Contractor shall also supply County's Security Representative a daily list of any scheduled visitors. Only scheduled visitors will be permitted to enter upon verification of identity.
- C. County reserves the right to direct Contractor to permanently remove any subcontractor or subcontracted employee from the site for breach of security,

policy, unsafe working practice, unprofessional behavior, or failure to comply with access restrictions.

1.10 SECURITY

- A. Contractor shall be responsible for protection of the Site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons. Contractor shall comply with Orange County's security requirements to protect the Western Regional Water Supply Facility site.
- B. The County is implementing special security measures to protect the public water system and the Contractor shall provide the same level of security. The Contractor shall provide the following security measures:
 - 1. Contractor will supply list of all personnel that will be on the WRWSF site each morning to County's R.P.R.
 - 2. All personnel, employees, and/or subcontractors and suppliers that pass through the security perimeter shall wear Contractor issued photo identification badges.
 - 3. Contractor will supply list with names, driver license, and license plate numbers of all personnel.
 - 4. All Contractor's and subcontractor's personnel passing through the security perimeter shall have background checks to identify any historical crimes dealing with terrorism, sabotage, or other government related illegal activities at the cost of the Contractor and before entering Orange County Utilities' WRWSF. Proof of background checks shall be submitted to County, prior to any on-site work commencing.
 - 5. All project deliveries shall be inspected prior to entering the security perimeter of the Facility in order to verify contents. All delivery personnel and delivery vehicles shall be under supervision while within the security perimeter of the Facility in lieu of issuance of photo identification badges. The Contractor shall maintain staff to accept all deliveries to the site, the County will not be responsible for receipt of any deliveries.
 - 6. If access other than the main gate off Lakeville Road is utilized, a full time guard shall be provided at the construction gate during contractor working hours at the cost of the Contractor. All arrangements for alternative access shall be pre-arranged with the County. All alternative access must be secured and locked when not in use.

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

1.11 SMOKE FREE CAMPUS

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

1.12 TRAINING

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01010

SUMMARY OF PROJECT

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. This Contract is for the expansion of the Western Regional Supply Facility Improvements Phase 3A – Part 2 as shown on the Drawings and specified herein. The Work consists of furnishing all labor, equipment, and materials for the construction of the facilities consisting of, but not limited to the expansion of or improvements to the equipment and structures associated with the following:
1. Conversion of the old chlorine building to a maintenance building.
 2. Removal and replacement of exterior building signs at the eight (8) existing well houses, Fluoride Building, High Service Pump Building and converted maintenance building to match the building signs and the Operations Building and the Sodium Hypochlorite Building.
 3. Completion of the new finished water flow meter bypass, including installation of line stops and replacing the existing multi-path transit time flow meter with a butterfly valve and the addition of butterfly valves on the new finished water flow meter line.
 4. HVAC improvements in the fluoride building.
 5. Addition of an exhaust fan to the existing storage building.
 6. Upgrades to the fire alarm system in the proposed maintenance building and existing fluoride building.
 7. A summary of the electrical work provided under this Contract is provided in Section 16010.

1.02 CONTRACTOR'S USE OF PREMISES

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

1.03 PROJECT SEQUENCE

- A. The Contractor shall establish his work sequence based on the use of crews to facilitate completion of construction and testing within the specified Contract Time.
- B. The Western Regional WSF shall remain fully operational throughout construction. No shut downs will be allowed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

1.01 GENERAL

- A. The Contractor shall receive and accept the compensation provided in the Proposal and the Contract as full payment for furnishing all materials, labor, tools and equipment, for performing all operations necessary to complete the work under the Contract, and also in full payment for all loss or damages arising from the nature of the work, or from any discrepancy between the actual quantities of work and quantities herein estimated by the Engineer, or from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner.
- B. The prices stated in the proposal include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the unit price shown in the proposal shall be in accordance with the description of that item in this Section.
- C. The Contractor's attention is again called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established by the Bid Form or Payment Items, he shall include the cost for that work in some other applicable bid item, so that his proposal for the project does reflect his total price for completing the work in its entirety.

1.02 MEASUREMENT

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

1.03 PAYMENT ITEMS

- A. Items are as enumerated on the bid form.

1. Item 1 – Construction of the Western Regional Water Supply Facility Improvements Phase 3A – Part 2:
 - a. Measurement for various items covered under Construction of the Western Regional Water Supply Facility Improvements Phase 3A – Part 2 will not be made for payment, and all items shall be included in the lump sum price.
 - b. Payment for General Requirements shall include all Insurance requirement costs, the cost of bonds, and all Administrative costs. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the pay request invoices to substantiate that appropriate insurance and bonds have been obtained by the Contractor.
 - c. Payment for Mobilization/Demobilization will be made at the Contract lump sum price for the item, which price and payment shall be full compensation for the preparatory work and operations in mobilizing for beginning Work on the project including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of field office, building, safety equipment and first aid supplies, sanitary and other facilities, as required by these Specifications, and State and local laws and regulations; and any other preconstruction expense necessary for the start of the Work; the cost of field engineering, permits and fees, construction schedules, shop drawings, temporary facilities, laydown storage area, construction aids, erosion control, work associated with contractor support during Owner/Engineer reviews and inspection, reinspections and any re-work resulting from same, as described in Section 01710: Cleaning. The Contractor shall submit invoices substantiating the cost of mobilization with each pay request. Mobilization/demobilization shall not be more than five percent (5%) of the Total Base Bid price. Ten percent of the cost for mobilization will be withheld until substantial completion and site clean-up.
 - d. Payment for Project Record Documents will be made at the Contract lump sum price for the item, which price and payment shall be full compensation for furnishing all labor, materials, and equipment necessary to create the Project Record Drawings, including the certified as-built survey, in accordance with the County requirements and specifications Section 01720: Project Record Documents. Payment will be made at the lump sum price divided into equal monthly payments based on the Contract Time

and acceptance by County of the progressive as-built drawings and tables. This lump sum price shall be a minimum of one percent (1%) of The Total Base Bid price (except bid items under General Requirements and Mobilization/Demobilization).

- e. Payment for Indemnification: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, Owner specifically agrees to give the Contractor \$100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.
- f. Payment for the Western Regional Water Supply Facility construction will be made at the contract lump sum price, based upon the approved schedule of values and progress payments. This item shall include all materials, equipment, testing, permits, appurtenances, and work required for the construction of the Western Regional Water Supply Facility Improvements, excluding bid items listed elsewhere and excluding Additive Alternate bid items.

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

- a. Measurement for various items covered under Orange County permits as defined in Section 01065 will not be made for payment, and all items shall be included in the lump sum price.
- b. Payment for Orange County Permits as defined in Section 01065 shall be 0.2% fixed percentage of the total bid and pre-established on the bid form. Payment for the lump sum item shall be proportional to the amount to the contract payment for Item No. 1.

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish personnel and equipment that will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress that will ensure the completion of the work within the Contract time. If at any time, such personnel appear to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforementioned, he may order the Contractor to increase the efficiency, change the character or increase the personnel and equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor or his obligations to secure the quality of the work and rate of progress.
- B. This Section includes requirements for coordinating with County's operations during the Work, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on County's operations except as allowed in this Section.
- C. Contractor shall provide labor, materials, tools, equipment, bypass pumps, standby generators, and incidentals shown, specified and required to coordinate with County's operations during the Work.

1.02 COORDINATION

- A. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.
- B. All contacts, requests, changes, communications, and coordination with the County shall be initiated through the County's Resident Project Representative (R.P.R). Any other communication or request that is not initiated through the RPR will be null and void. The RPR will decide if a Construction Assistance Request (C.A.R) is needed. All training, spare parts distribution, and other activities described elsewhere shall always require a C.A.R. with seven (7) days notice.

- 1.03 Except for shutdowns specified, perform the Work such that County's facility remains in continuous, permit compliant operation during the Project. Schedule and conduct the Work such that the Work does not impede County's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.

- 1.04 Contractor has the option of providing additional temporary facilities, including temporary bypass pumping that can eliminate or mitigate a constraint without additional cost to County, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect County's ability to comply with Laws and Regulations, permits, and operating requirements; and that requirements of the Contract Documents are fulfilled.
- 1.05 Coordinate shutdowns with County designated RPR and Engineer. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on County's operations and processes.
- 1.06 Do not shut off or disconnect existing operating systems. Operation of existing equipment will be by County unless otherwise specified or indicated. Where necessary for the Work, Contractor shall seal or bulkhead County-operated gates and valves to prevent leakage that may affect the Work, County's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of the County.
- 1.07 SUBMITTALS
- A. Action Submittals: Submit the following:
1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that County's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule.
- B. Informational Submittals: Submit the following:
1. Shutdown Planning Submittal:
 - a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for County to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown. Also include a back-up plan that can be implemented within 8 hours if the work is not completed in the stated time.

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

1.08 GENERAL CONSTRAINTS

- A. Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for County's equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by County after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.
- B. The following constraints apply to coordination with County's operations:
 - 1. Operational Access: County's personnel shall have access to equipment and areas.
 - 2. Temporary Partitions and Enclosures: Contractor shall provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas that are adjacent to the Work and that must be kept operational.
 - 3. Schedule and perform equipment and system start-ups and shutdowns for Monday through Thursday. Equipment and systems shall not be placed into operation or shutdown on Friday, Saturday, and Sunday without prior approval of County.
 - 4. Dead End Valves or Pipe: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of pipes and conduits, unless otherwise noted. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by Engineer. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with drain/flushing connection consisting of a 1-inch tap with corp for every 12 inches in pipe diameter.

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PIPE LOCATIONS

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

3.02 OPEN EXCAVATIONS

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

3.03 TEST PITS

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

3.04 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.

3.05 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from damage in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at no additional expense to the Owner.
- B. Protect all structures in a suitable manner to prevent damage. Should any part of a structure become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If, in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the Contract.
- C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

3.06 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street is received in writing from the proper authority (County, City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.
- B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the Contractor shall expedite construction operations and periods when traffic is being detoured will be strictly controlled by the Owner. All maintenance of traffic plans required for construction shall be approved by the local governmental entity having jurisdiction.
- C. The Contractor shall take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

3.07 PRIVATE LAND

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

3.08 SITE ACCESS

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

3.09 COOPERATION WITHIN THIS CONTRACT

- A. The Contractor shall, at least 7 days prior to interrupting a utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the Owner and make arrangements for the interruption, which will be satisfactory to the Owner.
- B. The Contractor shall plan his work to minimize interference with the operation of the existing water treatment facilities. The Contractor shall coordinate with and provide at least 7 days notice to the Owner prior to any required shutdown or interruption of the operation of any portion of the existing water treatment plant and shall plan his work to minimize interruptions of service.

3.10 COOPERATION WITH OTHER CONTRACTS

- A. This Contract will require a portion of the work to be connected to work done under other contract(s). It will be necessary for the Contractor to plan his work and cooperate with other contractors insofar as possible to prevent any interference and delay.
- B. Contractor shall coordinate and cooperate with other contractors performing work on or contiguous to the project. Owner has awarded or anticipates to award the following related contracts:

1. Western Regional WSF Phase 3B () to ():

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

3.11 TIE-INS

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

3.12 SHUT DOWNS

A. General:

1. Terminology: A "shutdown" is when a portion of the normal operation of County's facility, whether equipment, systems, piping, electrical, or conduit, has to be temporarily suspended or taken out of service to perform the Work.
2. Work that may interrupt normal operations shall be accomplished at times convenient to County.
3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to Engineer's satisfaction that Contractor has complied with these requirements before commencing the shutdown.
4. If Contractor's operations cause an unscheduled interruption of County's operations, immediately re-establish satisfactory operation for County.
5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of County's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by Contractor if, in Engineer's opinion, Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.
6. Shutdowns shall be in accordance with this Section and the example schedule. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

7. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may not be included in the example schedule. Coordinate requirements for such shutdowns with Engineer and County.
- B. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. Contractor shall lock out and tag circuit breakers and switches operated by County and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify Engineer that facilities are available for use.

END OF SECTION

OUTAGE REQUEST

CONTRACTOR: _____ Outage Request # _____

EQUIPMENT TO BE AFFECTED BY THE OUTAGE: _____

REQUESTED STARTING DATE: _____ STARTING TIME: _____

COMPLETION DATE: _____ COMPLETION TIME: _____

WORK TO BE ACCOMPLISHED: _____

EQUIPMENT REQUIRED TO BE ON HAND PRIOR TO OUTAGE:

COMMENTS: _____

REQUESTED BY: _____ APPROVED BY: _____
Contractor Date

APPROVED BY CONTRACTOR/CONSTRUCTION MANAGER: _____

OCU COMMENTS:

OCU APPROVAL: _____ DATE: _____

START OF DOWNTIME, TIME/DATE: _____

COMMENTS: _____

WORK VERIFIED BY:

(Contractor) (Date)

(OCU) (Date)

FINISH OF DOWNTIME, TIME / DATE: _____

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide and pay for field engineering service for Project.
1. Survey work required in execution of Work.
 2. Civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.
 3. The method of field staking for the construction of the Work shall be at the option of the Contractor.
 4. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.
 5. The Contractor shall be held responsible for the preservation of all stakes and marks. If any stakes or marks are carelessly or willfully disturbed by the Contractor, the Contractor shall not proceed with any work until he has established such points, marks, lines, and elevations as may be necessary for the prosecution of the Work.
 6. The Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to identify existing control points and maintain a survey during construction.
- B. Related Requirements Described Elsewhere:
1. Conditions of the Contract.
 2. Project Record Documents: Section 01720.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

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

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

1.03 SURVEY REFERENCE POINTS

- A. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to the Engineer.
 - 2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - 3. Require surveyor to replace Project control points which may be lost or destroyed at no additional cost to the Owner. Establish replacement based on original survey control.

1.04 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two (2) permanent bench marks on site, referenced to data established by survey control points.
 - 1. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 - 1. Site improvements:
 - a. Stakes for grading, fill, and topsoil replacement.
 - b. Utility slopes and invert elevations.
 - 2. Batter boards for structure.
 - 3. Building foundation, column locations, and floor levels.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- C. From time to time, verify layouts by same methods.

1.05 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. At the end of the project, submit a certified site survey at 1 inch equals 20 feet scale on reproducible tracing sheets 24 inches by 36 inches, indicating the building corners and location of all new structures and elevations of stormwater facilities, pavement areas, sidewalks, finished floors, vaults, and above grade piping.
- C. At the end of the project, submit a certified survey at the same scale as the Engineer's line drawings indicating elevations and stationing at 100-foot pipe increments and at all valve and fitting locations.

1.06 SUBMITTALS

- A. Submit name and address of surveyor and professional engineer to the Engineer.
- B. On request of the Engineer, submit documentation to verify accuracy of field engineering work.
- C. Submit certificate signed by a registered engineer or surveyor certifying that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certify as to variances from the Contract Documents.
- D. Submit drawings showing locations of all structures constructed. This drawing shall be included with the Project Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. General

1. Upon Notice of Award, obtain and pay for all appropriate and applicable permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Strictly adhere to the specific requirements of the governmental unit(s) or agency (cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.
4. A copy of the permits obtained by the County are furnished in Appendix C "Permits Obtained by County" of these specifications.
5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

B. Building Permit - Permit No. B19900002

1. The County will pay the general building permit fee and any related impact fees or assessments to be paid to Orange County for the issuance of that permit only.
2. The County will pay all fees associated with obtaining Orange County trade permits and any and all inspection fees for the Orange County Building Department providing inspections for this project in accordance with the General Conditions. The Contractor shall apply for and obtain the building permits from Orange County and schedule and obtain final approval from the building inspectors.

3. The Contractor shall obtain the Building Permits within 14 days of the Notice to Proceed. Any delays in picking up and obtaining the permit shall be the Contractor's responsibility and all costs including re-permitting or extending the permit for any portion of the project shall be paid by the Contractor of no cost to the Owner.
4. Information on Orange County Building Department fees is included in the Instructions to Bidders in Division 0.
5. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from Orange County, as required by the building and sub-discipline construction permits.

C. Construction Dewatering Permit

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 STANDARDS AND ABBREVIATIONS

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

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

- B. Abbreviations:

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

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

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

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01091

REFERENCE SPECIFICATIONS

PART 1 - GENERAL

1.01 GENERAL

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

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

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

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

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

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

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, pollution of adjacent lands, flooding of adjacent lands, or excessive noise.
- B. Sound levels measured by the contractor furnished testing service shall not exceed 50 dBA from 7 P.M. to 7 A.M. or 60 dBA 7 A.M. to 7 P.M. This sound level shall be measured at the exterior of the nearest exterior wall of the nearest residence. Levels at the equipment shall not exceed 85 dBA at any time. Sound levels in excess of these values are sufficient cause to have the Work halted until equipment sound levels are in compliance with this section. Work stoppage by the local governmental agency, Engineer, or Owner for excessive noise shall not relieve the Contractor for any delays of other portions of the contract including but not limited to the completion date. This work stoppage shall not be grounds for any claims by the Contractor.
- C. Pollution control (i.e. dust, dirt, debris, etc.) shall be based on requirements outlined in Section 02050 - Demolition to comply with governing regulations.
- D. No claim shall be made by the Contractor for time lost due to work stoppage resulting from the creation of a public nuisance by the Contractor.

1.02 HAULING AND CONSTRUCTION OPERATIONS ON PLANT PROPERTY

- A. The Contractor shall conduct access, hauling, filling, and storage operations as specified herein and as shown on the Contract Drawings.
 - 1. On-site borrow areas are designated as follows: Suitable material, as approved by Engineer, from excavations for project structures. Any additional borrow material required shall be provided by the Contractor from off-site.
 - 2. On-site spoil areas will become property of the Contractor and are to be disposed off-site.
- B. Construct all fill areas so runoff shall not flood improved areas.

1.03 EXCAVATION AROUND AND CONNECTION TO EXISTING UTILITIES

- A. It is essential that the Contractor understand that the existing water plant must be kept in operation with minimal impact and shut-downs. The Contractor shall coordinate and consult with the Owner's plant operating personnel and the County Construction Inspector before excavating around or cutting into existing utilities on the plant site. Existing utilities of major concern are water, chemical and process pipelines, electrical power conduits and cables, instrumentation conduits and cables and drain lines.
- B. The Contractor shall take necessary steps to verify the location of all underground utilities shown prior to commencing any excavation work. Where work is to be conducted through congested utility corridors where the likelihood exists that all underground utilities may not be shown, the Contractor shall use methods such as the use of ground penetrating radar, or equal, in order to establish the locations of potential conflicts within the proposed alignment. Where potential conflicts are identified, the Contractor shall submit (within seven (7) days of discovery) to the Engineer for review, a plan for avoiding such conflict.
- C. Some areas within the water plant construction site will require hand excavation due to the congestion of underground piping systems and/or due to the criticality of piping systems that may be damaged unavoidably during machine excavation.
- D. Cover for underground piping shall not be less than that indicated on the Drawings, or a minimum of 36 inches of cover where obtainable. In areas where other piping conflicts preclude the maximum cover desired, the piping shall be laid to provide the maximum cover obtainable.
- E. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation, cooperation, and coordination with the Owner's plant management personnel. Some such connections may have to be made during off-peak hours (late night or early morning hours). The Contractor shall give a minimum of 7 days notice to the Owner when tie-ins with the existing plant utilities are required.
- F. For major utility pipeline tie-ins and relocations, the Contractor shall submit a detailed Plan of Action for review and approval by the Owner and the Engineer. No major utility relocation or tie-ins shall proceed until the Plan of Action for that Work is approved.

1.04 JURISDICTIONAL DISPUTES

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

1.05 INCLEMENT WEATHER

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

1.06 COORDINATION OF WORK

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

1.07 USE OF PUBLIC STREETS

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

1.08 CHEMICALS

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

1.09 SAFETY AND HEALTH REGULATIONS

- A. The Contractor shall comply with the Department of Labor Safety & Health Regulations for construction promulgated under the Occupational Safety & Health Act of 1970, (PL 91-596) and under Section 107 of the Contract Work Hours & Safety Standards Act (PL 91-54).

- B. All equipment furnished and installed under this Contract shall comply to Part 1910, Occupational Safety & Health Standards & Amendments thereto.
- C. The Contractor shall comply with the Florida Trench Safety Act (90-96, Florida Law).
- D. All materials, equipment, and components that come in contact with drinking water or drinking water chemicals shall be in conformance with ANSI/NSF Standard 61.
- E. All raw water and potable piping, equipment, and ground storage tanks that will contact raw water or potable water and potable water wells shall be disinfected in accordance with County, FDEP, and AWWA requirements and Specification Section 15041 prior to being put into service.

1.10 STATE AND FEDERAL PERMITS

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

1.11 INSPECTION

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

1.12 ENVIRONMENTAL PROTECTION

- A. General:
 - 1. Contractor shall comply with all Federal, State and Local laws and regulations controlling pollution of the environment. Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials

and to prevent pollution of the atmosphere from particulate and gaseous matter. In the event of conflict between such laws and regulations and the requirements of the Specifications, the more restrictive requirements shall apply. Environmental protection requirements specified in other Sections shall be considered as supplementing the requirements of this Section.

2. Failure of the Contractor to fulfill any of the requirements of this Section may result in the Owner ordering the stopping of construction operations.
 3. Failure on the part of the Contractor to perform the necessary measures to control erosion, siltation, and pollution will result in the Owner notifying the Contractor to take such measures. In the event that the Contractor fails to perform such measures within 24 hours after receipt of such notice, the Owner may stop the Work as provided above, or may proceed to have such measures performed by others. The cost of such work performed by others plus related fees by the Engineer will be deducted from monies due the Contractor on his Contract.
 4. All erosion and pollution control features installed by the Contractor shall be acceptably maintained by the Contractor during the time that construction work is being done.
 5. Repair or replace damaged or inoperative erosion and pollution control devices as directed by the Engineer or the Owner's Representative.
 6. Where there is a high potential for erosion and possible water pollution, the Contractor shall not expose, by his construction methods or procedures, an area of erosive land at any one time larger than the minimum amount required for the proper and efficient construction operation. If the exposure of any incomplete work corresponding to the exposure period required for erosion is anticipated, temporary protective measures shall be taken to prevent the erosion or collapse of land in that immediate construction area.
- B. Erosion and Pollution Control Schedule: At or prior to the preconstruction conference, the Contractor shall submit to the Owner for his information, three (3) copies of his erosion and pollution control work schedule. This schedule shall show the time relationship between phases of the Work which must be coordinated to reduce erosion and pollution, and shall describe construction practices and temporary control measures which will be used to minimize erosion and pollution. The schedule shall also show the Contractor's proposed method of erosion control on haul roads and borrow and material pits, and his plan for disposal of waste materials or other sources of pollution. Maps or other documents may also be required to show the proposed final surface gradient of

proposed borrow pits, soil type base course pits, and waste areas. No work shall be started until the erosion and pollution control schedules and methods of operations have been submitted to the Owner for his information.

C. Air Pollution Controls:

1. Contractor shall control dust caused by his operations in the construction of the Project, including but not specifically limited to the following:
 - a. Clearing, grubbing, and stripping.
 - b. Excavation and placement of embankment.
 - c. Cement and aggregate handling.
 - d. Limerock stabilization.
 - e. Use of haul roads.
 - f. Sandblasting or grinding.
2. Contractor shall control air pollution from the following causes in constructing the project:
 - a. Volatiles escaping from asphalt and cutback materials.
 - b. Use of herbicides or fertilizers.
3. Control of dust and other air pollutants by the Contractor shall include:
 - a. Exposing the minimum area of land.
 - b. Applying temporary mulch with or without seeding.
 - c. Use of water sprinkler trucks.
 - d. Use of covered haul trucks.
 - e. Use of stabilizing agents in solution.
 - f. Use dust palliatives and penetration asphalt on temporary roads.
 - g. Use of wood chips in traffic and work areas.

- h. Use of vacuum-equipped sandblasting systems.
 - i. Use of plastic sheet coverings.
 - j. Restricting the application rate of herbicides to recommended dosage. Materials shall be covered and protected from the elements. Application equipment and empty containers shall not be rinsed and discharged so as to pollute a stream, river, lake, pond, water impoundment, or the ground water.
 - k. Relay of operations until climate or wind conditions dissipate or inhibit the potential pollutants.
- D. Open Burning of Combustible Wastes: No open burning of combustible waste materials or vegetation shall be permitted. All waste materials shall be removed from the site or within public rights-of-way and disposed in a legal manner.
- E. Permanent and Temporary Water Pollution Control (Soil Erosion):
1. Sufficient precautions shall be taken during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride, or other polluting materials harmful to humans, fish, or other life, into the supplies and surface waters of the State. Control measures must be adequate to assure that turbidity in the receiving water will not be increased more than allowed by the State or controlling agency. Such measures may consist of construction of berms, dikes, dams, drains and sediment basins, or use of fiber mats, woven plastic filter cloths, gravel, mulches, quick growing grasses, sod, bituminous spray and other erosion control devices or methods approved by the State or controlling agency.
 2. The Contractor shall not be permitted frequent fording of live streams with construction equipment; therefore, temporary bridges or other structures shall be used wherever such crossings adversely affect sediment levels and an appreciable number of stream crossings are necessary.
 3. The Contractor shall promptly clear all waterways and drainage patterns of false work, piling, debris, or other obstructions placed during construction work and not a part of the finished work.
 4. The Contractor shall remove and dispose of silt accumulations as directed by the Engineer or the Owner's Representative.

5. If new and additional erosion control structures are to be installed, under this project, to prevent possible future erosion as a result of work under this contract, they shall be constructed concurrently with the other work, as early as possible, and as conditions permit.
- F. Noise Control: The Contractor shall provide adequate protection against objectionable noise levels caused by the operation of construction equipment in order to comply with all current City ordinances and these Specifications. Sound levels shall be measured at the exterior of the nearest exterior wall of the nearest residence or building. Levels at construction equipment shall not exceed 85 dBA at any time. Sound levels in excess of allowable values are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the Engineer or Owner for excessive noise shall not relieve the Contractor of the other portions of this Specification including, but not limited to completion dates and bid amounts.

1.13 TREE AND SHRUB PROTECTION AND TRIMMING

- A. Contractor shall exercise care to protect all trees and shrubs designated to remain. Trees and shrubs outside construction limits shall remain and shall be protected and where damaged, restored to original condition. Contractor shall obtain approval from the Owner prior to removing any trees. Trees damaged within construction limits due to negligence shall be restored to original condition.
- B. Tree limbs which interfere with construction operations and are approved for pruning shall be neatly cut with sharp pruning instruments; do not break or chop. All cut faces shall be coated with an approved tree pruning compound which is waterproof, antiseptic, elastic and free of kerosene, coal tar, creosote and other substances harmful to plants. Pruning operations shall be extended to restore the natural shape of the entire tree or shrub. Do not allow fires under or adjacent to trees or other plants which are to remain.
- C. Contractor shall protect tree and shrub root systems. Do not store construction materials, debris or excavated materials beyond construction limits. Do not permit vehicles or construction equipment beyond the limits of utility line construction. Restrict foot traffic to prevent excessive compaction of soil over root system. Excavated material shall be stockpiled away from tree drip lines as approved by the Engineer. Protect tree and shrub root systems from damage due to noxious materials in solution caused by run-off or spillage during construction operations, or drainage from stored materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations. Excavate within the drip line of trees only when approved by the Engineer. Where trees are designated to remain within the limits of construction and trenching for utilities is

required within tree drip lines, cut roots with sharp pruning instruments; do not break or chop. Paint roots over 2" caliper with approved tree pruning compound.

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

1.14 SITE CLEANUP AND RESTORATION

- A. The Contractor shall keep the working area free at all times of tools, materials and equipment not essential to the progress of the Work. Debris, waste materials, and rubbish shall be properly disposed of and not allowed to accumulate. If the Contractor should fail to do this, the Owner will make the necessary arrangements to affect the cleanup by others and will back charge the cost to the Contractor. If such action becomes necessary on the part of and in the opinion of the Owner, the Owner will not be responsible for the inadvertent removal of material which the Contractor would not have disposed of had he affected the required cleanup.
- B. Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as result of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the Work, and the ditches, channels, drains etc., kept in a clean and neat condition.
- C. On or before the completion of the Work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations, in a neat and satisfactory condition.
- D. The Contractor shall restore the entire project site to its original or better condition, with the exception of any area(s) designated for alteration by the Contract Documents. The Contractor shall restore or replace; when and as directed, any public or private property damaged by his work, equipment, or employees to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration.

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

1.15 LAWS AND REGULATIONS

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

1.16 CONTRACTOR'S USE OF PREMISES

- A. All project construction work will be accomplished on the Owner's property, public rights-of-way or within temporary construction easements and the Contractor shall confine his activity to those designated areas. The Contractor shall not enter upon private property for any reason without securing prior permission from the property owner. Such permission, including any stipulations, shall be in writing and a copy shall be delivered to the Engineer prior to the Contractor's entry or occupation of the subject property. This requirement will be rigidly enforced, particularly with regard to the utilization of vacant areas adjacent to the work site for the storage of materials or parking equipment.
- B. The Contractor shall perform his work in such manner that he will not damage adjacent public or private property. Any damage to existing physical structures or utility services shall be repaired or restored promptly at no expense to the Owner.
- C. The Contractor shall avoid damage to and preserve all existing vegetation (grass, shrubs, trees, etc.) on or near the work area which do not, within reason, interfere with construction. The Contractor will be responsible for and required to replace or restore all such vegetation damaged or destroyed at no cost to the Owner. The Contractor will also be responsible for any unauthorized cutting or damage to trees, shrubs, etc., and also damage caused by careless operation of equipment, storage of materials and rutting or tracking of grass by equipment.
- D. The Contractor shall conduct access, hauling, filling, and storage operations as specified herein and as shown on the Contract Drawings.

1. On-site borrow areas are designated as follows: Suitable material, as approved by Engineer, from excavations for project structures. Any additional borrow material required shall be provided by the Contractor from off-site.
 2. On-site spoil areas will become property of the Contractor and are to be disposed off-site.
- E. Construct all fill areas so runoff will not flood improved areas.
- F. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation, cooperation, and coordination with the Owner. Some such connections may have to be made during off-peak hours (late night or early morning hours). The Contractor shall give a minimum of 7 days notice to the Owner when tie-ins with the existing plant utilities are required.
- G. For major utility pipeline tie-ins and relocations, the Contractor shall submit a detailed Plan of Action for review and approval by the Owner and the Engineer. No major utility relocation or tie-ins shall proceed until the Plan of Action for that Work is approved.

1.17 HAZARDOUS LOCATIONS

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

1.18 ADDITIONAL PROVISIONS, PROJECT SEQUENCE

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01152

APPLICATIONS FOR PAYMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Submit applications for payment in accordance with schedule established by the General Conditions and the Agreement between Owner and Contractor.
- B. Related Requirements Described Elsewhere:
 - 1. Agreement between Owner and Contractor.
 - 2. Progress Payments, Retainages and Final Payment: General Conditions of the Contract.
 - 3. Measurement and Payment: Section 01025.
 - 4. Contract Closeout: Section 01700.

1.02 FORMAT AND DATA REQUIRED

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

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Forms:
 - 1. On Orange County's form (8-1/2" x 11") fill in required information, including that for Change Orders executed prior to date of submittal of application.
 - 2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
 - 3. Execute certification with signature of a responsible officer of Contract firm.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.
2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
3. List each Change Order executed to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item of work.

C. Certification and Consent of Surety:

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

D. Monthly As-Builts

1. Contractor shall submit current, up-to-date as-builts including coordinate asset table with each monthly payment application.
2. Monthly payment application will not be processed without monthly as-built submittal approved by County Resident Project Representative.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. To receive approval for payment on component material stored on site, submit copies of the original invoices with the application for payment. Provide a log sheet for all stored materials, which identifies the type, quantity and value of all stored materials
- B. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
 - 1. Project.
 - 2. Application number and date.
 - 3. Detailed list of enclosures.
 - 4. For stored products:
 - a. Item number and identification as shown on application.
 - b. Description of specific material.
 - c. Proof that stored products paid for on previous estimates have been paid for by Contractor.
 - 5. Contractor shall provide monthly photos, aerial photos, draw schedules and progress schedules.
- C. Submit one copy of data and cover letter for each copy of application.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments.
 - 1. Project Record Documents: To requirements of Section 01720.
 - 2. Warranties and Bonds: To requirements of Section 01740.
 - 3. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
 - 4. Certificate of Insurance for Products and Completed Operations.
 - 5. Contract Closeout: To requirements of Section 01700.

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

1.06 SUBMITTAL PROCEDURE

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall cooperate and coordinate with the Engineer to schedule and administer the preconstruction meeting, periodic progress meetings, and specifically called meetings throughout the progress of the Work. The Contractor shall:
 - a. Prepare agenda for meetings.
 - b. Make physical arrangements for meetings.
2. Representatives of Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
3. The Owner will attend meetings to ascertain that the Work is expedited consistent with Contract Documents and construction schedules.
4. The Contractor shall record the preconstruction meeting and each progress meeting in its entirety, and shall provide the Engineer with a CD of such recording, having good quality and clarity, and a typed transcript of the minutes of the meeting in a format approved by Owner.

B. Related Requirements Described Elsewhere:

1. Construction Progress Schedules: Section 01310.
2. Shop Drawings, Working Drawings, and Samples: Section 01340.
3. Project Record Documents: Section 01720.

1.02 PRECONSTRUCTION MEETING

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

- B. Location: A local site, convenient for all parties, designated by the Engineer.
- C. Attendance:
 - 1. Owner's representative.
 - 2. Engineer and his professional consultants.
 - 3. Resident project representative.
 - 4. Contractor and his superintendent.
 - 5. Major subcontractors.
 - 6. Representatives of major suppliers and manufacturers as appropriate.
 - 7. Governmental and Utilities representatives as appropriate.
 - 8. Others as requested by the Contractor, Owner, and Engineer.
- D. The Engineer shall preside at the preconstruction meeting. The purpose of the preconstruction meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.
- E. The suggested agenda for the preconstruction meeting will include but not be limited to the following:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected schedules.
 - c. Schedule of Values.
 - 2. Critical work sequencing: Relationships and coordination with other contracts and/or work and continuing water treatment plant operation.
 - 3. Major equipment deliveries and priorities.
 - 4. Project coordination: Designation and responsible personnel.

5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Request for Information.
 - d. Submittals.
 - d. Change Orders.
 - f. Applications for Payment.
6. Submittal of Shop Drawings, project data and samples.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents
9. Use of premises:
 - a. Office, work, and storage areas.
 - b. Owner's requirements.
 - c. Access and traffic control.
10. Construction facilities, controls, and construction aids.
11. Temporary utilities.
12. Safety and first aid procedures.
13. Check of required Bond and Insurance certifications.
14. Completion time for contract and liquidated damages.
15. Request for extension of Contract Time.
16. Procedures for periodic monthly (or whatever interval is deemed appropriate or necessary, however, a minimum of monthly meetings will be required) progress meetings, for all involved.
17. Security procedures.

18. Procedures for making partial payments.
19. Guarantees on completed work.
20. Equipment to be used.
21. Project layout and staking of work.
22. Project inspection.
23. Labor requirements.
24. Laboratory testing of material requirements.
25. Provisions for material stored on site and monthly inventory of materials stored.
26. Requirements of other organizations such as utilities, railroads, highway departments, building departments.
27. Rights-of-way and easements.
28. Housekeeping procedures.
29. Posting of signs and installation of Project Sign.
30. Pay request submittal dates.
31. Equal opportunity requirements.

1.03 PROGRESS MEETINGS

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

- D. Attendance:
1. Engineer and his professional Subconsultants as needed.
 2. Resident Project Representative.
 3. Contractor and his Superintendent.
 4. Owner's representatives.
 5. Subcontractors (active on the site, as appropriate to the agenda).
 6. Others as appropriate to the agenda (suppliers, manufacturers, other subcontractors, etc.).
- E. The Engineer shall preside at the meetings. The purpose of the meetings will be to review the progress of the Work.
- F. The suggested agenda for the progress meetings will include but not be limited to the following:
1. Review approval of minutes of previous meeting.
 2. Review of labor and construction equipment.
 3. Review of work progress since previous meeting.
 4. Review of work scheduled (4-week look ahead schedule).
 5. Schedule update.
 6. Field observations, problems, conflicts.
 7. Review of pay applications.
 8. Review of off-site fabrication, delivery schedules.
 9. Corrective measures and procedures to regain projected schedule.
 10. Request for information.
 11. Maintenance of quality standards.
 12. Change proposals.

13. Review of submittals/shop drawings.
 14. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date.
 - b. Effect on other contracts of the Project.
 15. Critical/long lead items.
 16. Punch list.
 17. Other business/general discussion.
 18. Adjournment.
- G. The Contractor is to attend progress meetings and is to study previous meeting minutes and current agenda items, and be prepared to discuss pertinent topics and provide specific information including but not limited to:
1. Status of all submittals and what specifically is being done to expedite them.
 2. Status of all activities behind schedule and what specifically will be done to regain the schedule.
 3. Status of all material deliveries, latest contact with equipment manufacturers, and specific actions taken to expedite materials.
 4. Status of open deficiencies and what is being done to correct the same.
- H. The Contractor is to provide a current submittal log at each progress meeting in accordance with Section 01340: Shop Drawings, Working Drawings, and Samples.

PART 2- PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES

PART 1- GENERAL

1.01 REQUIREMENT

- A. The Contractor will submit cost-loaded Critical Path Method (CPM) Progress Schedules to the Project Manager depicting the approach to prosecution and completion of the Work. This requirement includes, but is not limited to the Contractor's approach to Activity cost-loading, recovering schedule and managing the effect of changes, substitutions and Delays on Work sequencing.
- B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work (or Work remaining) conform to the Contract requirements and the sequences of Work indicated in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may affect cost, progress, schedule, furnishing and performance of the Work; and show how the Contractor's Means and Methods translate into Activities and logic.
- C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision Submittals. Upon acceptance by the Project Manager, the Initial submittal will become the As-Planned Schedule for the Work. Revision submittals upon acceptance will become the As-Planned Schedule for the Work remaining to be completed as of the submittal date for that Revision.
- D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.
- E. No work shall begin prior to Owner and Engineer acceptance of the schedule.

1.02 GLOSSARY OF TERMS

- A. The following terms, whether or not already defined elsewhere in the Contract Documents, have the following intent and meanings within this Section:
 - 1. Activity Value (Value) – That portion of the Contract Price representing an appropriate level of payment for the part of the Work designated by the Activity.
 - 2. As-Planned Schedule – The first, complete Initial Progress Schedule submitted by the Contractor with the intent to depict the entire Work as

- awarded and accepted by the Project Manager or returned as no resubmittal required.
3. Contract Float – Days between the Contractors anticipated date for completion of the Work, or of a specified portion of the Work, if any, and the corresponding Contract Time.
 4. CPM Schedule – The Progress Schedule based on the Critical Path Method (CPM) of scheduling. The term Critical Path means any continuous sequence of Activities in the Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent, specified Contract Time.
 5. Early/Late Dates – Early/late times of performance, based on CPM calculations, for an Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part of the Work on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work on the corresponding Contract Time, even if the Contractor plans early completion.
 6. Milestones – Key, pre-determined points of progress in the completion of a facility, denoting interim targets in support of the Contract Times. Milestones may pinpoint targets for key excavation and substructure events, significant deliveries, critical path transition from superstructure to piping and electrical rough-in and building enclosure. Also, hook-up of mechanical and electrical equipment, availability of power for testing, equipment shakedown, training of County personnel, start-up, Substantial Completion and other events of like import.
 7. Official Schedule – The Initial or most recent Revision Submittal accepted by the Project Manager or returned as no resubmittal required and the basis for Payment Submittals until another Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-Planned Schedule.
 8. Payment Submittal – A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.
 9. Total Float – Days by which an activity may slip from its Early Dates without necessarily extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float may also be calculated and reported in working Days. When an activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will impact a Contract Time.

1.03 QUALITY ASSURANCE

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

- B. The Contractor will obtain a written interpretation from the Project Manager, if the Contractor believes that the selection of activities, logic ties and/or restraints requires a written interpretation of the Contract Documents. With each submission, the Contractor will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.
- C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints.
- D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the obligation to comply with the Contract Times and any sequence of Work indicated in or required by the Contract Documents and to complete, within the Contract Times, any Work omitted from that Progress Schedule.
- E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any interpretation of or variation from the Contract Documents, unless expressly approved by the Project Manager through a written interpretation or by a separate, written notation on the returned Progress Schedule Submittal.

1.04 ALLOWANCES

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

1.05 "OR EQUALS" AND SUBSTITUTIONS

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

1.06 MILESTONES AND SCHEDULE RECOVERY

- A. The Project Manager will select Milestones and Milestone Dates on the basis of the As-Planned Schedule. As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone Dates will serve as target dates.
- B. Whenever any Activity slips by fourteen (14) or more Days from the Late Date for an activity in the Official Schedule, Milestone Dates selected by the Project Manger, or a pertinent Contract Time, the Contractor will deliver a Revision Submittal

documenting the Contractor's schedule recovery plan and/or a properly supported request for an extension in the Contract Time. The narrative will identify the Delay and actions taken by the Contractor to recover schedule, whether by adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).

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

1.07 PROGRESS SCHEDULE SOFTWARE

- A. The scheduling software employed by the Contractor to process the Progress Schedule will be the current version of Oracle's Primavera P6 Professional Project Management, or Oracle's Primavera Contractor CPM scheduling software.
- B. If the Contractor intends to use companion schedule reporting, analysis or graphics software tools, the Contractor will furnish to the Project Manager descriptive materials and samples describing such software tools.

1.08 NON-PERFORMANCE

- A. The Project Manager may refuse to recommend all or any part of any payment, if the Contractor fails, refuses or neglects to provide the required Progress Schedule information on a timely basis. Partial payments without a properly updated Progress Schedule shall be returned to the Contractor as non-conforming.
- B. If justified under the circumstances, the County also may prepare alternate progress schedules, as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or take other action commensurate with the breach.

1.09 REPORTS, SCHEDULES AND PLOTS

- A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float.
 - 1. For Precedence Diagram Method, separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying vertical logic ties are appended or not.

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

For Payment and Revision Submittals plot a target comparison based on the current Official Schedule.

- C. The Activity Value report will tabulate Activity code and description and Activity Value, percent complete and earned value as calculated by the scheduling software. Cash flow plots shall be provided showing the monthly and cumulative actual and planned earned values with curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule submittals, the cash flow curves shall also plot the most current Official Schedule planned earnings curves.
- D. Each submittal shall include listings of all added and deleted activities, logic, constraints, Activity Value changes and update information vs. the previous Progress Schedule submittal. This list may be manually prepared or generated by accessory software that will generate such listings.

1.10 NARRATIVE REQUIREMENTS

- A. The Initial Submittal narrative will describe the Contractor's approach to prosecution of the Work and the basis for determination of activity durations, sequence and logic, including the Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor's phasing of the Work; use of crewing and construction equipment; identification of non-work Project Managers, shifts, weekend Work and multiple calendars applied to activities and an explanation of the basis for restraint dates
- B. Revision and Payment Submittal narratives will explain any changes to the approach or planning referred to in Paragraph A above on account of any change, delay, schedule recovery, substitution and/or Contractor-initiated revision occurring since the previous submittal.
- C. Each narrative will list the Critical Path Activities and compare Early and Late Dates against Contract Times and Milestone Dates. Narratives shall also recap progress and Days gained or lost vs. the current Official Schedule, and identify delays, their extent and causes.
- D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all pending and anticipated "or equal" and substitution proposals. Payment and Revision Submittals narratives will describe any new delays and shall certify that the Contractor has not been delayed, as of the cut-off date, by any acts or omissions of the County or Project Manager, except as otherwise specifically stated.

1.11 ACTIVITY REQUIREMENTS

- A. Separate activities will identify permits, design when included in the Work, construction, Submittal preparation and review (and resubmission and re-review), deliveries (site or storage), testing, start-up, commissioning and Punch List. Separate Activities will be used for County-furnished equipment, interfaces with other work and other responsibilities of the County, Project Manager and Professional.
- B. Activities will be detailed to the extent required to show the transition of trade Work. Activities will delineate the progression of the Work through mass excavation, substructure, superstructure, equipment installation, start of piping and conduit rough-in, building enclosure, mechanical and electrical equipment hook-up phase, building mechanical, electrical and plumbing (MEP), interior finishes, training of County personnel, equipment checkout & testing and start-up.
- C. Submittal Activities will segregate long-lead items, any item requiring structural access and other procurements that, in the Contractor's judgment, may bear on the rate of progress. If the Contract Documents require MEP coordination drawings, separate MEP coordination drawing Activities will be used for each floor. Allow time for reviews per Section 01300 and the General Conditions, and revisions and re-submittals. Also include activities for or provide a separate tabular schedule of submittal dates for all shop drawings, product data, and samples including County furnished products and the dates reviewed submittals will be required from the Project Manager. Indicate decision dates for selection of finishes.
- D. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work, Work in separate structures and Work in distinct areas, locations or floors within an area or structure; or rough-in and finish Work.
- E. Activity durations will equal the work Days required to sufficiently complete the Work designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity is not quite 100% complete). Installation Activities will last from ten (10) to forty (40) workdays. Submittal review activity durations shall conform to specified timeframes.
- F. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by building or structure, floor or area, Change Order and other meaningful schemes.
- G. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the Contract Amount to the time periods that they will be earned and eligible for payment based on the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify cost-loading of the Progress Schedule.

When used, pay activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots.

1.12 FLOAT TOLERANCES AND FLOAT OWNERSHIP

- A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative twenty (20) Days of Float will be returned as “Revise and Resubmit,” unless a time extension is requested or the County assesses liquidated damages or gives notice of intent to do so, in the event schedule is not recovered.
- B. Float calculated from the definitions given in this Section, supersede any conflicting Float values in any early completion Progress Schedule.
- C. Neither the County nor the Contractor own the Float time, the Project owns the Float time. Neither the County nor the Contractor use of positive Total Float will impact a Contract Completion Date or justify an extension of Contract Time.

1.13 SUBMITTALS

- A. Each Progress Schedule Submittal will consist of an electronic disk with the Contractor's files, a narrative and five (5) copies of the required reports and plots.
- B. The Project Manager will review Progress Schedule Submittals and return a review copy within 14 Days after receipt and the Contractor shall, if required, resubmit within 7 Days after return of the review copy.
- C. Requirements for a Preliminary Submittal:
 - 1. Within twenty (20) Days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the Project Manager a Preliminary Submittal of the Progress Schedule for the Work. The Preliminary Submittal will show the Work as awarded, without delays, Change Orders or substitutions. The Preliminary Submittal shall be in CPM format and show general work planning and sequencing for the entire Contract Time and detailed planning for the first 90 days after Notice to Proceed.
 - 2. No cost or resource loading of activities is required for the Preliminary Submittal. The Project Manager may issue comments on the Preliminary Submittal. A narrative should be included if needed to clarify planning and sequencing represented in the Preliminary Submittal.

Any comments issued should be considered and incorporated as appropriate in the development of the full Progress Schedule Initial Submittal.

D. Requirements for the Initial Submittal:

1. Within twenty (20) Days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the Project Manager the Initial Submittal of the Progress Schedule for the Work. The Initial Submittal will show the Work as awarded, without delays, Change Orders or substitutions.
 - a. Activity Values will prorate Schedule of Values costs and/or pay items through to Activities. Provide a cross-reference listing with two parts; a part that will list each activity with the respective amounts allocated from each Schedule of Values and Unit Price Item making up the total value of each activity and a second part that will list the Schedule of Values and Unit Price Items with the respective amounts allocated from each activity that make up the total value of each item.
2. After the As-Planned Schedule is established, the Project Manager will select Milestones and record the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.
3. If the Project Manager refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the Contractor will continue to submit Payment and Revision Submittals reflecting progress and the Contractor's approach to remaining Work. The Project Manager will rely on the available Payment and Revision Submittals, subject to whatever adjustments it determines appropriate.

E. Requirements for Payment Submittals:

1. Payment Submittals with progress up to the closing date and updated Early Dates and Late Dates for progress and remaining Activities will be due with each Progress Payment. As-built data will consist of actual dates, percent complete, earned payment, changes, Delays and other significant events occurring before the closing date.
2. Activity percent complete and earned value should indicate a level of completion that corresponds to the Application for Progress Payment for the same period. The earned value should be calculated by the scheduling software as Activity Value times percent complete. Explanation should be provided whenever the cumulative earned value of activities in a Payment

Submittal is not within 10% of the value of work completed as represented in the corresponding Application for Progress for Payment.

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

F. Requirements for revision Submittals:

1. Revision Submittals will be submitted when necessary because of major changes or delays affecting activities, sequencing or restraints for Work remaining and/or to put forth a schedule recovery plan. Revision Submittals may also be required because of Contractor-initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence that will require additional testing or inspection personnel, or when requested by the Project Manger when Work is performed out-of-sequence from the current Official Schedule such that the number of Days gained or lost can not be determined or the scheduled dates of completion of the Work in a Payment Submittal are not viewed as reliable.
2. If requesting a time extension, the Revision Submittal should show the impact of the delay after incorporating reasonable mitigation to minimize the impact and illustrate how the number of Days requested time extension was determined. The delay should be determined as the change in the forecast Contract Completion Date(s) resulting solely from delays that entitle the Contractor to a time extension as provided in the General Conditions. Any and all Contractor slippage and delay occurring prior to and concurrent with the delay potentially entitling the Contractor to a time extension shall be incorporated in the Revision and explained such that the concurrent and non-concurrent periods of delay are indicated. If the Contractor does not follow the procedures contained in this Section or, if the Contractor's analysis is not verifiable by an independent, objective evaluation by the Project Manager using the electronic files and data furnished by the Contractor, any such extension in Contract Time will not be granted.

G. Retrospective Delay Analysis.

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

For each Progress Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will be correlated to Delays occurring solely in that iteration.

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

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and approval, such Shop Drawings, Test Reports, and Product Data on materials and equipment (hereinafter in this Section called Data), and material samples (hereinafter in this Section called Samples) as are required for the proper control of work, including but not limited to those Shop Drawings, Data, and Samples for materials and equipment specified elsewhere in the Specifications and in the Drawings.
2. Within fourteen (14) calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete list of preliminary data on items for which Shop Drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way expressed or implied relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Contract Documents. This procedure is required in order to expedite final review of Shop Drawings.
3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:
 - a. Submittal description and number assigned.
 - b. Date to Engineer.
 - c. Date returned to Contractor (from Engineer).
 - d. Status of submittal (Approved, Approved as Noted, Amend and Resubmit, and Rejected).
 - e. Date of resubmittal and return (as applicable).

- f. Date material release (for fabrication).
- g. Projected date of fabrication.
- h. Projected date of delivery to site.
- i. Status of O&M manuals submittal.
- j. Specification Section.
- k. Drawings sheet number.

B. Related Requirements Described Elsewhere:

- 1. Construction Progress Schedules: Section 01310.
- 2. Material and Equipment: Section 01600.
- 3. Project Record Documents: Section 01720.
- 4. Operating and Maintenance Data: Section 01730.

1.02 CONTRACTOR'S RESPONSIBILITY

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

B. Determine and verify:

- 1. Field measurements.
- 2. Field construction criteria
- 3. Catalog numbers and similar data.

4. Conformance with Specifications.
- C. The Contractor shall furnish the Engineer a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning and ending of manufacture, testing, and installation of materials, supplies, and equipment. This schedule shall indicate those that are critical to the progress schedule.
- D. The Contractor shall not begin any of the work covered by a Shop Drawing, Data, or a Sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.
- E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.
- F. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:
1. Date.
 2. Project Title and Number.
 3. Contractor's name and address.
 4. The number of each Shop Drawings, Project Data, and Sample submitted.
 5. Notification of Deviations from Contract Documents.
 - a. The Contractor shall indicate in **bold type** at the top of the cover sheet of submittal of shop drawing if there is a deviation from the Drawings, Specifications, or referenced specifications or codes.
 - b. The Contractor shall also list any deviations from the Drawings, Specifications, or referenced specifications or codes and identify in green ink prominently on the applicable Shop Drawings.
 6. Submittal Log Number conforming to Specification Section Number.
- G. The Contractor shall submit five (5) copies of descriptive or product data information and Shop Drawings to the Engineer plus the number of copies which the Contractor requires returned in addition to electronic copies.

- H. No work shall be performed until the completion of the review and approval by the Engineer of the associated Shop Drawing.
- I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposes to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of the Drawings and Specifications.
- J. The Contractor shall not use Shop Drawings as a means of proposing alternate items to demonstrate compliance with the Drawings and Specifications.
- K. Each submittal will bear a stamp indicating that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. The Contractor stamp shall be similar to the sample given below.

| | |
|--|---|
| (OWNER'S NAME) | |
| (PROJECT NAME) | |
| (PROJECT NUMBER) | |
| SHOP DRAWING NO.: _____ | |
| SPECIFICATION SECTION: _____ | DRAWING NO. _____ |
| <p>WITH RESPECT TO THIS SHOP DRAWING OR SAMPLE, I HAVE DETERMINED AND VERIFIED ALL QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE CRITERIA, INSTALLATION REQUIREMENTS, MATERIALS, CATALOG NUMBER, AND SIMILAR DATA WITH RESPECT THERETO AND REVIEWED OR COORDINATED THIS SHOP DRAWING OR SAMPLE WITH OTHER SHOP DRAWINGS AND SAMPLES AND WITH THE REQUIREMENTS OF THE WORK AND THE CONTRACT DOCUMENTS.</p> | |
| _____ | NO VARIATION FROM CONTRACT DOCUMENTS |
| _____ | VARIATION FROM CONTRACT DOCUMENTS AS SHOWN |
| (CONTRACTOR'S NAME) | |
| (CONTRACTOR'S ADDRESS) | |
| BY: _____ | DATE: _____ |
| AUTHORIZED SIGNATURE | |

NOTE: NOT TO SCALE

- L. Drawings and schedules shall be checked and coordinated with the work of all trades and sub-contractors involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such

checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

- A. The Engineer's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conforms to the information in the Contract Documents and is compatible with the design concept. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
 - 1. As permitting any departure from the Contract Documents.
 - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials.
 - 3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or contract time, the Engineer may return the reviewed drawings without noting an exception.
- D. "Approved As Noted" - Contractor shall incorporate Engineer's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the Engineer acknowledging the comments and their incorporation into the Shop Drawing.
- E. "Amend And Resubmit" - Contractor shall resubmit the Shop Drawing to the Engineer. The resubmittal shall incorporate the Engineer's comments highlighted on the Shop Drawing.
- F. "Rejected" - Contractor shall correct, revise and resubmit Shop Drawing for review by Engineer.
- G. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by

the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

- H. If the Contractor considers any correction indicated on the drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.
- I. When the Shop Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:
 - 1. Systems.
 - 2. Processes.
 - 3. As indicated in specific Specifications Sections.

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

- K. Only the Engineer shall utilize the color "red" in marking Shop Drawing submittals.
- L. Shop drawing and submittal data shall be reviewed by the Engineer for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor and the Contractor shall reimburse the Owner for services rendered by the Engineer as specified in the Supplementary Conditions.
- M. Submittals for sequencing, shutdowns, start-ups and demolition plans or any plan required for interfacing with existing facilities shall include a step by step, detailed plan. Generalized descriptions will not be accepted.

1.04 SHOP DRAWINGS

- A. When used in the Contract Documents, the term "Shop Drawing" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project.
Shop Drawings shall be complete and detailed and shall consist of fabrication, erection, setting and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Catalogs cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive information to required Shop Drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.
- B. Manufacturer's catalog sheets, brochures, diagrams, illustrations, and other standard descriptive data shall be clearly marked to identify pertinent materials, products, or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. Each Shop Drawing shall be submitted with an 8-1/2" by 11" cover sheet which shall include a title block for the submittal. Each Shop Drawing cover sheet shall have a blank area 3-1/2 inches high by 4-1/2 inches wide, located adjacent to the title block. The title block/cover sheet shall display the following:
1. Project Title and Number.
 2. Name of project building or structure.
 3. Number and title of the Shop Drawing.
 4. Date of Shop Drawing or revision.
 5. Name of Contractor and subcontractor submitting drawing.
 6. Supplier/manufacturer.
 7. Separate detailer when pertinent.
 8. Specification title and Section number.
 9. Applicable Drawing number.

- D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, catalog cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction, and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish, and all other pertinent Data.
- E. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address, and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.
- F. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.
- G. All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least two (2) years unless specified otherwise in the Specification Section applicable.

1.05 WORKING DRAWINGS

- A. When used in the Contract Documents, the term "Working Drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework for underpinning, and for such other work as may be required for construction but does not become an integral part of the Project.
- B. Copies of working drawings as noted in paragraph 1.05 A. above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for the Work.
- C. Working Drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida, and shall convey, or be

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

1.06 SAMPLES

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

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

- D. The Contractor shall prepare a transmittal letter and a description sheet for each shipment of samples. The description sheet shall contain the information required in Paragraphs 1.06B and C above. He shall enclose a copy of the letter and description sheet with the shipment and send a copy of the letter and description sheet to the Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1- GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work, at the Pre-Construction Conference, and as otherwise specified or requested to be submitted earlier as evidence of the Apparent Low Bidder's qualifications.
2. Upon request of the Engineer support the values with data which will substantiate their correctness. The data shall include, but not be limited to quantity of materials, all sub-elements of the activity, and their units of measure.

1.02 SUBMITTALS

- A. Submit three copies of a Preliminary Schedule of Values within fifteen (15) days after the recommended award of the Contract.
- B. Submit three copies of a proposed final detailed Schedule of Values within twenty (20) days after receipt of Notice to Proceed as per the General Conditions.
- C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by Project Manager. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.
- D. List installed value of each major item of work and each subcontracted item of work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- E. Coordinate listings with the Progress Schedule.
- F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid.

- G. The sum of values listed shall equal the total Contract Amount for the Work or the Contract Amount for a part of the Work with a separate Contract Amount provided for by the Contract Documents.
- H. When the Project Manager requires substantiating information, submit data justifying line item amounts in question.

1.03 DEFINITION

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

1.04 REQUIREMENT

- A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Project Manager. Progress payments on account of Unit Price Work will be based on the number of units completed.
- B. No payment will be made for work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the Project Manager.
- C. The equitable value of work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.05 PRELIMINARY SCHEDULE OF VALUES

- A. The preliminary schedule of values listing shall include, at a minimum, the proposed value for the following major work;
- B. Mobilization, General Requirements and Demobilization as per the specified percentage of Contract Amount.
- C. The total value of access road construction inclusive of clearing and grubbing, stripping, excavation, fill construction, paving, road removal, site restoration, and all incidental work associated with access roads. This total value shall be broken down into separate values for each access road.
- D. The total value of pipeline construction work inclusive of fabrication, excavation, pipe installation, pipe structures (air-release valves, blowoff valves, and vents), backfilling, testing, site restoration, and all incidental work associated with pipeline construction. The total value shall be broken down into separate values for each pipeline section.

- E. The total value of reinforced concrete and building construction work by structure and building inclusive of all excavation, dewatering, subgrade preparation, backfill, and incidental work for all new structures. Additionally, this total value shall be broken down into separate values for each new structure constructed as a part of the work. Miscellaneous and minor concrete work may be listed as one item in this breakdown.
- F. The total value of all mechanical work (HVAC and plumbing), including piping, valves, and equipment.
- G. The total value of process piping, valves, and mechanical equipment (such as pumps).
- H. The total value of electrical work.
- I. The total value of instrumentation and control work including fiber-optic cable system.
- J. The total value of all other work not specifically included in the above items.
- K. The Contractor and County Project Manager shall meet and jointly review the preliminary schedule of values and make any adjustments in value allocations if, in the opinion of the Project Manager, these are necessary to establish fair and reasonable allocation of values for the major work components. Front-end loading will not be permitted. The Project Manager may require reallocation of major work components from items in the above listing if, in the opinion of the Project Manager, such reallocation is necessary. This review and any necessary revisions shall be completed within 15 days from the date of the notification of the required reallocation.

1.06 DETAILED SCHEDULE OF VALUES

- A. Base the detailed schedule of values on the accepted preliminary schedule of values for major work components. Because the ultimate requirement is to develop a detailed schedule of values sufficient to determine appropriate monthly progress payment amounts verifiable by cost loaded of Progress Schedule activities, provide sufficient detailed breakdown to meet this requirement. The County shall be the sole judge of acceptable numbers, details, and description of values established. If, in the opinion of the County, a greater number of schedule of values items than proposed by the Contractor is necessary, the Contractor shall add the additional items so identified by the County as a condition to processing the payment requests.
- B. The minimum detail of breakdown of the major work components is indicated below.
- C. Mobilization/General Requirements/Demobilization. Mobilization/General Requirement/ Demobilization costs on the Schedule of Values shall not exceed 5% of the Contract Amount. All Work included in the Schedule of Value that falls under this heading as described in this paragraph (including such Work by Subcontractors) will be added and checked for compliance with the 5% limitation. Any actual cost in

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

- D. Access road and site construction shall be broken down by clearing and grubbing, stripping, excavation, full construction, erosion control, paving, paving removal, site restoration, and any other items determined to be necessary for the establishment of pay and schedule activity items.
- E. Pipeline construction work shall be broken down separately by pipeline segment, which shall not exceed 500-foot-long sections of the pipeline. Each pipeline segment shall be broken down into excavation, pipe fabrication (by wall thickness), pipe installation, pipe structures (air-release valves, blowoff valves, and vents), backfilling, testing, site restoration, and any other items determined to be necessary for the establishment of pay and schedule activity items.
- F. Concrete structures and buildings shall be broken down by structure into excavation, subgrade preparation, and appurtenant prefoundation work; concrete foundation construction; slabs on grade; walls/columns; roof structures and roofing, doors and windows, lifting and other equipment; interior and exterior finishes; miscellaneous metalwork; and backfill.
- G. Mechanical (HVAC and plumbing) Work shall be broken down by building and to identify individual piping and ductwork and equipment installation and equipment testing.
- H. Process piping, valves, and equipment Work shall be broken down by structure into individual piping systems, equipment installation by equipment (including valves, actuators, etc.), name and number, and equipment testing and checkout.
- I. Electrical Work shall be broken down by structure into conduit and raceway installation, cable and wire installation, electrical equipment installation, terminations, and lighting. Yard facilities shall be broken down by duct bank designation and substations.
- J. Instrumentation and control Work shall be broken down by structure and by pull boxes, duct, fiber-optic cable, and installation and testing.
- K. Equipment testing and start-up broken down by process and building.

- L. Other work not specifically included in the above items shall be broken down as necessary for establishment of pay and schedule activity items.
- M. The Contractor and County shall meet and jointly review the detailed schedule of values within 40 days from the date of Notice to Proceed. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed to provide cost loading of the Progress Schedule activities. Make any adjustments deemed necessary to the value allocation or level of detail, and submit a revised detailed schedule of values within 10 days from the date of the review meeting.

1.07. INCORPORATION OF SCHEDULE OF VALUES INTO CPM PROGRESS SCHEDULE

- A. Following acceptance of the detailed schedule of values, incorporate the values into the cost loading portion of the CPM Progress Schedule. The CPM activities and logic shall have been developed concurrent with development of the detailed schedule of values; however, it may be necessary to adjust the detailed schedule of values to correlate to individual schedule activities. It is anticipated that instances may occur, due to the independent but simultaneous development of the schedule of values and the CPM schedule activities, where interfacing these two documents will require changes to each document. Schedule activities may need to be added to accommodate the detail of the schedule of values. Schedule of Value items may need to be added to accommodate the detail of the CPM schedule activities. Where such instances arise, the Contractor shall propose changes to the schedule of values and to the CPM schedule activities to satisfy the CPM schedule cost loading requirements.
- B. Cross-Reference Listing - To assist in the correlation of the schedule of values and the CPM schedule, provide a cross-reference listing, furnished in two parts. The first part shall list each scheduled activity with the breakdown of the respective Schedule of Values items making up the total cost of the activity. The second part shall list the Schedule of Values item with the respective scheduled activity or activities that make up the total cost indicated. In the case where a number of schedule activities make up the total cost for a Schedule of Values item, the total cost for each schedule activity should be indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Scope of Work: The Contractor shall employ a competent photographer to take construction record photographs prior to start of work and periodically during the course of the Work. All photographs shall be taken digitally and provided to the Owner on a flash drive.
- B. Related Requirements Described Elsewhere:
 - 1. Project Requirements: Section 01000
 - 2. Summary of Project: Section 01010
 - 3. Project Record Documents: Section 01720

1.02 PHOTOGRAPHY REQUIRED

- A. Photographs taken in conformance with this Section shall be furnished to the Engineer with each pay request.
- B. Photographs shall be taken at each of the major stages of construction and as directed by the Engineer.
- C. Non Aerial photographs may be taken by the Contractor's personnel but must be of professional quality as herein specified. Photographs which are deemed unsatisfactory by the Engineer will be rejected and retakes will be required at no additional cost to the Owner.
- D. Views and Quantities Required:
 - 1. Six (6) prints of one (1) view of each activity as directed by the Resident Project Representative, up to a limit of fifteen (15) activities photographed per month.
 - 2. Six (6) prints of five (5) views of overall Project site monthly, as directed by the Resident Project Representative.

E. Negatives:

1. The photographer shall maintain negatives of the entire Project and then shall convey the negatives to the Owner at the completion of the Project.
2. The photographer shall agree to furnish additional prints to Owner and the Engineer at commercial rates applicable at time of purchase.

1.03 COST OF PHOTOGRAPHY

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

PART 2 - PRODUCTS

2.01 PRINTS

A. Type of Print:

1. Paper: Single weight, color print paper.
2. Finish: Smooth surface, glossy.
3. Size: 8 inch x 10 inch for construction photos and preliminary aerial photos, 16 inch x 20 inch for selected aerial photos.

B. Identify each print on back, listing:

1. Name of project.
2. Detailed description of view, including point from which exposure made, compass direction of view, vertical direction of view (horizontal, looking up, looking down, etc.), identification of main features in view and any other data and information pertinent to the purpose and identification the exposure photographer feels necessary to include.
3. Date and time of exposure.
4. Name and address of photographer.
5. Photographer's numbered identification of exposure.

6. Weather conditions under which exposure made.

C. Print Mounting

1. Each print to be inserted in a clear plastic envelope designed for the purpose.
 - a. Print deterioration not to be caused by envelope material or fabrication.
 - b. Designed to prevent print from accidentally slipping out of the envelope.
 - c. Front and back of print to be visible through the plastic envelope.
 - d. Permit convenience removal and insertion of print.
 - e. To have 1 inch hinged binding edge suitable for binder insertion.

PART 3 - EXECUTION

3.01 TECHNIQUE

- A. Factual Presentation.
- B. Correct exposure and focus.
 1. High resolution and sharpness.
 2. Maximum depth-of-field.
 3. Minimum distortion.

3.02 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate condition of construction and state of progress.
 - 1. At successive periods of photography, take at least one photograph from the same overall view as previously photographed.
 - 2. Consult with the Engineer at each period of photography for instructions concerning views required.

3.03 DELIVERY OF PRINTS

- A. Deliver prints to the Owner to accompany each Application For Payment.
- B. Distribution of construction prints as soon as processed is anticipated to be as follows:
 - 1. Owner (two (2) sets)
 - 2. Engineer (two (2) sets)
 - 3. Project record file (one (1) set to be stored by Contractor until the end of the project which shall be delivered with Project Record Documents as specified in Section 01720).
 - 4. Contractor (one (1) set)

END OF SECTION

SECTION 01390
COLOR DVD
PRECONSTRUCTION RECORD

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Prior to commencing work, the Contractor shall have a continuous color DVD recording taken along the entire length of the Project and at all proposed construction sites within the Project area to serve as a record of pre-construction conditions. Contractor shall provide video of all manufacturer's and contractor training required in Section 01650. Video and audio shall be standard DVD done in standard MPEG2 format. Audio portion shall describe the location of the video footage.
- B. Contractor to lay out Project along with pipe alignment and station points prior to video.

1.02 QUALITY ASSURANCE

- A. The Contractor shall engage the services of a professional electrographer. The color DVD shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business or preconstruction color DVD documentation.
- B. The electrographer shall furnish to the Engineer a list of all equipment to be used for the DVD, i.e., manufacturer's name, model number, specifications and other pertinent information.
- C. Additional information to be furnished by the electrographer are the names and addresses of two references that the electrographer has performed color DVD for, on projects of a similar nature, within the last 12 months.
- D. Owner's Representative must be present during filming. Provide Owner forty-eight (48) hours notice prior to start of filming.
- E. No construction shall begin prior to review and approval of the DVD covering the construction area by the Owner and Engineer. The Engineer shall have the authority to reject all or any portion of a DVD not conforming to specifications and order that it be redone at no additional charge.

- F. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the DVD coverage.
- G. DVD shall not be made more than ninety (90) days prior to construction in any area. All DVDs and written records shall become property of Owner.

PART 2 - PRODUCTS

2.01 DVD

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

PART 3 - EXECUTION

3.01 EQUIPMENT

- A. All equipment, accessories, materials and labor to perform this service shall be furnished by the Contractor.
- B. The total audio-video system shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of imperfection. The audio portion of the recording shall reproduce the commentary of the camera operator with proper volume, clarity and be free from distortion and interruptions.
- C. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be more than ten (10) feet. In some instances, DVD coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance provided by the Contractor.
- D. The color video camera used in the recording system shall have a horizontal resolution of 350 lines at center, a luminance signal to noise ratio of 45 dB and a minimum illumination requirement of one (1) foot candle.

3.02 RECORDED INFORMATION - AUDIO

- A. Each DVD shall begin with the current date, project name and municipality and be followed by the general location, i.e., viewing side and direction of progress. The audio track shall consist of an original live recording. The recording shall contain the narrative commentary of the electrographer, recorded simultaneously with his fixed elevation video record of the zone of influence of construction.

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

3.03 RECORDED INFORMATION - VIDEO

- A. All video recordings shall, by electronic means, display on the screen the time of day, the month, day and year of the recording. This time and date information must be continuously and simultaneously generated with the actual recording.
- B. Each DVD shall have a log of that DVD's contents. The log shall describe the various segments of coverage contained on that DVD in terms of the names of streets or easements, coverage beginning and end, directions of coverage, video unit counter numbers, engineering stationing numbers and the date.

3.04 LIGHTING

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

3.05 SPEED OF TRAVEL

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

3.06 AREA OF COVERAGE

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

END OF SECTION

SECTION 01400

WEB BASED PROJECT CONTROLS SYSTEM

PART 1 - GENERAL

1.01 PROJECT CONTROLS

- A. The Project Controls on this project shall be performed through the use of web-based project controls software. In fulfilling this requirement the Contractor shall provide the following:
1. Utilization of Primavera Contract Management (BCM), Business Intelligence Publisher Edition Version 14.2 or version as required by the County of Primavera Contract Management web-based software hosted and managed by a third party provider. No other software shall be acceptable. The intended users on the individual license shall include the Owner (seven (7) users), Construction Consultant (three (3) users), Engineer (three (3) users), and Contractor (minimum of two (2) users). The software, owner's manuals, licensing and database shall be owned and retained by the County. If the Contractor requires additional users, additional user licenses shall be provided to the County by the Contractor at no cost to the County and those additional licenses may be retained by the Contractor at project final completion.
 2. OCU reserves the right to migrate to another software during the course of the project, the contractor will be properly notified and may be required to attend a training session for the new system.
 3. A maintenance agreement including but not limited to technical support, training, maintenance and software upgrades shall be provided from the software supplier on the software for the duration of the project.
- B. A web-based hosting service to provide individual user access for a minimum of fifteen (15) named PCM licenses, including sequel server database software, BI Publisher as the report engine, email functionality, minimum of 100 gigabytes of memory shall be provided for the duration of the contract. Contract Management shall be hosted by LoadSpring Solutions Inc.
1. Contractor shall provide and attend a one day joint training session for the Owner, owner construction consultant, Engineer and Contractor, for all components of the software in the manner detailed in section 3.01 of this specification.

2. Contract Management and the LoadSpring Solutions access portal shall be operational within 14 calendar days after issuance of Notice to Proceed and once the County approves Version 14.2 software.
3. The Contractor shall be responsible for providing all the necessary connections at the temporary office facility including but not limited to, patch panels, switches routers, etcetera, at both ends of the fiber optic cables, also, installing a single mode fiber optic cable exterior and Multi-Mode interior, from the existing Administration Building to the temporary Contractor's and Owner's field offices to be located in the general vicinity of the South Effluent Pump Station.
4. Contractor shall provide two fiber optic patch panels with four fiber adapters PN# FAP6WST2. Contractor shall terminate fiber optic cable to patch panel at each end.
5. The Contractor shall be responsible for providing internet connection averaging download speeds of 45 Mbps. The download speed shall be no less than specified elsewhere in the contract specifications. The contractor is to provide internet connectivity for the duration of the project and until no longer necessary as determined by the RPR.
6. The Primavera Contract Management 14.2 application (PCM) utilizes BI Publisher to allow users to run pre-defined reports. The user may select filters or parameters to only view data of interest, and report access is permission based making for a secure environment. The contractor will also be required to purchase two Business Intelligence Publisher for Oracle Applications licenses.
7. At least 8 custom reports and forms are to be provided under this contract. OCU will determine and identify the required reports/forms. These reports/forms will be created and tested in the OCU environment on the LoadSpring cloud. The contractor shall budget at least 5 hours per report/form for LoadSpring to create, test and implement each report/form.
8. All project correspondence and documentation including but not limited to Requests for information, Notices, Change Orders / Change Management, noncompliance notices, Notice of claims, requests for clarification, updates, meeting minutes, shop drawing transmittals, shop drawings in PDF format, shop drawing comments, letters, memos, etc. shall be created and managed in Contract Management. **The use of emails as project correspondence and documentation is unacceptable and shall be considered to be noncompliance with this specification.**

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

1.02 SUBMITTALS

- A. Provide a statement of Capability and Cooperation per 1.01.
- B. Provide for approval a minimum of fifteen (15) user licenses in Orange County Utilities' name for the latest version (at the Notice to Proceed preconstruction meeting) of Contract Management.
- C. Provide for approval two Business Intelligence Publisher for Oracle Applications licenses
- D. Maintenance Agreement – Provide proof of maintenance agreement with Oracle/Primavera Systems that will last for the duration of the project.
- E. Provide proof of web hosting services for the duration of the project.

PART 2 - PRODUCTS

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

- A. Web based hosting services to be provided by:

LoadSpring Solutions, Inc.

15 Union Street, #401

Lawrence, MA 01840

Scott D Harrison

Account Executive | LoadSpring Solutions, Inc.

Mobile: +1 781.820.0704

Office: +1 978.685.9715 x125

Web: www.loadspring.com

PART 3 - EXECUTION

3.01 REQUIREMENTS FOR OPERATION OF CONTRACT MANAGEMENT

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

A. Project Information Modules

1. Companies – All contact information for parties involved in this project will be entered by the County. Contractor shall provide a digital list of all contact information (Full Name with middle initial, Company Name, address, phone number, cell phone, email address, title, etc).
2. Issues – Issues shall be created as necessary to monitor potential problems on the project. Issues shall be assigned from items in requests for information, meeting minutes, or independently generated items. The project team shall be responsible for entering data and maintaining this list.

B. Communication Modules

1. Transmittal – All transmittals between the Contractor, Owner and Engineer shall be generated in the Contract Management software including but not limited to shop drawing transmittal cover letters, submittals and other project related packages or documentation.
2. Requests for Information - All requests for information shall be generated and performed through Contract Management. Requests for Information shall be performed completely electronically. All requests shall be complete. If necessary, the Contractor shall attach electronic attachments of all sketches, photographs or other documentation as necessary to provide full details of the issue or concern. References to all pertinent details, drawings, schedule activities, and issues shall be noted in each request for information. All project participants shall be responsible for electronic updates for their action items. Contractor shall submit all RFI's with a ball in court (BIC) to the Engineer. The Engineer shall provide a response and submit the RFI with a ball in court to the County. RFI's shall not be considered answered and shall not be acted upon by the Contractor until the County has officially CLOSED the RFI.
3. Notices – All notices be performed in this module. Notices shall be comprised of all documentation previously written in the form of letters, memo's, emails, test requests, Notice of claim, general correspondence, clarification, schedule update, bulletin, etc and shall be created in Contract Management with the appropriate attachments as required.

4. Notices of Non-compliance – All notices of non-compliance shall be generated and performed through Contract Management. Both the original notice from the Owner/Engineer and the proposed corrective action by the Contractor shall be completed in web-based software. Owner/Engineer shall submit all notices of non compliance with a ball in court (BIC) to the Contractor. The Contractor shall provide a response and submit the NCN with a ball in court to the Engineer. NCN's shall not be considered answered and shall not be acted upon by the Contractor until the County has officially CLOSED the NCN.
5. Meeting Minutes – All meetings shall be documented in Contract Management. Business Items and Attendees will be documented, and attachments will be attached as appropriate. Recurring meetings shall be generated using delivered functionality within Contract Management, and will be updated by the meeting organizer. Logs presented at the meetings including but not limited to Shop drawing logs, RFI logs, Change Order Logs, Test Request & Results logs, and correspondence logs shall be generated from Contract Management, dispersed and attached to the meeting minutes module. Logs shall be downloaded as of the date of the meeting to provide the most current status of all logs.

C. Contract Information Modules

1. Change Management – Change Management shall be used to organize all related documents for each change to scope of work, schedule, or budget. Related documents shall be linked via Issues and included in the CPM schedule. Estimates, proposals, and final change orders shall be linked as Attachments. The contractor shall input data and maintain this module. The Change Management process shall only be initiated from a request for information in the RFI module.
2. Payment Requisition – The Contractor shall utilize the Payment Requisition module for the purpose of inputting the monthly pay applications into Contract Management for the project record as well as for the required approval of the “pencil copy” or preliminary submittal for approval by the County inspector prior to submitting each month’s printed copy through normal means.

D. Logs Modules

1. Submittal Packages – Submittals will be combined into Submittal Packages as appropriate, when workflow is similar and using Packages increase efficiency.
2. Submittals – Contract Management shall be used to create all transmittals between the Engineer, Owner and Contractor for all submittals. The printed

copy of the submittals will be transmitted through normal means. Contractor shall enter a complete list of all known submittals for the project at the start of the project. Submittals shall include required by dates so that all parties are aware of upcoming submittals, and will use industry standard specification codes to categorize the submittals and shall be included in the Primavera CPM schedule. Contractor shall provide and attach a digital copy of the shop drawing submittal including all revisions, in PDF format for a complete project record and access for all users. However, only hard copy shop drawings submittals shall be reviewed and approved by the Engineer.

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

E. Other

1. Correspondence Sent – All correspondence sent shall be logged within Contract Management by the originating party in the appropriate module. Documents generated within Contract Management shall be recorded via delivered functionality within Contract Management. Documents generated external to Contract Management shall be kept to an absolute minimum and shall be manually added to appropriate contract Management module. Digitally Attach applicable documents as appropriate to Contract Management.
2. Correspondence Received – All correspondence received from outside parties pertinent to the project shall be logged within Contract Management by the receiving party. Receipt of submittals or other documents that originated out of Contract Management shall be recorded by the contractor via delivered functionality within Contract Management in the appropriate module. Digitally Attach applicable documents as appropriate to Contract Management.

END OF SECTION

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Owner will employ, and pay for services of an Independent Testing Laboratory to perform Testing specifically indicated on the Contract Documents or specified in the Specifications and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.
2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
3. Employment of laboratory by Owner shall in no way relieve Contractor's obligations to perform the Work of the Contract.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.
2. Respective section of Specifications: Certification of products.
3. Each Specification section listed: Laboratory tests required, and standards for testing.

1.02 LABORATORY DUTIES: LIMITATIONS OF AUTHORITY

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

1. Project title, Owner's job number, and Engineer's job number;
2. Testing laboratory name and address;
3. Date of report issuance;

4. Name and signature of field technician;
 5. Date of inspections, sampling, and/or testing;
 6. Record of weather conditions;
 7. Identification of product tested and associated specification section;
 8. Testing location;
 9. Description of testing performed;
 10. Observations made regarding compliance with the Contract Documents.
- B. Laboratory is not authorized to:
1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Approve or reject any portion of work.
 3. Perform any duties of the Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Owner's personnel, provide access to Work and manufacturer's operations.
- B. Secure and deliver to the Owner adequate representational samples of materials proposed to be used and which require testing.
- C. Provide to the Owner the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Owner may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.

- E. Contractor shall not have direct contact with laboratory or laboratory personnel. All testing shall be coordinated through Owner.
- F. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- G. Notify Owner sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- H. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.
- I. If the test results indicate the material or equipment complies with the Contract Documents, the Owner shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall pay for the laboratory costs directly to the Owner or the total costs shall be deducted from any payments due to the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide temporary facilities required which shall include but are not necessarily limited to the following:
1. By Contractor:
 - a. Telephone.
 - b. Storage sheds.
 - c. Temporary water service.
 - d. Temporary sanitary facilities.
 - e. Temporary electrical service.
 - f. Contractor's field office.
 - g. Owner's field office.
 2. By Owner:
 - a. None.

1.02 TEMPORARY ELECTRIC POWER

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

1.03 TEMPORARY WATER

- A. Make arrangements for developing water sources and supply all labor and equipment to collect, load, transport, and apply water as necessary for compaction of materials, concrete construction operations, testing, dust control, and other construction use.
- B. Furnish potable drinking water in suitable dispensers and with cups for use of all employees at the job site during the entire construction period.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide temporary toilet facilities separate from the job office. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Provide enough chemical toilets to conveniently serve the needs of all personnel.
- B. Chemical toilets and their maintenance shall meet the the State and local health regulations and ordinances. Any facilities or maintenance methods these requirements shall be corrected immediately.

1.05 CONSTRUCTION STAKING

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

1.06 SILT BARRIERS, TURBIDITY CURTAINS, AND SCREENS

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

1.07 PROJECT SIGNS

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

1.08 CONTRACTOR'S FIELD OFFICE AND STORAGE SHEDS

- A. Provide field office with parking spaces, a telephone and storage sheds for the performance of the work, and protection of materials and equipment. Provide personnel to answer the telephone during working hours. If the facilities are located off the project site, the Contractor shall indemnify and insure the owner of the land against claims for accident, theft, and other items in accordance with the General Conditions.

1.09 OWNER'S FIELD OFFICE

- A. Furnish, equip, and maintain an office trailer for the sole use of the Owner, with secure entrance doors and one key per occupant. Provide entrance/exit steps at all exterior doors. Provide parking areas for County vehicles. No Contractor employees or equipment parking will be permitted on Owner parking areas. Contractor shall have Owner's field office fully functional prior to any construction activities.
1. Area: 600 square feet minimum, with minimum dimensions 12 feet x 50 feet.
 - a. Divide trailer into two offices, one on each end, reception area, restroom, and conference hall.
 - b. Obtain prior approval of Engineer of floor plan. Each room shall have doors with integral locks, keyed alike.
 2. Windows:
 - a. Minimum: 3, with a minimum total area of 10 percent of floor area.
 - b. Operable sash and insect screens.
 - c. Locate to provide view of construction areas.
 - d. Provide operable Venetian blinds for all windows.
 3. Flooring:
 - a. Provide VTC flooring throughout interior of trailer.
 4. Furniture:
 - a. Two (2) conference tables 30 inches x 96 inches with conference chairs.
 - b. Two (2) standard size desks, 3-foot x 5-foot with four drawers.
 - c. Two (2) office chairs with armrest, high back, swivel and reclining.
 - d. Two (2) plan tables: 36 inches x 60 inches.
 - e. Two (2) plan table stools with cushion and high backs.
 - f. One (1) plan rack to hold a minimum of six sets of project drawings.
 - g. Two (2) standard four-drawer legal size metal filing cabinet with lock and keys (one key per occupant).
 - h. Two (2) wooden bookshelves with four shelves each.
 - i. Four (4) office chairs with armrest (2 per office).
 - j. Four (4) wastebaskets.

- k. One (1) tack board, 30 inches x 48 inches.
- l. One (1) dry erase board, 30 inches x 42 inches.
- m. One (1) coat rack.
- n. One (1) 5 cubic-foot refrigerator.
- o. One (1) 1.5 cubic-foot microwave oven.
- p. One (1) table for printer, copier, fax.
- q. One (1) personnel Laptop computer with minimum 14-inch flat screen. It shall be equipped with a Windows 10 operating system, Intel Core i5 Processor 4 GB DDR3 memory , 500 GB Hard Drive, WIFI, Webcam MS Pro Office Suite, Anti Virus Program, Contractor Compatible Software package, Overdrive Pro 3G/4G Mobile Hotspot (equivalent) 3 year in house warranty.

5. Office Equipment and Supplies:

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

6. Office Communications:

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

7. Services (AOD) :

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

B. Removal of Temporary Construction When No Longer Needed

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

C. Construction Solid Waste Disposal

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01505

MOBILIZATION

PART I - GENERAL

1.01 DEFINITION AND SCOPE

- A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the Work. Mobilization shall include, but not be limited to, the following principal items.
1. Move onto the site all Contractor's plant and equipment required for first month operations.
 2. Provide a temporary field office for the Contractor's use.
 3. Provide a temporary field office for the Engineer's use.
 4. Install temporary construction power, wiring, and lighting facilities.
 5. Establish fire protection plan and safety program.
 6. Secure construction water supply.
 7. Provide on-site sanitary facilities and potable water facilities as required by agencies having jurisdiction.
 8. Arrange for and erect Contractor's work and storage yard and employee's parking facilities.
 9. Submit all required insurance certificates and bonds.
 10. Obtain all required permits.
 11. Post all OSHA, EPA, Department of Labor, and all other required notices.
 12. Submit a detailed construction schedule acceptable to the Engineer as specified.
 13. Submit a schedule of values of the Work. Mobilization and Demobilization shall not be more than 5.0% of the bid amount.

14. Submit a schedule of submittals.

15. Install project sign.

1.02 DEMOBILIZATION

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01525
CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish, install and maintain required construction aids, remove on completion of Work.
- B. Related Requirements Described Elsewhere:
 - 1. Summary of Project: Section 01010.
- C. Comply with applicable requirements specified in Sections of Divisions 2 through 16.

PART 2 - PRODUCTS

2.01 MATERIALS

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

2.02 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate execution of the Work: scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment such as temporary valves and fittings. Refer to respective Sections for particular requirements for each trade.
- B. When permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.
- C. Maintain facilities and equipment in first-class condition.

PART 3 - EXECUTION

3.01 PREPARATION

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

3.02 GENERAL

- A. Comply with applicable requirements specified in sections of Divisions 2 through 16.
- B. Relocate construction aids as required by progress of construction, by storage of work requirements and to accommodate legitimate requirements of Owner and other contractors employed at the site.

3.03 REMOVAL

- A. Completely remove temporary materials, equipment and services:
 - 1. When construction needs can be met by use of permanent construction.
 - 2. At completion of work.
- B. Clean and restore areas damaged by installation by use of temporary facilities.
 - 1. Remove foundations and underground installations for construction aids.
 - 2. Grade and grass areas of site affected by temporary installations to required elevations, slopes, ground cover and clean the area.
- C. Restore permanent facilities used for temporary purposes to specified condition or in kind if not specified.

END OF SECTION

SECTION 01568

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as required by applicable rules and regulations and permit conditions.
2. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.
3. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.
4. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.
2. Solid Sodding: Section 02822

PART 2 - PRODUCTS

2.01 EROSION CONTROL

- A. Sodding is specified in Section 02822.
- B. Netting shall be fabricated of material acceptable to the Owner.

2.02 SEDIMENTATION CONTROL

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

PART 3 - EXECUTION

3.01 EROSION CONTROL

- A. Minimum procedures for grassing are:
 - 1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
 - 2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
 - 3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.
 - 4. Apply netting over mulched areas on sloped surfaces.

5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.
6. Stake and secure sodding as needed to prevent erosion.

3.02 SEDIMENTATION CONTROL

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

3.03 PERFORMANCE

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

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish, install and maintain project signs.
2. Remove signs on completion of construction.
3. Allow no other signs to be displayed.

B. Related Requirements Described Elsewhere:

1. Painting: Section 09900.

1.02 PROJECT SIGNS

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

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

C. Information:

1. Project Sign:
 - a. Owner title, logo, and Commissioners/Administrator names.
 - b. Project name.
 - c. Contractor.
 - d. Engineer.
 - e. All consultants employed by Engineer.

1.03 QUALITY ASSURANCE

- A. Sign Painter: Professional experience in type of work required.
- B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

1.04 SUBMITTALS

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

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: May be new or used, wood or metal, in sound condition, structurally adequate and suitable for specified finish.
- B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.
 - 1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.
- C. Rough Hardware: Galvanized.
- D. Paint: Exterior quality, as specified in Section 09900: Painting.

PART 3 - EXECUTION

3.01 PROJECT IDENTIFICATION SIGNS

- A. Paint exposed surface of supports, framing and surface material; one (1) coat of primer and one (1) coat of exterior paint.
- B. Paint graphics in styles, sizes, and colors selected.

3.02 MAINTENANCE

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

3.03 REMOVAL

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

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

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

1.02 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five copies to the Engineer.
1. Maintain one (1) set of complete instructions at the job site during installation and until completion.

- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
 - 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.03 TRANSPORTATION AND HANDLING

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

1.04 STORAGE AND PROTECTION

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

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

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

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

1.05 STORAGE AND HANDLING OF EQUIPMENT ON SITE

- A. Because of the long period allowed for construction, special attention shall be given to the storage and handling of equipment on site. As a minimum, the procedure outlined below shall be followed:
 1. Materials shall not be shipped until approved by the Engineer. The intent of this requirement is to avoid unnecessary delivery of unapproved materials and to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall major equipment or finish products be delivered to the site more than one month prior to installation without written authorization from the Engineer. Materials shipped to the site, or temporarily stored off-site in approved locations, shall be stored in accordance with Paragraph 1.04, herein.
 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the Engineer, until such time as the equipment is to be installed.
 3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
 4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed with the Engineer. These instructions shall be carefully followed and a written record of this kept by the Contractor.
 5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half the load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.

6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the Owner.
7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.06 SPARE PARTS

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

1.07 GREASE, OIL AND FUEL

- A. All grease, oil and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.
- B. The Contractor shall be responsible for changing the oil in all drives and intermediate drives of each mechanical equipment after initial break-in of the equipment, which in no event shall be any longer than three (3) weeks of operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01650

START-UP AND DEMONSTRATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Demonstrate to Owner and Engineer that the Work functions as a complete and operable system under normal and emergency operating conditions.
- B. Requirements
 - 1. Equipment testing and plant startup is requisite to satisfactory completion of the contract and, therefore, shall be completed within the required contract time for substantial completion.
 - 2. The Contractor shall furnish all personnel, power, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.
 - 3. The Contractor may use water from the existing wellfields in the testing of equipment, process subsystems, and plant start-up. The Contractor shall notify the Owner of the amount of water required for the test at the time the testing is scheduled. The Owner reserves the right to limit the amount of water or set the time of day and dates of the deliveries of water to the Contractor if deliveries of such water unduly affects Owner's system operation and to maintain customer service.
 - 4. Disposal of Non-Acceptable Water. It shall be the sole responsibility of the Contractor to dispose of plant flow produced during any equipment, process subsystem, and plant startup testing in a manner approved by regulatory agencies and to the satisfaction of the Owner. The Contractor shall identify the disposal method in its testing protocol submittal.
 - 5. Prior to commencement of any discharge from equipment testing and plant start-up, the Contractor shall obtain all regulatory approval, in writing, and submit it to the Engineer. If only the Owner may apply for a specified permit regarding the disposal of testing water, the Contractor shall notify the Owner and furnish all the regulatory

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

6. Disinfection of piping and structure shall be performed prior to start-up.
7. All start-up, demonstration, and performance testing activities shall be coordinated with and witnessed by the Engineer, Owner's Construction Inspector, and Operations Staff. Owner shall be notified in advance of proposed start-up and demonstration testing.
8. The WSF shall remain operational during start-up and demonstration testing.

C. Related Work Described Elsewhere:

1. Construction Progress Schedules: Section 01310.
2. Operating and Maintenance Data: Section 01730.
3. Equipment: Division 11.
4. Mechanical: Division 15.
5. Electrical: Division 16.

1.02 START-UP GUIDELINES

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

1. Individual Equipment Units. The startup and testing of the individual equipment units shall not commence until all disinfection and pressure testing of pipelines, hydraulic structures, and equipment is complete. Sequence as determined by Contractor. Description and requirements for startup and testing of individual equipment units are located under the equipment's individual specification section.
2. Process Subsystems. The startup and testing of the process subsystems shall not commence until the startup and testing of the individual equipment units is complete. Sequence as determined by Contractor. Description of startup and testing of process subsystems is located under the system's specification section or herein as noted. This segment includes functional tests of instrumentation and control system loop validation tests.

3. Plant Startup. The startup of the complete plant shall not commence until the startup and testing of the process subsystems is complete and approved by the Engineer. This segment shall demonstrate operation of the facility for a specified length of time and provide evidence of satisfactory water quality.
4. Performance Testing. Performance testing of the plant shall not commence until the startup of the plant is complete and plant finished water can be introduced to the existing water storage and distribution system with the permission of regulatory agencies having jurisdiction. This segment shall demonstrate that the entire work will function properly and reliably as a system and that the system will function to meet the specified standards over the stated period of time.

PART 2 - PRODUCTS

2.01 START-UP PLAN

- A. Submit for approval by the Engineer a detailed start-up plan outlining the schedule and sequence of all tests and start-up activities, including submittal of checkout forms, submittal of demonstration test procedures, start-up, demonstration and testing, submittal of certification of completed demonstration and training. Start-up and commissioning may not begin until the plan is approved by the Engineer. Start-up plan shall be submitted and approved a minimum of 7 days in advance of start-up activities.
- B. Provide adequate chemicals and diesel fuel to perform start-up services. After completion and acceptance of the performance testing, all bulk chemical and fuel tanks shall be completely filled to provide a minimum of 30 days storage.

PART 3 - EXECUTION

3.01 COMPONENT TEST AND CHECK-OUT

- A. Start-up Certification: Prior to system start-up, successfully complete all the testing required of the individual components of the Work. Submit six (6) copies of CHECK-OUT MEMO'S for each individual component or piece of equipment, signed by the Contractor or the subcontractor and the manufacturer's representative. All copies of the Operation and Maintenance Manuals must be provided before start-up may begin. These forms shall be completed and submitted before Instruction in Operation to Owner or a request for initiating any

final inspections. Insert one (1) copy of this form into the applicable section of each Operation and Maintenance Manual.

- B. Demonstrate to the Engineer and the Owner's representative, that all temporary jumpers and/or bypasses have been removed and that all of the components are operating under their own controls as designated.
- C. Coordinate start-up activities with the Owner's operating personnel at the treatment plant site and with the Engineer prior to commencing system start-up.

3.02 START-UP

- A. Confirm that all equipment is properly energized, that the valves are set to their normal operating condition and that the flow path through the new Work is unobstructed.
- B. Confirm that all process subsystems have been tested and are ready for operation. The process subsystems are listed below:
 - 1. Electrical and Process Control Subsystems. Verify the performance of the electrical equipment and process and control systems.
- C. Slowly fill each hydrostatic structure in the process flow stream with water.
- D. Initiate start-up and training in accordance with and with the use of the plant operation and maintenance manuals.
- E. Observe the component operation and make adjustments as necessary to optimize the performance of the Work.
- F. Coordinate with Owner for any adjustments desired or operational problems requiring debugging.
- G. Make adjustments as necessary.

3.03 START-UP DEMONSTRATION AND TESTING

- A. After all Work components have been constructed, field tested, and started up in accordance with the individual Specifications and manufacturer requirements, and after all Check-Out Forms have been completed and submitted, perform the Start-Up Demonstration and Testing. The demonstration period shall be held upon completion of all systems at a starting date to be agreed upon in writing by the Owner or his representative. Prior to beginning the start-up demonstration testing, the Contractor shall submit a detailed schedule of operational circumstances for

approval by the Engineer. The schedule of operational circumstances shall describe, in detail, the proposed test procedures for each piece of equipment. Provide similar test procedure forms for each piece of equipment or section of the Work to include all particular aspects and features of that equipment or section of the Work and as specified in the Technical Sections of the Specifications.

- B. The Start-Up Demonstration Testing will be conducted for five (5) consecutive days. The Work must operate successfully during the five (5) day testing period in the manner intended. If the Work does not operate successfully, or if the start-up is interrupted due to other contracts, the problems will be corrected and the test will start over from day one. The party causing the interruption will be subject to the assessment of actual damages due to delay.
- C. During the start-up demonstration period, operate the Work, instruct designated plant operating personnel in the function and operation of the Work, and cause various operational circumstances to occur. As a minimum, these circumstances will include average and peak daily flows, random equipment or process failures, tank overflows, surcharges, interlocks and bypasses. Demonstrate the essential features of the equipment and its relationship to other equipment. The approved schedule of operational circumstances and Demonstration Test Procedures Forms will be used as the agenda during the Start-Up Demonstration Testing period for all equipment and sections of the Work. Coordination of the demonstration test schedule will be accomplished through the Engineer.
- D. Acceptability of the Work's performance will be based on the Work performing as specified under these actual and simulated operating conditions, to provide water treatment facilities functioning as intended and as defined in the Contract Documents. The intent of the start-up demonstration and testing is for the Contractor to demonstrate to the Owner and the Engineer that the Work will function as a complete and operable system under normal, as well as emergency operating conditions, and is ready for final acceptance.
- E. Demonstrate the essential features of the whole system as it applies to the Work, including the mechanical equipment, piping, structures, finishes, controls, instrumentation, power distribution and lighting systems. Use the approved procedures and circumstances to demonstrate the system. Any minor deficiencies found shall be noted and included on a punch list attached to the Certificate of Completed Demonstration. The system shall be demonstrated only once, after completion of start-up tests. If circumstances arise that interrupt the test procedures (such as weather, unforeseen process problems, or problems caused by the Contractor whether or not the problems are the fault of the Contractor, etc.) then the test shall be terminated and rescheduled to a later date after the problem is corrected. The test shall be run in its entirety if so directed by the Engineer.

- F. Demonstrate the essential features of all the mechanical systems including, but not limited to, the following as they apply to the Work:
1. Mechanical Systems
 - a. Valves
 - b. Pumps
 - c. Fire Protection System
 2. Heating, Air Conditioning, and Ventilating Systems and Controls.
 - a. Air Conditioning/Heating System
 - b. Ventilating System
- G. Demonstrate the essential features of all electrical and instrumentation systems including, but not limited to, the following as they apply to the work:
1. Electrical systems controls and equipment.
 - a. Electrical power equipment.
 - b. Motor control centers.
 - c. Motor control devices.
 - d. Relays.
 - e. Special transformers.
 - f. Starting devices.
 2. Supervisory control and data acquisition system.
 3. Communications systems.
 4. Lighting fixtures (including relamping and replacing lenses).
 - a. Exit and safety fixtures.
 - b. Fixtures, indoor and outdoor.
 - c. Floodlighting.
 5. Panelboards.
 - a. Distribution panels.
 - b. Lighting panels.
 - c. Main panels, power panels.
 - d. Switchboard.
 6. Wiring devices.
 - a. Face plates.
 - b. Low-voltage controls.
 - c. Outlets: convenience, special purpose.

- d. Switches: regular, time.

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

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

- J. Upon completion of all specified operator training, the Contractor shall submit to the Engineer six (6) copies of the Certificate of Completed Demonstration Form, for each item of equipment or system in the Work, signed by the Contractor, Subcontractor, Engineer, and the Owner. Insert one (1) copy of this form in the applicable section of each Operation and Maintenance Manual. A sample Certificate of Completed Demonstration Form is provided in the General Conditions.

CHECK OUT FORM

| | | | | | |
|--------------------------|-------------|--------------------------------|------------|-------|----------------|
| <input type="checkbox"/> | OWNER | <u>Orange County Utilities</u> | No. Copies | _____ | CHECK-OUT |
| <input type="checkbox"/> | ENGINEER: | <u>Tetra Tech</u> | No. Copies | _____ | MEMO NO. _____ |
| <input type="checkbox"/> | ARCHITECT: | _____ | No. Copies | _____ | |
| <input type="checkbox"/> | CONTRACTOR: | _____ | No. Copies | _____ | |
| <input type="checkbox"/> | FIELD: | _____ | No. Copies | _____ | |
| <input type="checkbox"/> | OTHER: | _____ | No. Copies | _____ | |

PROJECT DATA

CONTRACT DATA

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

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

Name of equipment checked: _____

Name of manufacturer of equipment: _____

1. The equipment furnished by us has been checked on the job by us. We have reviewed, where applicable, the performance verification information submitted to us by the Contractor.
2. The equipment is properly installed, except for items noted below.*
3. The equipment is operating satisfactorily, except for items noted below.*
4. The written operating and maintenance information, where applicable, has been presented to the Contractor, and been discussed with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to him.

Checked By:

Name of Manufacturer's Rep.

Name of General Contractor

Address and Phone # of Rep.

Authorized Sig./Title/Date

Sig./Title/Pers. Making Chk.

Name of Subcontractor

Date Checked

Authorized Sig./Title/Date

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

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

CERTIFICATE OF COMPLETED DEMONSTRATION FORM

| | | | | | |
|--------------------------|-------------|--------------------------------|------------|-------|----------------|
| <input type="checkbox"/> | OWNER | <u>Orange County Utilities</u> | No. Copies | _____ | CERTIFICATE |
| <input type="checkbox"/> | ENGINEER: | <u>Tetra Tech</u> | No. Copies | _____ | OF COMPLETED |
| <input type="checkbox"/> | ARCHITECT: | _____ | No. Copies | _____ | DEMONSTRATION |
| <input type="checkbox"/> | CONTRACTOR: | _____ | No. Copies | _____ | MEMO NO. _____ |
| <input type="checkbox"/> | FIELD: | _____ | No. Copies | _____ | |
| <input type="checkbox"/> | OTHER: | _____ | No. Copies | _____ | |

PROJECT DATA

CONTRACT DATA

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

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

NOTE TO CONTRACTOR:

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

MEMORANDUM:

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

- (a) Owner's copy of Operation and Maintenance Manual for equipment or systems specified under this Section containing approved submittal sheets on all items, including the following:
- (1) Maintenance information published by manufacturer on equipment items.
 - (2) Printed warranties by manufacturers of equipment items.
 - (3) Performance verification information as recorded by the Contractor.

- (4) Check-Out Memo on equipment by manufacturer's representative.
- (5) Written operating instructions on any specialized items.
- (6) Explanation of guarantees and warranties on the system.
- (b) Prints showing actual "As-Built" conditions.
- (c) A demonstration of the system in operation and of the maintenance procedures which will be required.

(Name of General Contractor)

By: _____
(Authorized Signature, Title and Date)

(Name of Subcontractor)

By: _____
(Authorized Signature, Title and Date)

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

(Name of Owner)

By: _____
(Authorized Signature/Title/Date)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.
- B. Related Requirements Described Elsewhere:
 - 1. Start-Up: Section 01650
 - 2. Cleaning: Section 01710.
 - 3. Project Record Documents: Section 01720.
 - 4. Operating and Maintenance Data: Section 01730.
 - 5. Warranties and Bonds: Section 01740.
 - 6. Miscellaneous Work and Cleanup: Section 01800.

1.02 SUBSTANTIAL COMPLETION

- A. The Work will not be substantially complete, and Contractor may not request substantial completion inspection unless the following submittals and work is completed:
 - 1. All Operation and Maintenance manuals have been submitted and approved to the requirements of Section 01730. Final operation and maintenance manuals shall be turned over to the Owner.
 - 2. All equipment has been checked-out by the equipment manufacturer and Certificates of Manufacturer's Check-Out have been submitted as required by Section 01650.

3. All start-up and demonstration testing completed and Certificates of Completed Demonstration submitted to the requirements of Section 01650.
 4. Project Record Documents are complete and have been submitted and reviewed to the requirements of Section 01720.
 5. All training of Owner's personnel completed.
 6. All areas to be used and occupied are safe, operable in automatic and complete.
 7. All building occupancy certificates have been issued by the appropriate building permitting agency.
 8. All painting, finishes, fencing, cleanup, final grading, grassing, planting, sidewalk construction, and paving shall have been completed and are ready for inspection.
 9. All deficiencies noted on inspection reports or nonconformances are corrected or the correction plan approved.
 10. No partial substantial completions will be considered.
- B. When the conditions of paragraph 1.02 A. are met the Contractor shall submit to the Engineer:
1. A written notice that he considers the Work, or portion thereof, is substantially complete, and request an inspection.
 2. A punch list of items to be corrected. (Uncompleted work which is not related to the safe, effective, efficient use of the Project may be allowed on the punch list with the Engineer's approval.)
- C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
- D. Should the Engineer determine that the Work is not substantially complete:
1. The Engineer will promptly notify the Contractor in writing, giving the reasons therefor.

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

1.03 FINAL INSPECTION

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

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

1.04 REINSPECTION FEES

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

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

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Warranties and Bonds: To requirements of Section 01740.
- B. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- C. Certificate of Insurance for Products and Completed Operations.
- D. Provide copies of all the closed permits.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
 1. The original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous change orders or written amendments.
 - b. Allowances.
 - c. Unit prices.
 - d. Deductions for uncorrected work.
 - e. Penalties and bonuses.
 - f. Deductions for liquidated damages.
 - g. Deductions for reinspection payments.
 - h. Other adjustments.
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

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

1.02 DISPOSAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

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

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

3.02 DUST CONTROL

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

3.03 FINAL CLEANING

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

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 PURPOSE AND DESCRIPTION OF WORK

- A. The purpose of the Project Record Documents is to provide the County with factual information regarding all aspects of the Work, both concealed and visible, to enable future location, identification and modification of the Work without lengthy and expensive site measurement, investigation or examination.
- B. Maintenance, certification and submittal of Record Documents.
 - 1. Throughout progress of Work, maintain accurate records of progress and changes of Contract Documents and in the Record Drawings.
 - 2. Obtain the services of a Surveyor to certify the as-built asset attribute data for the location of the Work and transfer the data to the Record Drawings.
 - 3. Upon Surveyor certification of the location of completed work, transfer the information from the as-built asset attribute data to electronic record documents.
 - 4. Provide final record documents to the County.

1.02 DEFINITIONS

Except where specific definitions are used within a specific section, the following terms, phrases, words and their derivation shall have the meaning given herein when consistent with the context in which they are used. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. The word "shall" is mandatory, and the word "may" is permissive.

- A. As-Built Asset Attribute Data: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements so that the constructed facilities can be delineated in such a way that the location of the constructed improvements may be compared with the construction drawings. A completed table similar to the Table 01720-2 Asset Attribute Data Form Example in this Section shall be provided and certified by the Surveyor.

- B. As-Built Drawings: Drawings prepared by the Contractor's Surveyor shall depict the actual location of installed utilities for the completed WORK in a full size hard copy and an electronic AutoCAD file (dwg) format.
- C. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 61G17-6 'Minimum Technical Standards', FAC.
- D. Electronic As-Built Asset Attribute Data: Shall mean documents that are signed and sealed electronically by a Surveyor by creating a "signature" file and are transmitted electronically following the procedures and definitions of Chapter 61G17-7.0025, FAC.
- E. Record Documents: Shall mean full size hard and electronic copies of Boundary Surveys and As-Built Asset Attribute Data certified by a Surveyor, reports and other documents presented in Article 2.01.
- F. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a professional surveyor and mapper pursuant to Chapter 472, F.S.
- G. Survey Map Report: As a minimum the Survey Map Report shall identify or describe the locations where the pipe centerline was constructed within three feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary, any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained.

1.03 RELATED REQUIREMENTS

- A. All General Conditions, Supplements to the General Conditions, and any Addenda issued by the County are a part of this Section in the same manner as if fully written herein, and shall govern the Work of this Section, except where more stringent articles or requirements are stipulated, then they shall govern this Section.
- B. The Contract Documents are complementary and what is required by anyone shall be as binding as if required by all.
- C. Other requirements affecting Record Documents may appear in pertinent other sections of these specifications.

1.04 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of the Record Documents to one person on the Contractor's staff as approved by the County.

- B. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of drawings and other documents where such entry is required to show progress and changes properly.
- C. Make entries within 24-hours after receipt of information has occurred.
- D. Survey documents shall comply with the minimum technical standards of Chapter 61G17-6 of the Florida Administrative Code (FAC) and Table 01720-1 Minimum Survey Accuracies specified in, whichever are more stringent. Asset attribute data shall be signed, sealed and dated by the Surveyor. All coordinates shall be geographically registered in the Florida State Plan Coordinate System using the contract drawings control points for horizontal and vertical controls.

Table 01720-1
Minimum Survey Accuracies

| Asset/Location | Horizontal Accuracy (feet) | Elevation Accuracy (feet) | Location: horizontal center and vertical top, unless otherwise specified |
|--|----------------------------|---------------------------|--|
| Bench Marks | N/A | 0.01 | Point |
| Horizontal Control | 0.01 | N/A | Point |
| Easements and Tracts | * | N/A | Survey Monuments |
| Civil Site, Topo and Foundation Drawings | 0.1 | 0.01 | All |
| Hydrants | 0.01 | N/A | Operating Nut |
| Blow off Valves | 0.01 | N/A | Valve Enclosure |
| Air Release Valves | 0.01 | N/A | Valve Enclosure |
| Master Meters | 0.01 | N/A | Register |
| Meter Box | 0.01 | N/A | Top of Meter Box |
| Clean-out | 0.01 | N/A | Top of Clean-out |
| Pump Station | 0.01 | 0.01 | Top Center of Wet Well and Pipe Inverts |
| Manholes | 0.01 | 0.1 | Top Center of Cover |
| Manhole | N/A | 0.01 | Pipe Inverts |
| System Valves | 0.01 | 0.1 | Operating Nut and Valve Body |
| Fittings | 0.01 | 0.1 | Top of Fitting and Ground |
| Piping at 100' max intervals | 0.01 | 0.1 | Top of Pipe and Ground |
| Restrained Pipe | 0.01 | N/A | Limits |
| Electrical Conduit | 0.01 | N/A | Limits |
| Connections | 0.01 | 0.1 | Pipe Invert |

| | | | |
|----------------------|------|-----|-----------------------------------|
| Bore & Jack Casing | 0.01 | 0.1 | Top of Casing at Limits of Casing |
| Existing Utilities** | 0.01 | 0.1 | Conflicts |

*Shall conform to the requirements of the “Chapter 61G17-6, ‘Minimum Technical Standards’, FAC”, certified by a Surveyor.

**Existing utilities including but not limited to water, wastewater, reclaimed water, storm, fiber optic cable, electric, gas and structures within the limits of construction.

1.05 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300 “Submittals” and other submittal requirements in the different Articles of this Section and the rest of these specifications.
- B. As a prerequisite for progress payments, the CONTRACTOR shall exhibit the currently updated Record Documents for review by the COUNTY. Payment will be withheld at the COUNTY’S discretion based on the status of the Record Documents or if they are not properly maintained.
- C. The Work will not be placed into operation until the asset attribute data (see Table 01720 Asset Attribute Data Form Example) certified by the Surveyor for the Record Drawings is approved by the County.
- D. Prior to submitting request for final payment or the County issuing a Certificate of Completion for the Work, Contractor shall submit the final Record Documents to the County for approval. Retainage funds will be withheld at the County’s discretion based on the quality and accuracy of the final Record Documents.
- E. Required Submittal Documents:
 1. Full size, hard copy set of the final Record Documents including but not limited to:
 - a. As-built asset attribute data added to the Record Drawings by the Contractor, boundary surveys of pump stations, Surveys and Survey Report for the location of constructed pipes within any easements and pump station site.
 - b. Other Final Record Documents.
 2. Digital Set of the final Record Documents including but not limited to:
 - a. Scanned digital copies of the Record Drawings updated to match the as-asset attribute data table.
 - b. Electronic Survey documents electronically sealed by the Surveyor.
 - c. Final Record Documents information.
 - d. Digital Record Drawing in the Engineer’s current version of AutoCAD file (dwg) format for the Contract Drawings, updated to match the final Record Drawing information.

Table 1720-2
 Asset Attribute Data Form Example

| Asset Type | I.D. Number | Utilities Asset Number | UTILITIES Asset Coordinates | | |
|-------------------------|-------------|------------------------|-----------------------------|----------|-----------|
| | | | Northerly | Easterly | Elevation |
| Bench Marks | BM-1 | | 1605466 | 450720.5 | 86.04 |
| | | | | | |
| Horizontal control | HC-1 | | 1605700 | 450879 | N/A |
| Horizontal control | HC-2 | | 1605333 | 450773.1 | N/A |
| | | | | | |
| Fire hydrant | FH-1 | | 1605630 | 450920.4 | N/A |
| Fire hydrant | FH-2 | | 1605162 | 450024.6 | N/A |
| | | | | | |
| | | | | | Depth |
| Gate valve | GV-1 | | 1605631 | 450533.2 | 2.9 |
| Gate valve | GV-2 | | 1605400 | 450765.8 | 3.4 |
| | | | | | |
| Plug valve | PV-1 | | 1605024 | 450123.7 | 3.3 |
| Plug valve | PV-2 | | 1605626 | 450245.4 | 2.6 |
| | | | | | |
| Blow off valve | BO-1 | | 1605805 | 450057.3 | N/A |
| Blow off valve | BO-2 | | 1605030 | 450126.2 | N/A |
| | | | | | |
| Air release valve | ARV-W1 | | 1605647 | 450939.9 | N/A |
| Air release valve | ARV-FM2 | | 1605978 | 450490.1 | N/A |
| | | | | | |
| Master meter | MM-1 | | 1605290 | 450130.2 | N/A |
| Master meter | MM-2 | | 1605900 | 450883.9 | N/A |
| | | | | | |
| Detector check meter | DCM-1 | | 1605244 | 450848.8 | N/A |
| Detector check meter | DCM-2 | | 1605829 | 450035.9 | N/A |
| | | | | | |
| Clean-out | CO-1 | | 1605290 | 450130.2 | N/A |
| Clean-out | CO-2 | | 1605900 | 450883.9 | N/A |
| | | | | | |
| Force Main Fitting | FMF-1 | | 1605024 | 450123.7 | 3.3 |
| Water Main Fitting | WMF-1 | | 1605626 | 450245.4 | 3.6 |
| Reclaimed Water Fitting | RWMF-1 | | 1605680 | 450302.7 | 3 |

| Asset Type | I.D. Number | Utilities Asset Number | UTILITIES Asset Coordinates | | | Notes | |
|---------------------------------|-------------|------------------------|-----------------------------|----------|---------------|-------------------|---------------------|
| | | | Northerly | Easterly | Elevation | | |
| Water Piping | WM-1 | | 1605290 | 450130.2 | 2.8 | | |
| Force Main Piping | FM-1 | | 1605900 | 450883.9 | 4 | | |
| Reclaimed Water Main Piping | RWM-1 | | 1605900 | 450883.9 | 3.2 | | |
| | | | | | | | |
| Restrained Water Main | RSWM-1 | | 1605631 | 450533.2 | | | Limits of restraint |
| Restrained Force Main | RSFM-1 | | 1605400 | 450765.8 | | | Limits of restraint |
| Restrained Reclaimed Water Main | RSRWM-1 | | | | | | Limits of restraint |
| | | | 1605024 | 450123.7 | | | |
| Water Main Connection | WMC-1 | | 1605626 | 450245.4 | | | |
| Force Main Connection | RMC-1 | | 1605030 | 450126.2 | | | |
| RW Main Connection | RWMC-1 | | 1605805 | 450057.3 | | | |
| | | | | | | | |
| Water B&J Casing | WMBJC-1 | | 1605900 | 450883.9 | | | |
| Force Main B&J Casing | FMBJC-1 | | 1605647 | 450939.9 | | | |
| RW B&J Casing | RWBJC-1 | | 1605978 | 450490.1 | | | |
| | | | | | | | |
| Other Utility Line Conflicts | CONFL-1 | | 1605290 | 450130.2 | | | |
| | | | | | | | |
| | | | | | | | |
| | I.D. Number | Asset Number | 1605829 | 450035.9 | Top Center | Infl. Pipe Invert | Wet Well Bottom |
| PS top center of wetwell | PS-1 | | 1605643 | 450370.8 | 87.04 | 73.25 | 68.20 |
| | I.D. Number | Asset Number | Asset Coordinates | | Top Elevation | Invert Elevations | |
| | | | Northerly | Easterly | | N | S |
| Manhole | MH-1 | | 1605320 | 450196.7 | 88.19 | 73.50 | 73.60 |
| Manhole | MH-2 | | 1605160 | 450726.7 | 87.48 | 75.35 | 75.45 |

1.06 RECORD DOCUMENTS AT SITE

- A. Maintain at the site and always available for County's use one record copy of:
1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.
 2. Change Orders, Verbal Orders, and other modifications to Contract.
 3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).
 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests.
 5. Field test records, inspection certificates, manufacturer certificates and construction photographs.
 6. Partial Surveyor's as-built assets attribute data, pipe deflection data, and gravity main data.
- B. Maintain the documents in an organized, clean, dry, legible condition and completely protected from deterioration and from loss and damage until completion of the Work, transfer of all record data to the final Record Documents and for submittal to the County.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

- A. As-Built Drawings: After obtaining one complete set of all documents comprising the Contract and other Documents described in paragraph 1.06 Record Documents at site, the Contractor shall maintain and create the As-Built Drawings including:
1. Pump station site boundary survey and map report: Provide the pump station site boundary survey showing the real property boundaries and site improvements. The boundary survey field work and survey map shall be performed after the Work at the site has been completed and before the start-up inspection. Provide a survey map report in addition to the boundary survey.
 2. Survey Map Report for the As-Built Asset Attribute Data Table: As a minimum the Survey Map Report shall identify or describe the locations

where the pipe centerline was constructed within three feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary, any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained. Survey map report shall be dated after the Work within the right-of-ways or easements have been completed.

3. Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements and certify a completed table similar to the Table 01720-2 Asset Attribute Data Form Example.
 4. Surveyor shall prepare a certified table to include as a minimum the pipe lengths, manhole inverts, and slopes for gravity mains.
 5. Surveyor shall calculate and prepare a certified table for horizontal and vertical pipe deflections of pipe that will include as a minimum the pipe lengths, coordinates of pipe deflections, horizontal or vertical deflections, the manufacturer's recommendations for pipe deflections, and meets or exceeds the manufacturer's recommendations.
- B. Final Record Documents: Contractor shall provide final version of the Record Documents both as paper copies and electronic format described below.
1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.
 2. Change orders, verbal orders, and other modifications to Contract.
 3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).
 4. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
 5. Field test records, inspection certificates, manufacturer certificates and construction photographs.
 6. As-Built Drawings described in paragraph A. above.

PART 3 - EXECUTION

3.01 MAINTENANCE AND CREATION OF RECORD DOCUMENTS

- A. Promptly following the receipt of the County's notice to proceed, secure from the County, at no charge to the Contractor, one (1) complete electronic set of construction drawings. Maintain the As-Built Drawings and create documents to add to it as described herein.

- B. Construction Progress Meetings
 - 1. Identify each paper document and sample with the title "RECORD DOCUMENTS" using one inch high letters or higher.
 - 2. Print a paper copy of the current draft electronic As-Built Drawings and As-Built Asset Attribute Data Table (all partially constructed improvements).
 - 3. Print a paper copy of the current table shall for pipe deflections (horizontal and vertical) depicting if the deflections meet the manufacturer's recommendations.
 - 4. Print a paper copy of the current table of manhole elevations, pipe lengths, and slopes. The table shall be updated before progress meetings when the wastewater pipes that enter the manholes are backfilled.

- C. Survey Documents: Contractor shall obtain the services of a Surveyor to acquire the As-Built Assets Attribute Data, pump station Boundary Survey(s), and re-establish easement corners with pins if destroyed by the Work.
 - 1. Pump station site boundary survey and map report.
 - 2. Survey Map Report for the As-Built Asset Attribute Data Table.
 - 3. Complete a table similar to the Table 01720-2 Asset Attribute Data Form Example and the final table shall be certified by the Surveyor.
 - 4. Gravity main slope table prepared certified by Surveyor.

- D. Electronic As-Built Drawing Entries:
 - 1. Maintain the electronic As-Built Drawings to accurately record progress of Work and change orders throughout the duration of the Contract.
 - 2. Date all entries. Enter RFI No., Change Order No., etc. when applicable.

3. Call attention to the entry by highlighting with a “cloud” drawn around the area affected.
4. In the event of overlapping changes, use different colors for entries of the overlapping changes.
5. Make entries in the pertinent other documents while coordinating with the Engineer and the County for validity.
6. Entries shall consist of graphical representations, plan view and profiles, written comments, dimensions, State Plane Coordinates, details and any other information as required to document field and other changes of the actual Work completed. As a minimum, make entries to also record:
 - a. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed as well as any changes made by Field Order, Change Order or other.
 - b. Depths of various elements of foundation in relation to finish floor datum and State Plane Coordinates and elevations.
 - c. Plan view and profile drawings, station and offset dimensions, State Plane coordinates for all fittings, valves and appurtenances of underground piping in the Work once lying uncovered in the trench. Show locations for equipment, facilities and other Work relocated or changed in the field.
 - d. When manholes, boxes, or underground conduits and plumbing are involved as part of the Work, record true elevations and locations, dimensions between manholes, slope of gravity mains, invert and top elevations.
 - e. Actually installed pipe or other Work materials, class, pressure rating, diameter, size, specifications, etc. Similar information for other encountered underground utilities, not installed by Contractor, their owner and actual location if different than shown in the Contract Documents.
 - f. Location of utilities, appurtenances and other Work concealed in the construction, referenced to visible and accessible permanent improvements.
 - g. Details, not on original contract Drawings, as needed to show the actual location of the Work completed in a manner that allows the County to find it in the future.

- h. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar items shown schematically on the construction documents and show on the As-Built Drawings the actual horizontal and vertical alignments and locations.
- i. Major architectural and structural changes including relocation of doors, windows, etc. Architectural schedule changes according to contractor's records and shop drawings.

E. Storage and Preservation:

- 1. Store Record Documents and samples at a protected location in the project field office apart from documents used for construction.
 - a. Provide files and racks for storage of documents.
 - b. Provide locked cabinet or secure space for storage of samples.
- 2. File documents and samples in accordance with CSI format with section numbers matching those in the Contract Documents.
- 3. In the event of loss of recorded data, use means necessary to again secure the data to the County's approval.
 - a. Such means shall include, if necessary in the opinion of the County, removal and replacement of concealing materials.
 - b. In such cases, provide replacements of the concealing materials to the standards originally required by the Contract Documents.

3.02 FINAL RECORD DOCUMENTS SUBMITTAL

- A. Refer to Article 1.05 Submittals for relevant information regarding final submittal.
- B. Refer to Article 2.01 for relevant information for Final Record Documents.
- C. Scanned Documents: Scan the Survey Documents and other Record Documents reflecting changes from the Bid Documents.
 - 1. The scanned record drawing sets shall be complete and include the title sheet, plan/profile sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-Built Drawings shall be included in the electronic drawings, with each sheet being converted into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4 at 400 dpi resolution to maintain legibility of each drawing.

Then, the tif images shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set. Review all Record Documents to ensure a complete record of the project

- D. Contractor's Surveyor shall review and check for accuracy the As-Built Drawings and ascertain that all data furnished and other documents are accurate and truly represent the Work as actually installed.
- E. As-Built Drawings: Provide an encompassing digital AutoCAD file that includes all the information of the Drawings and any other graphical information in the As-Built Drawings. It shall include the overall Work, utility system layout and associated parcel boundaries and easements. Feature point, line and polygon information for new or altered Work and all accompanying geodetic control and survey data shall be included. The surveyor's certified as-built asset attribute data shall be added to the As-Built Drawings and Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).
- F. Submit the Final Record Documents at Substantial Completion.
- G. Participate in review meetings as required.
- H. Make required changes and promptly deliver the Final Record Documents to the Engineer and County.

3.03 CHANGES SUBSEQUENT TO ACCEPTANCE

- A. The Contractor has no responsibility for recording changes in the Work after final completion, except for changes resulting from work performed under guarantee.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
 - a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Requirements Described Elsewhere:

1. General Requirements: Division 1.
2. Equipment: Division 11.
3. Special Construction: Division 13.
4. Mechanical: Division 15.
5. Electrical: Division 16.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.
2. Familiar with requirements of this Section.
3. Skilled as technical writer to the extent required to communicate essential data.

4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

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

B. Format:

1. Size: 8-1/2 inches x 11 inches.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches x 17 inches.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of projects and major component parts of equipment.
 - b. Provide identified tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.
7. Provide electronic versions of each submittal in PDF format with bookmarks for each section. Once each O&M manual is approved, Contractor shall provide one (1) PDF version of all O&M manuals combined into one file with bookmarks and a searchable table of contents.

C. Binders:

1. Commercial quality, three D-ring type binders with durable and cleanable white plastic covers. Binders shall be presentation type with clear vinyl covers on front, back and spine. Binders shall include two sheet lifters and two, horizontal inside pockets.
2. Maximum D-ring width: 2 inches.
3. When multiple binders are used, correlate the data into related consistent groupings.

1.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to content of the volume.
3. List, with each product, name, address and telephone number of:
 - a. Subcontractor, manufacturer and installer name, addresses and telephone numbers.
 - b. A list of each product required to be included, indexed to content of the volume.
 - c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement equipment including name, address and telephone number.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:

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

1.05 MANUAL FOR MATERIALS AND FINISHES

- A. Submit six (6) copies of complete manual in final form and six (6) electronic PDF copies and one (1) Microsoft Word version.

- B. Content: for architectural products, applied materials and finishes:
 - 1. Manufacturer's data, giving full information on products.
 - a. Catalog number, size, composition.
 - b. Color and texture designations.
 - c. Information required for reordering special manufacturing products.
 - 2. Instructions for care and maintenance.
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods which are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- C. Content, for moisture protection and weather-exposed products:
 - 1. Manufacturer's data, giving full information on products.
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 - 2. Instructions for inspection, maintenance and repair.
- D. Additional requirements for maintenance data: Respective sections of Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit six (6) copies of complete manual in final form and six (6) electronic PDF copies and one (1) Microsoft Word version.
- B. Content, for each unit of equipment and system, as appropriate:
 - 1. Description of unit and component parts.

- a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Summary of information listed on equipment and motor data plates.
2. Operating procedures:
- a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
3. Maintenance procedures:
- a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
4. Servicing and lubrication required.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
- a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.
 9. Each Contractor's coordination drawings.
 - a. As-installed color coded piping diagrams.
 10. Charts of valve tag numbers, with location and function of each valve.
 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of specifications.
 13. Approved record shop drawings with all corrections made, and a copy of the warranty statement, checkout memo, demonstration test procedures and demonstration test certification.
- C. Content, for each electric and electronic systems, as appropriate:
1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories and panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.

5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.
 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 8. Other data as required under pertinent sections of specifications.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.07 SUBMITTAL SCHEDULE

- A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents of Operation and Maintenance Manuals within 90 days after Notice to Proceed.
- B. Submit two (2) copies of completed data in preliminary form no later than 20 days following Engineer's review of the last shop drawing of a product and/or other submittal specified under Section 01340, but no later than delivery of equipment. One (1) copy will be returned with comments to be incorporated into the final copies and the other copy will be retained on-site for use in any early training.
- C. Submit six (6) copies of approved manual in final form directly to the offices of the Engineer within 10 days after the reviewed copy or last item of the reviewed copy is returned.
- D. Provide six (6) copies of addenda to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to demonstration test, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with Owner's operating and maintenance personnel in full detail to explain all aspects of operations and maintenance.
- C. All on-site training shall require both classroom instruction and field instruction. Allow Owner's personnel to attend each session for each major system and equipment. A minimum of two (2) days shall be allotted for each session, unless additional time is required in the individual equipment specifications.
- D. Instructors shall be fully qualified personnel as outlined within the individual equipment specifications. If no specific training specifications are listed with the equipment, the Contractor shall provide the instruction with qualified Contractor personnel.
- E. The Contractor shall provide a list to the Owner indicating the proposed date, time and instructors that will be present for all training sessions. The Owner will review and approve the training schedule prior to training events and facilitate the classroom training location as needed.
- F. The instructors shall provide for and prepare lesson scopes and handouts for individuals designated by the Owner that outline the items to be covered. Separate sessions for operation and maintenance instruction shall be provided consecutively. Handouts shall be submitted to the Owner with at least one week's notice prior to the training sessions.
- G. All instruction sessions shall be recorded with portable DVD recording cameras and DVDs supplied by the Contractor. DVD recording shall be made by the Contractor under the direction of the Owner using DVD compatible recording equipment and shall include audio recording. Provide C.A.R. for scheduling training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Described Elsewhere:

1. Contract Closeout: Section 01700.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two (2) each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product of work item.
2. Firm, with name of principal, address and telephone number.
3. Scope.
4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity or warranty or bond.
7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inches by 11 inches, punch sheets for standard three (3) ring binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three (3) D-ring type binders with durable and cleanable white plastic covers and maximum D-ring width of two (2) inches. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year, unless otherwise specified, commencing at Final completion of the project.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Divisions 11: Equipment; 13: Special Construction; 15: Mechanical; and 16: Electrical and which has at least a 1 hp motor or which lists for more than \$1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
- C. The Owner shall incur no labor or equipment cost during the guarantee period.

- D. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer or the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01800

MISCELLANEOUS WORK AND CLEANUP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

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

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 RESTORING OF FENCES

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

3.02 CLEAN UP

- A. The Contractor shall remove all construction material, buildings, equipment and other debris remaining on the job as the result of construction operations and shall render the site of the work in a neat and orderly condition. All suitable excess excavated material shall remain on site.

3.03 INCIDENTAL WORK

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

END OF SECTION

DIVISION 2

SITework

SECTION 02050

DEMOLITION

PART 1-GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This section includes furnishing all labor, materials, equipment, and incidentals required for demolition of the existing gaseous chlorine feed system, sodium hydroxide system, fire sprinkler system and HVAC equipment located in the former Chlorine Building; existing flow meter vault and flow meter; and additional site demolition as shown in the drawings and as specified herein.
2. This section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping mechanical, electrical, existing (to be abandoned) piping and miscellaneous appurtenances encountered during demolition operations.
3. The sequence of demolition of the existing structures will be in accordance with the approved Demolition and Removal Plan as specified in Paragraph 1.06 of this Section. The Contractor is solely responsible for the demolition sequencing of the work.
4. The Contractor shall be responsible for:
 - a. Approximate locations and dimensions of piping and structures are shown in the Contract Drawings demolition plans.
 - b. All piping and equipment to be demolished associated with the Western Regional Water Supply Facility Improvements shall be demolished and removed according to this Specification.
 - c. Capping of all subsurface water piping as referenced in the Contract Drawings demolition plan.
 - d. Termination and plugging of all subsurface water piping as referenced in the Contract Drawings demolition plans.
 - e. Termination of all electric in accordance with local codes and NEC.
 - f. Final grading and site restoration.
 - g. Disposal of non-salvageable and excess unacceptable materials as specified below.
 - h. All concrete tankage and slabs shall be removed before filling and compacting the depression with clean fill.

- i. The fire hydrants and old flow meter vault located by the old chemical building shall be removed.
 - j. Water service shall not be disturbed, irrigation piping shall not be disturbed, and overhead electric shall not be disturbed except as noted above.
- 5. The Contractor shall examine the various drawings regarding the proposed site, visit the proposed site and determine for himself the extent of the work, the extent of the work affected therein and all conditions under which he is required to perform the various operations.

1.02 PERMITS AND NOTICES

- A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses performing the work and shall furnish a copy of same to the Engineer prior to commencing work. The Contractor shall comply with the requirements of the permits.
- B. Notices: If applicable, Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Engineer.
- C. Utility Services: If applicable, Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove equipment owned by them in structures to be demolished and to remove, disconnect, cap or plug their services to facilities demolition.
- D. Contractor shall obtain a permit from the Office of the Fire Marshall for the demolition of the fire sprinkler system in the former Chlorine Building. Decommission and removal of the existing fire sprinkler system shall be performed by a licensed fire sprinkler contractor.

1.03 CONDITIONS OR STRUCTURES

- A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variation within the structure may occur prior to the start of demolition work.

1.04 RULES AND REGULATIONS

- A. The Standard Building Codes shall control demolition, modification or alteration of the existing buildings or structures.

- B. No blasting shall be done on site. The Contractor shall not bring or store any explosives on site.

1.05 DISPOSAL OF MATERIAL

- A. Salvageable material shall become the property of the Owner, if the Owner requests any specific item. The Contractor shall dismantle all materials to such a size that it can be readily handled, and deliver any of this salvageable material requested by the Owner to a storage area designated by the Owner.
- B. The following type of materials are examples of what the Owner desires to keep:
 - 1. Pipes and valves.
 - 2. Equipment.
 - 3. Miscellaneous metals and other materials at the discretion of the Owner.
- C. Any materials that the owner rejects shall become the Contractor's property and must be removed from the site.
- D. Concrete, concrete block and non-salvageable bricks shall be diverted to a recycle facility or hauled to a waste disposal site by the Contractor.
- E. All other non-recyclable or salvageable material shall be hauled to a waste disposal site by the Contractor.
- F. The storage, or sale, of removed items on the site will not be allowed.
- G. The Contractor is responsible for the dewatering of pipelines.

1.06 SUBMITTALS

- A. Submit to the Engineer for approval, two (2) copies of the proposed demolition and removal plan for the structures and modifications as shown on the Drawings or as specified herein prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility service as required.

The demolition and removal plan shall include as a minimum, the following:

- 1. A detailed sequence of demolition and removal work to insure the uninterrupted progress of the Owner's operations, and the expeditious completion of the Contractor's work.
- 2. Evidence (by signature) of approval of the Owner's plant operator of the work plan.

- B. Before commencing demolition work, all modifications necessary to bypass the affected structure will be completed. Contractor shall coordinate with the Owner's personnel to determine the locations of the affected valves and fittings.

1.07 TRAFFIC AND ACCESS

- A. Conduct demolition and modification operation, and the removal of equipment and debris to ensure minimum interference with roads, streets or walks both on-site and off-site and to ensure minimum interference with occupied or used facilities.
- B. Special attention is directed towards maintaining safe and convenient access to the existing site.
- C. Do not close or obstruct streets or walks without permission from the Owner and Engineer. Provide alternate traffic routes around closed or obstructed access ways.

1.08 DAMAGE

- A. Promptly repair damage caused to adjacent facilities or structures within the Western Regional Water Supply Facility by demolition operations and at no cost to the Owner.

1.09 UTILITIES

- A. Maintain existing utilities to remain in service and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Owner and the Engineer. Provide temporary service during interruptions to existing utilities as acceptable to the Owner.
- C. The Contractor shall cooperate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.
- D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under this jurisdiction of utility companies.
- E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.10 POLLUTION CONTROL

- A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions or work. Comply with the governing regulations.
- B. Clean structures and improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer. Return areas to conditions existing prior to the start of work.

1.11 QUALITY CONTROL

- A. Protect all existing materials and equipment either in operation or to be salvaged or reused, from damage.
- B. Cap or plug all lines to be abandoned. Place covers and label all junction boxes, conduits, and wire as abandoned.
- C. Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 – MATERIALS (NOT USED)

PART 3 – EXECUTION

3.01 SEQUENCE OF WORK

- A. The sequence of demolition and renovation of existing facilities will be in accordance with the approved demolition and removal plan as specified in Paragraph 1.06 of this section.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING AND APPURTENANCES

- A. Existing equipment, piping, buried and non-buried valving, and appurtenances shall be removed or abandoned in-place as shown or dictated on the Drawings, and/or specified herein.
- B. All equipment piping and appurtenances shall be cleaned, flushed, and drained. Equipment to be retained by the Owner as specified in Paragraph 1.05 above shall be dismantled sufficiently to permit thorough cleaning and draining. All valves shall be left open. All abandoned piping shall be capped and sleeves and openings remaining after removal of the existing equipment, piping, and

appurtenances shall be plugged and sealed as shown on the Drawings, and/or specified herein.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work to be performed under this Section shall include the design and installation of a temporary wellpoint system until completion of construction to dewater subsurface waters from structures as required. Contractor shall obtain all permits for the dewatering operations.
- B. Related Work Described Elsewhere:
 - 1. Shop Drawings, Working Drawings, and Samples: Section 01340.
 - 2. Earthwork: Section 02200.

1.02 QUALITY ASSURANCE

- A. Qualifications: The temporary dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date.
- B. Standards: The dewatering of any excavation areas and the disposal of water during construction shall be in strict accordance with all local and State government rules and regulations.

1.03 SUBMITTALS

- A. Materials and Shop Drawings: Shop drawings required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 01340: Shop Drawings, Working Drawings, and Samples. Submittals shall include at minimum the following:
 - 1. Design notes and drawings.
 - 2. Descriptive literature of the temporary dewatering system.
 - 3. Layout of all piping involved.
 - 4. Bill of materials.

1.04 CRITERIA

- A. The wellpoint system shall be developed to the point that is capable of dewatering such that groundwater levels are maintained at least three (3) feet below the bottom of excavations. Each wellpoint system shall be capable of dewatering and maintaining groundwater levels at the respective structures. Observation wells shall be constructed for the purpose of testing each system.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The equipment specified herein shall be standard dewatering equipment of proven ability as designed and manufactured by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods.
- B. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the work and require such modifications as may be required to assure that the systems will perform satisfactorily. Dewatering systems shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils and to preserve the integrity of adjacent structures.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Dewatering: The Contractor shall install a temporary wellpoint dewatering system for the removal of subsurface water encountered during construction of the proposed structures.

3.02 PROTECTION AND SITE CLEAN-UP

- A. At all times during the progress of the Work the Contractor shall use all reasonable precautions to prevent either tampering with the wellpoints or the entrance of foreign material.
- B. After the wellpoint system is no longer needed, the Contractor shall remove all of his equipment, materials, and supplies from the site of the work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the Engineer.

END OF SECTION

SECTION 02200

EARTHWORK

PART I - GENERAL

1.01 DESCRIPTION

- A. **Scope of Work:** The work included under this Section consists of dewatering, excavating, trenching, sheeting/shoring, filling, grading, backfilling, and compacting those soil materials required for the construction of the embankments, structures, piping, ditches, utility structures and appurtenances as shown on the Drawings and specified herein.
- B. **Definitions**
1. **Maximum Density:** Maximum weight in pounds per cubic foot of a specific material as determined by ASTM D1557.
 2. **Optimum Moisture Content:** The optimum moisture content shall be determined by ASTM D 1557 to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.
 3. **Rock Excavation:** Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
 4. **Suitable:** Suitable material shall be non-cohesive, non-plastic granular local sand that is free from vegetation, organic material, marl, silt or muck. The materials shall also meet detailed requirements specified herein. The Contractor shall furnish all additional fill material required.
 5. **Unsuitable:** Unsuitable materials are highly organic soil (peat or muck) classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 in accordance with AASHTO Designation M 145.
- C. **Plan For Earthwork**
1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered,

the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work.

2. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall reflect the equipment and methods to be employed in the excavation. Prices established in the Proposal for the work to be done will reflect all costs pertaining to the work. No claims for extras based on substrata or groundwater table conditions will be allowed.
- D. Trench Safety Act: The Contractor shall comply with all of the requirements of the Florida Trench Safety Act (Chapter 90-96, CS/CB 2626, Laws of Florida). The Contractor shall acknowledge that included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act.
- E. Related Work Described Elsewhere
1. Shop Drawings, Working Drawings, and Samples: Section 01340.
 2. Testing and Testing Laboratory Services: Section 01410.
 3. Temporary Erosion and Sedimentation Control: Section 01568.
 5. Dewatering: Section 02140.
 6. Mechanical: Division 15.

1.02 APPLICABLE PUBLICATIONS

- A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE

- A. The requirements for testing and laboratory services are specified in Section 01410: Testing and Testing Laboratory Services.

1.04 FEDERAL AND STATE REGULATORY REQUIREMENTS

- A. All trench excavations which exceed 5 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S. 1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act."

1.05 JOB CONDITIONS

- A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price.

1.06 SUBMITTALS

- A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction and backfilling for the various portions of the work. Review shall be for information only. The Contractor shall remain responsible for the adequacy and safety of the methods. Where sheeting and bracing is required for construction, the design shall be performed by a Professional Geotechnical Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. All fill material from on and off-site sources shall be subject to the approval of the Engineer.
2. All fill material shall be unfrozen and free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material

1. Common Fill shall be sand not containing stones, rock, concrete or other rubble larger than 2 inches in diameter. No more than 10% of the material, by weight, shall pass a 200 mesh sieve and organic matter in the material shall be less than 1% by weight.
2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.
3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

C. Select Common Fill

1. Select Common Fill material shall be free from stones larger than 1 1/2 inches and no more than 5% of the material shall pass a 200 mesh sieve. The amount of organic matter in the material shall not exceed 1% by weight.
2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.
3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

D. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

| <u>U.S. Sieve Size</u> | <u>Percent Passing By Weight</u> |
|------------------------|----------------------------------|
| 1 - inch | 100 |
| No. 4 | 75-100 |
| No. 40 | 15-80 |
| No. 100 | 0-30 |
| No. 200 | 0-10 |

E. Bedding Rock: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

| <u>U.S. Sieve Size</u> | <u>Percent Passing By Weight</u> |
|------------------------|----------------------------------|
| 1/2 | 100 |
| 3/8 | 90-100 |
| No. 4 | 20-55 |
| No. 8 | 5-30 |
| No. 16 | 0-10 |
| No. 50 | 0-5 |

F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clearing and grubbing shall be performed in accordance with Section 02110.
- B. Protection
 - 1. Sheeting and Bracing:
 - a. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Owner is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.
 - b. The Contractor shall construct sheeting outside the neat lines of the foundation unless another configuration is desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. Any deformation shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
 - c. Where sheeting and bracing is required for construction, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall conform with the design, and certification of this shall be provided by the Professional Geotechnical Engineer.
 - d. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.

- e. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the Owner directs him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.
- f. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the Owner.
- g. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
- h. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one (1) foot above the top of any pipe.

2. Pumping and Drainage

- a. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The installed dewatering system shall be in conformity with the overall construction plan. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
- b. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bottom of the excavation and to preserve the integrity of adjacent structures. Well or

sump installations shall be constructed with proper sand filters to prevent intermixing of finer grained soil from the surrounding ground.

- c. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
- d. The Contractor shall take all additional precautions to prevent buoyant uplift of any structure during construction.
- e. The conveying of dewatered liquids in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. The Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the Owner or the authority having jurisdiction, at no cost to the Owner.
- f. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
- g. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by the Contractor.
- h. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.02 EXCAVATION

A. General

- 1. Excavation consists of removal, storage and disposal, if necessary, of material encountered when establishing required grade elevations and in accordance with the notes shown in the Drawings.
- 2. Sandy Organic Muck identified in the Geotechnical Investigation and other unsuitable materials shall be removed under all proposed structures, pipes, and roads. Also, the unsuitable materials described above shall be removed outside of

the structures, pipes, and roads by a margin equal to the depth of material, or 5 feet, whichever is greater. Replacement material shall be Common Fill placed and compacted as specified herein.

3. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
4. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the Engineer. Unauthorized excavation, as well as remedial work shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise specified or directed by the Engineer.
5. When excavation has reached required subgrade elevations, make an inspection of conditions. If the material is unsuitable or has clay and/or organic material, and if authorized by Engineer to remove, carry excavation deeper and replace excavated material with Bedding Rock. Removal and replacement of unsuitable subgrade material, as directed by the Engineer, will be paid for as extra work by unit prices established in the Bid Form.
6. If the Contractor excavates below grade through error or for his own convenience or through failure to properly dewater the excavation or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the preceding paragraph, in which case the work of excavating below grade and finishing and placing the refill shall be performed at his own expense.
7. Stockpile satisfactory excavated materials at a location approved by the Engineer until required for backfill or fill. Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located away from the edge of excavations. Excess soil materials shall be disposed of by the Contractor.

B. Trench Excavation

1. Excavation for all trenches required for the installation of pipes shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry.

2. Excavation shall not exceed normal trench width. Normal trench width is defined as indicated on the Drawings. Any excavation which exceeds the normal trench width, shall require special backfill requirements as determined by the Engineer.
3. Rock shall be removed to provide at least eight inches clearance around the bottom and sides of the pipe being laid.
4. Where pipe is to be laid in Bedding Rock or encased in concrete, the trench may be excavated to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
5. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. Manually trim and shape trench bottom to receive pipe at correct line and grade. Shape trench to provide a uniform, continuous support along the entire length of the barrel of each pipe section. Hand-shape firm unyielding bedding so that the bottom segment will be in continuous contact with the pipe barrel.

3.03 PLACEMENT OF MATERIALS

A. Fills

1. Material placed in fill areas shall be deposited within the lines and to the grades shown on the Drawings making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved. If sufficient Common Fill material is not available from excavation on site, the Contractor shall provide borrow as required.
2. Fill shall be brought up in substantially level lifts not exceeding 8 inches in depth. The entire surface of the work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section. Fill shall not be placed against concrete structures until they have attained sufficient strength.
3. During the process of placing fill, all roots, debris and stones greater in size than specified herein shall be removed from the fill areas and the Contractor shall assign a sufficient number of employees to this work to insure satisfactory compliance with these requirements.
4. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.
5. All fill materials shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas as required to perform the work in such a manner

that will preserve the undisturbed state of the natural soils. The Contractor shall not claim excavated material as unsuitable due to moisture content. The Contractor shall sufficiently dewater excavated materials for use as backfill.

6. Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials. Plow strip or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with the existing surface.
7. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each classification.

B. Bedding and Backfilling for Pipes

1. Bedding for pipe shall be as shown on the Drawings. The Contractor shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.
2. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with suitable material to the mid-diameter of the pipe. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings.
3. After the pipe is laid to line and grade, place and carefully compact pipe bedding material for the full width of the trench to the springline of the pipe. Place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping equipment supplemented by "walking in" and slicing with a shovel to assure that all voids are filled. Place backfill in 6-inch layers and carefully compact the area above the pipe springline with pipe cover material to a point 12 inches above the top outside surface of the pipe barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material. The backfilling shall be carried up evenly on both sides of the pipe. The remainder of the trench backfill shall then be filled and thoroughly compacted in uniform layers not exceeding 12 inches in depth.

- C. Backfill around structures shall be placed in uniform layers not exceeding 8 inches in depth. Backfill material shall be Common Fill meeting requirements set forth in Paragraph 2.01. All backfill shall be placed and compacted "in-the-dry." Backfill operations around structures shall not be started until the concrete has attained sufficient strength to resist the loads imposed by the backfill material.

3.04 COMPACTION

A. General

1. The Contractor shall control soil compaction during construction to provide the densities specified. It shall be the Contractor's responsibility to notify the Engineer in writing that compaction tests can be performed. Written notice from the Contractor shall precede completion of compaction operations by at least two (2) working days.
2. Material which is too wet shall be spread over the fill area and permitted to dry, assisted by harrowing if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied to provide a satisfactory moisture content. If too much water is added, the area shall be permitted to dry before compaction is continued. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and other materials and equipment necessary to place water in the fill in the manner specified.
3. When a trench or excavation bottom has a density less than that specified herein for the particular area classification, the Contractor shall compact the material to the required depth and percentage of maximum density.

B. Percentage of Maximum Density Requirements

1. All fill and backfill in unpaved areas shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557, unless specified otherwise.
2. All fill and backfill under roadways, driveways, sidewalks, or any other type of paving, shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557.

C. Special Foundation Preparation Requirements for Process Structures and Buildings

1. After clearing, grubbing, and removal of unsuitable materials, the existing ground beneath proposed tanks, building foundations and equipment base slabs and slabs on grade shall be removed and the area proof-rolled. Proof-rolling shall consist of at least 10 passes of a self-propelled roller that imparts a force of not less than 40,000 pounds per drum to the soils. Each pass shall overlap the preceding pass by 30 percent to insure complete coverage. The areas shall be compacted to a density of not less than 95 percent of Modified Proctor Dry Density as determined by ASTM D1557 (latest edition) for a depth of not less than 2-feet below the bottom of the foundations or concrete slabs. Any unsuitable foundation material shall be removed and replaced with Common Fill.

2. Any soft soils found as a result of proof-rolling shall be excavated in accordance with Paragraph 3.02 and replaced with Common Fill placed in lifts not exceeding 8 inches in depth.

3.05 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers.
- B. If, in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.06 FINAL GRADING

- A. After other earthwork work has been finished, and filling and backfilling operations are completed, all areas on the site of the work which are to be graded shall be brought to grade within a tolerance of +/- 0.1 feet at the indicated elevations, slopes, and contours where seeding or sodding is not required or, where sodding is required, within three (3) inches of finished grade. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least one percent shall be provided.

3.07 EXCESS EXCAVATED MATERIALS

- A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All excess excavated material shall be disposed of off-site by the Contractor.
- B. The Contractor shall segregate different types of excavated materials (i.e. sands, clayey sands) in the stockpile area. All unsuitable materials shall be disposed of by the Contractor offsite in a legal manner.
- C. The Contractor shall slope and compact the stockpile with a light roller to maintain stability.
- D. The Contractor shall maintain proper soil and erosion control measures.

END OF SECTION

SECTION 02822

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. Furnish all labor, materials, equipment and incidentals required to prepare lawn bed and install sodding as specified.
2. Areas to receive sodded grass lawns are all areas disturbed by construction at the Water Treatment Plant.

B. Related Work Described Elsewhere

1. Shop Drawings, Working Drawings, and Samples: Section 01340.
2. Earthwork: Section 02200.

1.02 QUALITY ASSURANCE (NOT APPLICABLE)

1.03 SUBMITTALS

- A. Provide technical data as required in Section 01340 regarding all materials or installation procedures required under this Section.
- B. Submit representative topsoil samples for analysis by a private laboratory to determine nutrient deficiencies and outline a proper fertilization program.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division may be used, but the Contractor shall furnish additional loam at his own expense, if required.

2.02 SOIL CONDITIONERS

A. Fertilizer:

1. Fertilizer shall be a complete fertilizer, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with State and Federal fertilizer laws.
2. Fertilizer shall be 6% nitrogen, 6% phosphorus and 6% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen.
3. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. Store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.

B. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 20 available phosphoric acid.

C. Lime shall be ground limestone.

2.03 SOD

A. Sod shall be Argentine Bahia of firm texture having a compacted growth and good root development as approved.

B. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type, and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.

C. Before being cut and lifted the sod shall have been mowed 3 times with the final mowing not more than a week before cutting into uniform dimensions.

PART 3 - EXECUTION

3.01 PREPARATION

A. Areas to be sodded shall be cleared of all rough grass, weeds, and debris, and ground brought to an even grade as approved.

- B. The soil shall then be thoroughly tilled to a minimum 8 inch depth.
- C. Loam shall be placed to a minimum depth of 4 inches and shall be lightly compacted. No loam shall be spread in water.
- D. Lime shall be applied at a rate necessary to achieve a pH of 6 to 7.
- E. Apply superphosphate at a rate of 5 pounds per 1,000 square feet and apply fertilizer at a rate of 16 pounds per 1,000 square feet.
- F. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.02 INSTALLATION

- A. During delivery, prior to planting, and during the planting of the lawn areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and protected so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope and with the joints offset relative to upper and lower panels. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.
- C. Bring the sod edge in a neat, clean manner to the edge of all paving and shrub areas. Top dressing with approved, clean weed free sand may be required at no additional cost to the Owner if deemed necessary by the Engineer.

3.03 MAINTENANCE

- A. The Contractor shall produce a dense, well established lawn. The Contractor shall be responsible for the repair and resodding of all eroded or bare spots until project acceptance and during the warranty period. Repair sodding shall be accomplished as in the original work except that fertilizing may be omitted. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Sodded areas shall receive no less than 1.5 inches of water per week.
- B. Contractor shall mow sod until Final Completion.

3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATIONS

- A. Lawn areas planted under this Contract and lawn areas outside the designated areas damaged by Contractor's operations shall be repaired at once by proper sod bed preparation, fertilizing and resodding, in accordance with these Specifications.

END OF SECTION

DIVISION 3
CONCRETE

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Footings.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Suspended slabs.
 5. Concrete toppings.
 6. Building frame members.
 7. Building walls.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 2. Water/cement ratio (total gallons of water per cubic yard).
 3. Brand, type, and quantity of cement.
 4. Type and quantity of aggregates.
 5. Type and quantity of admixtures.

6. Type, composition, and quantity of fly ash, slag (GGBFS), or silica fume.
 7. Unit weight (wet density).
 8. Composition strength based on 28-day compression test.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Engineer.
- F. Samples: For waterstops vapor retarder.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer manufacturer testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Floor and slab treatments.

9. Bonding agents.
 10. Adhesives.
 11. Vapor retarders.
 12. Joint-filler strips.
 13. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Submit laboratory test reports for concrete mix design, aggregates (particularly deleterious materials in coarse aggregate) and fly ash, slag (GGBFS) and silica fume (if used) 4 weeks before scheduled pouring.
1. For mass concrete, submit laboratory test report on the heat of hydration for the trial mix design if requested by Engineer. Trial mix design shall consist of concrete block 4-foot by 4-foot by 4-foot.
- F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- G. Field quality-control reports.
1. Submit written reports to Engineer documenting testing and inspection results.
 2. Submit mill test reports on reinforcement.
 3. Submit materials certificates in lieu of laboratory test reports on other materials. Manufacturer and Contractor shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements. Submit certification from admixture manufacturers that chloride content complies with specification requirements.
- H. Minutes of preinstallation conference.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade in the location indicated or, if not indicated, as directed by Engineer.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- I. Preinstallation Conference: Conduct conference at Project site.
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.07 PROJECT CONDITIONS

- A. Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 2. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Deformed-Steel Wire: ASTM A 496/A 496M.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, except use Type III where applications require high-early-strength or Type II where required by Engineer for corrosive environments.
 - 2. Use one brand of cement throughout Project, unless otherwise acceptable to Engineer.
- B. Fly Ash: ASTM C 618, Type C or Type F (corrosive environments) with loss on ignition not more than 6 percent.
- C. Ground Granulated Blast-Furnace Slag: ASTM C 989.
- D. Silica Fume: ASTM C 1240, amorphous silica.
- E. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record

data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

F. Water: ASTM C 94/C 94M.

G. Potable Water Structures: For surfaces in contact with potable water, use only materials approved by Department of Public Health of the state that has jurisdiction.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.1 percent chloride ions.
2. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. Water Reducing, Nonchloride Accelerator Admixture: ASTM C 494, Type E.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.06 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches (25 to 57 mm) long.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Monofilament Micro-Fibers:
 - 1) Axim Italcementi Group, Inc.; Fibrasol II P.
 - 2) Euclid Chemical Company (The), an RPM company; Fiberstrand 150.
 - 3) FORTA Corporation; FORTA Econo-Mono.
 - 4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) Nycon, Inc.; ProConM.
 - 7) Propex Concrete Systems Corp.; Fibermesh 150.
 - 8) Sika Corporation; Sika Fiber PPM.

2.07 WATERSTOPS

- A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
 - 1. JP Specialties, Inc.
 - 2. Sika Corporation
 - 3. Vinylex Waterstop & Accessories
 - 4. Westec Barrier Technologies
 - 5. Profile: As indicated.
 - 6. Dimensions: as indicated on the structural drawings.
- B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. BoMetals, Inc
 - 2. Paul Murphy Plastics Company
 - 3. Sika Corporation
 - 4. Vinylex Waterstop & Accessories
 - 5. Profile: as indicated on the structural drawings.
 - 6. Dimensions: as indicated on the structural drawings.

- C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
 - 1. Carlisle Coatings & Waterstop
 - 2. CETCO
 - 3. Concrete Sealants Inc.
 - 4. Henry Company, Sealants Division
 - 5. JP Specialties, Inc.
 - 6. Sika Corporation

- D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).
 - 1. Adeka Ultra Seal/OCM, Inc.
 - 2. Sika Corporation
 - 3. Vinylex Waterstop & Accessories

2.08 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Fortifiber Building System
 - 2. Raven Industries, Inc.
 - 3. Stego Industries, LLC

- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.

2.09 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. BASF Construction Chemical
 - 2. ChemMasters, Inc.
 - 3. Dayton Superior
 - 4. Euclid Chemical Company
 - 5. Kaufman Products, Inc.
 - 6. L&M Construction Chemical
 - 7. Lambert Corporation
 - 8. Metalcrete Industries
 - 9. Nox-Crete Products Group
 - 10. Sika Corporation
 - 11. SpecChem
 - 12. Symons by Dayton Superior
 - 13. TK Products Unitex by Dayton Superior
 - 14. Vexcon Chemicals Inc.
 - 15. W.R. Meadows, Inc.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- C. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixes for each concrete class and strength by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use independent testing facilities acceptable to Engineer for preparing and reporting proposed mix designs. Testing facility shall not be identical to that used for field quality control testing.

- B. Fly ash shall be used to partially supplant cement content in Class A and Class S concrete, unless noted otherwise, and is optional in other classes. Replacement quantity of cement content by weight shall be not less than 15 percent for Class A and Class S concrete or more than 25 percent for all classes except Class F.

- C. For concrete Class A and Class S, concrete mix design with fly ash and silica fume shall be maximum 30 percent of cement content by weight, and shall constitute no more than 20 and 10 percent, respectively, of the total weight of cementitious materials.
- D. For concrete, Class S, use Portland cement Type II with fly ash, Type F.
- E. Ground granulated blast furnace slag (GGBFS) shall only be permitted for mass concrete placement and as approved by Engineer. Replacement quantity of cement content weight shall not be less than 35 percent or more than 50 percent.
- F. Coarse aggregate shall be 1-1/2" top size, except for Class G concrete which shall be 3/8" top size.
- G. Design mixes to provide normal weight concrete for following classes and properties:
 - 1. Locations for concrete classes are as follows:
 - a. Class A Structural concrete (slabs, walls, columns, beams, equipment bases, and slab toppings 2 inches or greater in thickness). Note: High range water-reducing admixture shall be used for all concrete walls
 - b. Class S Sulfate resistant structural concrete (slabs, walls, columns, and beams) where indicated on Drawings.
 - c. Class G Grout fill for use in sweeping in final surfaces in sanitary structures and slab toppings less than 2 inches in thickness.
 - d. Class P Exterior pavements (unless otherwise indicated on Drawings).
 - e. Class B Sidewalks and manhole bases (unless otherwise indicated on Drawings).
 - f. Class C Fill within manholes, mud mats, fill under structures, encasement for piping below or adjacent to structures and encasement for floor drains, sewer inlets and similar items.
 - g. Class F Flowable fill for filling spaces as permitted and directed by Engineer.
 - 2. Properties for concrete classes are as follows:

| Concrete Class | | A | S | G | P | B | C | F |
|---|----------|----------|----------|----------|----------|----------|----------|-----------|
| 28-Day* Compressive Strength (f'c), psi | | 4,000 | 5,000 | 4,000 | 3,500 | 3,000 | 2,000 | 50-100 |
| Cement Content per cubic yard of concrete, sacks minimum ** | | 6 | 7 | 6 | 5.5 | 5 | 4 | 0.4-3.0 |
| Water/Cement Ratio by weight, maximum | | 0.44 | 0.40 | 0.44 | 0.44 | 0.58 | 0.75 | 0.40-0.75 |
| Air Content, percent by volume | | 5±1 | <4 | 5±1 | 6.5±1.5 | 6.5±1.5 | NA | NA |
| Slump at point of placement, inches. | WR*** | 2-4 | 2-4 | 2-4 | 2-4 | 3-5 | 3-6 | NA |
| | MRWR | 4-6 | 4-6 | 4-6 | 4-6 | NA | NA | NA |
| | HRWR**** | 6-8 | 6-8 | 6-8 | 6-8 | NA | NA | NA |
| Monofilament Polypropylene, Type F1 | | NA | NA | NA | NA | NA | NA | NA |

- * 7-day compressive strength for high-early-strength concrete.
56-day compressive strength for mass concrete with ground granulated blast furnace slag.
- ** For concrete with fly ash, values are total of cement plus fly ash (except Class F concrete).
- *** Slump prior to the addition of mid-range or high-range water reducers.
- **** High range water-reducing admixture shall be used for all concrete walls.

3. Adjustment of Concrete Mixes: Mix designs may be adjusted when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, when approved by Engineer, at no additional cost to Owner. Submit laboratory test data for revised mix design and strength results to Engineer before using in work.

4. Admixtures:

- a. Use water-reducing admixture or high range water-reducing admixture (superplasticizer) in concrete for placement and workability.
- b. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
- c. Add air-entraining admixture at manufacturer's prescribed rate to result in placed concrete having total air content specified.
- d. Use nonstructural synthetic reinforcement, monofilament polypropylene Type F1 in Class A concrete for exposed exterior surfaces without earth covering, and as specified by Engineer for other concrete mix design. Bottom slabs of open concrete tanks do not require synthetic reinforcement. The synthetic reinforcing fibers shall be added to the concrete mix at the rate of 1.5 pounds per cubic yard and in accordance with manufacturer's recommendations.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
- B. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use

setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. Vertical Forms not supporting concrete weight may be removed when concrete has sufficiently set to resist damage from removal operation.
- B. Other forms shall be left in place until concrete has attained strength to support its own weight and construction live loads, unless removed in sections, and each structural section immediately reshored.
- C. Time Periods: Forms remain in place as shown in table below. If form removal occurs before time shown in the table, apply curing procedures previously specified.

Minimum Time Forms are to Remain in Place:

| Part of Structure | Average Air Temperature* During Period | |
|--|---|-----------------|
| | 40 - 50 degrees F | 50 degrees F |
| Walls, columns and sides of beam (hours) | 72 | 24 |
| Bottom forms for slabs, beams arches not reshored (days) | 12 | 7 |
| Bottom forms for slabs, beams and arches if reshored (days) | 7 | 4 |

* Air temperature near form.

- D. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- E. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.05 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Field bending of reinforcement:
 - 1. Field bending of plain reinforcement shall be performed using an approved and appropriate sized portable hydraulic device that makes ACI-approved radius bends. No other field bending method shall be permitted.
 - 2. No field bending shall be permitted for epoxy coated reinforcement.

3.06 JOINTS

- A. Locate and install construction joints as shown or, if not shown, locate so as not to impair strength and appearance of structures, at intervals not to exceed 50 feet. For construction joints in water-containing structures or tanks or in water-restraining structures, use watertight joints.
- B. Continue reinforcement across construction joints, unless otherwise noted. Mechanical inserts with threaded studs are not accepted as substitutes for through-dowels.
- C. Locate construction joints in floor system at or near middle of span in slabs, beams, or girders unless beam intersects girders at this point. Then, where not shown on Drawings, joints in girders shall be offset distances twice the width of beams, and provisions made for shear by web reinforcement across joints.
- D. Provide watertight joints to prevent water seepage. Take special care in finishing surfaces to which succeeding concrete is bonded. Provide waterstops in joints if shown. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops according to manufacturer's printed instructions.
- E. Provide isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces of column pedestals, foundation walls, and grade beams.
- F. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction (control) joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 3/16 inch by 1/4 slab depth or inserts 1/4-inch wide by 1/4 of slab depth unless otherwise noted.
- G. If joint pattern is not shown, provide joints at 15 feet at most in either direction, with locations to conform to bay spacing wherever practical (at column centerlines, half-bays, third-bays).
- H. Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
- I. Cut contraction joints in unexposed floor slabs by saw cuts as soon as practical after slab finishing when it can be safely done without dislodging aggregate.
- J. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 INSTALLATION OF EMBEDDED ITEMS

- A. Set and build into Work anchorage devices and other embedded items required for other work that are attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of attachment items.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain set elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support screed strips by use of strike-off templates or accepted compacting screeds.
- C. Conduits and pipes of aluminum shall not be embedded in structural concrete unless they are effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.
- D. PVC Waterstops:
 - 1. Field butt splices shall be heat fused using a Teflon-coated thermostatically controlled waterstop splicing iron at approximately 380 degrees F following manufacturer's recommendations. Lapping of waterstop or use of adhesives shall not be allowed.
 - 2. Center the waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12 inches on center along length of waterstop and wire tie to adjacent reinforcing steel. Do not drive nails or otherwise puncture additional holes in the waterstop when forming.
- E. Bentonite and Hydrophylic Waterstops:
 - 1. Adhere waterstop to substrate using manufacturer's recommended adhesive.
 - 2. Tightly butt ends of waterstop together to form a continuous waterstop. Do not lap waterstop.
 - 3. Verify that minimum concrete per manufacturer's recommendations will occur along waterstop's entire length. Do not install waterstop in keyways.
 - 4. Follow manufacturer's recommended installation procedures.

3.08 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch to return forms to acceptable surface condition.

- B. Coat contact surfaces of forms with form-coating compounds before placing reinforcement.
- C. Thin form-coating compounds only with acceptable thinning agents, quantity, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete is placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with non-staining, rust-preventive form oil to protect against rusting. Rust-stained steel formwork is not acceptable.

3.09 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, reinforcing steel, waterstop installation, and other embedded or cast-in items.
 - 1. Notify other crafts to permit installation of their work.
 - 2. Cooperate with other trades in setting their work.
 - 3. Moisten wood forms immediately before placing concrete where form coatings are not used.
 - 4. Apply temporary protective covering to lower 2 feet of finished walls where adjacent floor slabs are poured to guard against spattering during slab placement.
- B. Comply with ACI 304R and as specified in this Section.
- C. Discharge Concrete at Site within 1-1/2 hours after cement is added to water or aggregates. When air temperature exceeds 85 degrees F, the discharge time shall be less than 45 minutes. The 45-minute requirement may be waived with the use of a water reducing, retarding admixture and approval of Engineer.
- D. Provide trip ticket in duplicate for each ready-mixed concrete load delivered, stating truck number, Project name, Contractor and producer, batching time, total yards of concrete and material contained therein. Show ticket to Engineer upon request. Fill in concrete discharge time and turn over to Engineer trip ticket copies at end of each day.
- E. Deposit concrete continuously or in layers so that no concrete is placed on concrete which has hardened sufficiently to cause seams or planes of weakness. If section cannot be placed continuously, provide construction joints as specified. Deposit concrete as nearly as practical to its final location to avoid segregation.

- F. When depositing by chute, provide equipment of size and design to ensure continuously flowing concrete. Provide discharge end of chute with baffle plate to prevent segregation. Position chute so that concrete need not flow more than 5 feet horizontally.
- G. Do not drop concrete from chute end distances greater than 3 times the deposited layer thickness, nor more than 5 feet. Where distance from chute end to surface of concrete exceeds these distances, use spout and maintain lower end as near to deposit surface as practical. When operations are intermittent, discharge chutes into hoppers.
- H. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches to avoid inclined construction joints. Where placement involves several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Fill bottom of wall space with 2 to 4 inches of cement slurry immediately before depositing concrete in walls. Use cement slurry composed of 1 part Portland cement, 2 parts fine aggregate, and sufficient water (but not to exceed 0.45 parts) for 7-inch slump mixture.
 - 2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for concrete consolidation in accordance with ACI recommended practices.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible machine effectiveness. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into concrete layers that have begun to set. At each insertion, limit duration to time necessary to consolidate concrete and complete reinforcement embedment and other embedded items without causing mix segregation. Keep vibrators away from waterstops to prevent displacement.
- I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operations between construction joints until panel or section placement is complete.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces before beginning finishing operations.

3. Maintain reinforcing in proper position during concrete placement operations.
 4. Maintain waterstop in proper position during concrete placement operations.
 5. Concrete Placement against Expanding Bentonite Waterstop. Direct concrete flow away from bentonite water stops. If flow cannot be away from bentonite, direct flow parallel to waterstop.
 6. Moisten soil when depositing concrete directly on granular soil.
- J. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- K. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- L. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. Trowel Finish: Apply trowel finish to monolithic slab surfaces exposed-to-view, and slab surfaces covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
 - 1. After floating, begin first trowel finish operation using power-driven trowels. Begin last troweling when surface produces ringing sound when trowel moves over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.
 - 2. Check and level surface plane to tolerances of floor flatness (FF) of 20 and floor levelness (FL) of 17 in accordance with ASTM E 1155.

3. Grind smooth surface defects that would telegraph through applied floor covering system.
- B. Nonslip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, ramps, and elsewhere as noted.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required finish with Engineer before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 4 inches ((100 mm)) high unless otherwise indicated; and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Maintain curing as follows:
 - 1. All concrete unless otherwise noted: 7 days.
 - 2. High-early-strength concrete: 3 days.
 - 3. Mass concrete with ground granulated blast furnace slag: 14 days.
- C. Curing Methods: Cure concrete for water-retaining structures by moist curing. Cure concrete for other structures by curing compound, moist curing, moisture-retaining cover curing, or combinations thereof.
- D. Provide Moist Curing by following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Continuous water-fog spray.
 - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to cover concrete surfaces and edges, with 4 inches lap over adjacent absorptive covers.
- E. Provide Moisture-Retaining Cover Curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practical width with sides and ends lapped 3 inches and sealed by waterproof tape or adhesive.
 - 2. Immediately repair holes or tears during curing period using cover material and waterproof tape.
- F. Provide Curing Compound as follows:
 - 1. Apply specified curing compound to concrete slabs as soon as last finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after

initial application. Maintain coating continuity and repair damage during curing period.

2. Transparent curing compound shall be used for structural concrete (Class A concrete). White curing compound shall be used for exterior pavements (Class P concrete) and sidewalks (Class B concrete).
 3. Do not use membrane curing compounds on surfaces that are covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including beam undersides, supported slabs and other similar surfaces by moist curing with forms in place for full curing period. If form removal occurs before curing period is up, continue curing by methods specified above as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.

4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Provide qualified personnel and employ testing laboratory, approved by Engineer, to do tests and to submit test reports.
- E. Sampling Fresh Concrete: ASTM C 172, except modified for slump and air-content tests to comply with ASTM C 94.
1. Slump: ASTM C 143, one each time compression test specimens are made; additional tests when concrete consistency seems to have changed.
 2. Air Content: ASTM C 231, pressure method, one each time compression test specimens made.
 3. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time compression test specimens are made.
 4. Compression Test Specimen: ASTM C 31, four standard cylinders for each compressive strength test set, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens.
 5. Compressive Strength Tests: ASTM C 39, one set for each day's pour exceeding 5 cubic yards plus additional set for each 100 cubic yards over and above first 50 cubic yards of each concrete class placed in 1 day; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.
- F. Test Results: Report test results in writing to Engineer and Contractor within 24 hours after tests. Compressive strength test reports shall contain Project identification name and number, concrete placement date, concrete testing service name, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and break type for both 7-day tests and 28-day tests.
- G. Acceptance: Concrete strength shall be considered satisfactory if averages of 3 consecutive strength test results equal or exceed specified 28-day compressive strength (f'_c), and no individual strength test result falls below specified compressive strength by more than 500 psi.

- H. Failure to Meet Requirements:
1. Should 7-day compressive strengths shown by test specimens fall below 65 percent of required 28-day strength ($f'c$), Engineer will have the right to require changes in proportions for remaining Work. Furthermore, Engineer will have the right to require additional curing, as specified in this Section, on those portions or structures represented by failed test specimens.
 2. Should 28-day compressive strengths ($f'c$) test results fail to meet required strength, core-boring tests conforming to ASTM Standard C 42 shall be made at Contractor's expense within 60 days of that concrete placement.
- I. At locations where concrete quality is deemed questionable by Engineer, core-boring tests shall also be made at Contractor's expense.
- J. Concrete is acceptable if average strength of 3 cores is at least 85 percent and no single core is less than 75 percent of required minimum allowable 28-day compressive strengths ($f'c$). If core-boring test results fail to meet strength requirements, Engineer will have right to require strengthening or replacing those portions of structures which failed to develop specified strength.
- K. Provide additional curing when ordered by Engineer because of failure to meet requirements. It shall be done at Contractor's expense, and no claim for extra compensation for additional curing will be allowed. Additional curing shall extend period of protection. Additional curing is limited to 60 days.
- L. Additional Tests: Testing service shall make additional in-place concrete tests when test results suggest specified concrete strengths and other characteristics have not been attained. Testing service may conduct tests to determine adequacy by cored cylinders complying with ASTM C 42, or by other approved methods. Contractor shall pay for additional tests when unacceptable concrete is verified.

END OF SECTION

SECTION 03345

CONCRETE FINISHING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This section describes materials and methods of concrete finishes, curing, repair of defects and surface protection.

1.02 SUBMITTALS

- A. Curing Compound: Submit manufacturer's statement of compliance with these specifications and recommend coverage to meet or exceed the specified tests and manufacturer's application instructions in accordance with Section 01420: Drawings and Submittals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. See Section 03300: Cast-In-Place Concrete.
- B. Curing Compound:
 - 1. Curing compound shall conform to ASTM C-309, Type 2, Class BN.
 - 2. Curing compound shall be compatible with required finishes and coatings, as specified in Division 9: Finishes.
 - 3. Curing compound for exposed concrete not to receive special finishes, protective coatings and/or concrete toppings shall be "Super Rez-Seal", as manufactured by Euclid Chemical Co., Cleveland, Ohio or equal.
 - 4. Curing compound for exposed concrete to receive special finishes, protective coatings and/or concrete toppings shall be "Kurez-DR", as manufactured by Euclid Chemical Co., Cleveland, Ohio or equal.
- C. Mortar for Repair of Concrete: Mortar used for repair of concrete shall be made of the same materials as used for concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than one (1) part cement to

two and one-half (2-1/2) parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing.

- D. Burlap Mats: Conform to AASHTO Specification M-182.
- E. Sisal-Kraft Paper and Polyethylene Sheets for Curing: Conform to ASTM C-171.

PART 3 - EXECUTION

3.01 CONCRETE FINISHES

- A. Complete concrete surfaces in accordance with the following schedule:

| <u>Finish Designation</u> | <u>Area Applied</u> |
|---------------------------|--|
| F-1 | Exterior walls below grade not exposed to water. |
| F-2 | Exterior and interior walls exposed to water. |
| F-3 | Walls of structures or buildings exposed to view. Underside of formed floors or slabs. |
| S-1 | Slabs (roof and floor) not water bearing (Building). |
| S-2 | Slabs and floors which are water bearing. Slab surfaces on which mechanical equipment moves. |
| S-3 | Slabs and floors of structures which are exposed to view. |
| S-4 | Slabs, beams, girders, columns, and floors of structures. Slabs and floors at slopes greater than 10 percent (10%). |
| E-1 | Exposed edges of slabs, floors, and walls tops. |
| E-2 | Top of walls, beams and similar uniform surfaces. |

- B. Concrete surface repair.
 - 1. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2 inch, and fill tie holes.
 - 2. Finish F-2: Repair defective concrete, remove fins, fill depressions 1/4 inch or deeper, and fill tie holes.

3. Finish F-3: In addition to Finish F-2, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one (1) part cement and one-half (1/2) parts sand by damp loose volume, over the surface of clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.
4. Finish S-1: Smooth steel trowel finish
5. Finish S-2: Steel trowel finish free from trowel marks and all irregularities.
6. Finish S-3: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.
7. Finish S-4: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.
8. Finish E-1: Exposed edges of slabs, floors, and tops of walls, finish with a 1/4 inch radius edger if a chamfer is not indicated.
9. Finish E-2: Struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surfaces.

3.02 FINISHING OF FORMED SURFACES

- A. Water cure surfaces until finishing and repairing are completed.
- B. As soon as possible after forms are removed, remove fins and irregularities by grinding or rubbing, fill depressions deeper than specified with mortar, and fill tie holes.
- C. Ream tie holes with toothed reamers until surface of hole is rough and clean. Coat surface with epoxy bonding compound and fill with mortar.
- D. Finish tapered tie holes as follows:
 1. Sandblast tie rod hole and blow clean prior to filling.
 2. Drive rubber plug, with one end open, to the center of the hole. Plug size shall be larger in diameter than the diameter of the hole at the center of the wall.

3. Coat entire annular surface of the hole with epoxy prior to filling with mortar. Apply epoxy in accordance with manufacturer's instructions.
4. Fill each side of hole with mortar. Apply mortar to the "wet" side of the wall first. Consolidate mortar solidly into the hole.
5. Notify Engineer of tie rod filling schedule.

3.03 REPAIR OF SURFACE DEFECTS

- A. Remove honeycombed and other defective concrete down to sound concrete. Edges shall be perpendicular to surface. Sandblast surfaces to receive repair.
- B. Coat sandblasted surface with epoxy bonding compound.
- C. Place mortar in layers having a compacted thickness of 3/8 inch. Scratch surface of each layer to promote bonding with next layer.
- D. Finish repair shall match adjacent concrete and cure as specified.
- E. Repair defective areas of more than 1 foot square and deeper than the reinforcing steel as above, except fill the area with pneumatically applied concrete.

3.04 REPAIR OF CRACKED CONCRETE (REFER TO STRUCTURAL STANDARDS DETAILS)

- A. Alternate methods of crack repair may be submitted by the Contractor for review by the Engineer.

3.05 CONCRETE SURFACES TO BE COATED.

- A. Concrete surfaces exposed to view and which paints or coatings are to be applied shall be of even color, gray or gray-white. The term "exposed to view" shall mean visible to the plant operation staff in their normal daily activities. The surface shall have no pits, pockets, holes or sharp changes of surface elevation. Scrubbing with a stiff bristle fiber brush shall produce no dusting or dislodging of cement or sand.

END OF SECTION

DIVISION 4

MASONRY

SECTION 04220

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Masonry, including but not necessarily limited to, the following:
 - 1. Standard concrete masonry units (CMU) with false joint
 - 2. Masonry reinforcing, ties and anchors.
 - 3. Control joints.
 - 4. Grouting of masonry units.
 - 5. Embedded flashing.

1.02 SUBMITTALS

- A. Submit two (2) samples of each type of concrete masonry units for the project.
- B. Submit catalog data for integral water repellants for CMU and mortar, metal ties and anchors, joint reinforcement, and control joint material.
- C. Submit certification of compliance to OSHA Section 1926.700 A and B for construction techniques for high masonry walls.
- D. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 - 2. Accessories embedded in the masonry.
 - 3. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
5. ASTM C129 - Standard Specification for Non-Load-Bearing Concrete Masonry Units.
6. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
7. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
10. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
11. ASTM C331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
12. ASTM C426 - Standard Test Method for Drying Shrinkage of Concrete Block.
13. ASTM C476 - Standard Specification for Grout for Masonry.
14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
15. ASTM C1019 - Standard Method of Sampling and Testing Grout.
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

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

1.04 QUALITY ASSURANCE

A. Masonry Inspection:

1. A qualified Engineer or Architect must inspect masonry during construction for compliance with the Contract Documents, including conducting the pre-installation conference, inspection of the field-constructed mock-ups, and periodic wall inspection of the critical portions of masonry construction, including flashing, weep hole construction, and proper unit bedding and joint installation techniques for structural integrity and weather-tightness.
2. Field-Constructed Mock-Ups: Prior to installation of unit masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements using materials indicated for final unit of Work:
 - a. Locate mock-ups on Site in locations indicated, or if not indicated, as directed by ENGINEER.
3. Notify ENGINEER 1 week in advance of the dates and times when mock-ups will be erected. Do not proceed with masonry work until mock-up is inspected and accepted. If mock-up is not acceptable, remove mock-up and construct additional mock-ups incorporating corrections until acceptable.
4. Protect mock-ups from the elements with weather-resistant membrane.
5. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.
 - a. When directed, demolish and remove mock-ups from Site.

1.05 PROTECTION OF MATERIALS

- A. All perishable materials for the work of this Section shall be delivered stored and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.
- B. All masonry shall be shipped stacked with hay or straw protection or other suitable protective device, and shall be similarly stacked off the ground on the

site. Any masonry damaged or chipped during shipment, storage or installation shall be rejected and removed from the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the Engineer.

1.06 COLD WEATHER CONSTRUCTION

- A. Masonry construction in cold weather shall conform to the applicable requirements of Cold Weather Masonry Construction, Section 2.3.2.2, Specifications for Masonry Structures ACI 530.1.

1.07 HOT WEATHER CONSTRUCTION

- A. Masonry construction in hot weather shall conform to the applicable requirements of hot weather construction, Section 2.3.2.3, Specifications for Masonry Structures ACI 530.1.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete Masonry Units:

1. Standard weight concrete masonry units (CMU) for interior and exterior walls where indicated on the Drawings, shall conform to ASTM C90, Grade N, Type II, two cell hollow, load bearing units of 4 inch by 16 inch, 8-inch by 16-inch and 12 inch by 16 inch normal face size and bed dimension as shown on the Drawings.
 - a. Integral Water Repellent: Provide units made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength for exposed units.
 - b. Products: Subject to compliance with requirements, provide one of the following
 - 1) ACM Chemistries; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
2. Units shall be obtained from one manufacturer to insure even color and texture.

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

B. Mortar:

1. Portland cement shall conform to ASTM C150 Type II requiring only sand and water for mixing.
2. Masonry cements used for integral colored CMU's shall be specifically approved for colored mortar. Colored mortar mixers shall be factory premixed with color pigments and Portland cement, requiring only sand and water for mixing. Colored mortar for the project shall be from the same factory lot and batch numbers. Color of the mortar mix shall be selected by the Engineer from the mortar manufacturer's standard color samples.
3. Lime used for masonry mortar shall be hydrated lime, conforming to ASTM C207, Type S.
4. Sand shall be clean, hard, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to ASTM C144 or C33 as required.
5. Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.
6. Mortar proportions shall conform to ASTM C270, Type S, or as otherwise approved by the Engineer. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.
7. Strength of mortars shall exceed 1,800 pounds per square inch, when tested with 2 inch cubes at the end of a 28-day aging period.
8. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
 - a. Products: Subject to compliance with requirements, provide one of the following
 1. ACM Chemistries; RainBloc for Mortar.
 2. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 3. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

9. Grout for setting bearing plates, machinery, or any other equipment shall be as specified in Section 03600.

C. Grout:

1. Portland cement shall conform to ASTM C150, Type I.
2. Aggregates shall conform to ASTM C144.
3. Grout for constructing CMU lintel blocks and for grouting cores to receive embedded anchors or reinforcing shall conform to ASTM C476, fine or coarse grout. Strength shall be 2500 psi minimum at 28 days. Mix grout to have a slump of 10-in plus or minus 1-in, at time of placement.

2.02 ACCESSORIES (REINFORCING, TIES, ANCHORS AND MISCELLANEOUS)

- A. Single Wythe reinforcement shall be truss type, fabricated from cold drawn steel wire complying with ASTM A82 with single pair of galvanized 9-gauge side rods and continuous 9-gauge cross-rods spaced not more than 16 inches on center, and furnished with matching corners and tee units. Units shall be galvanized after fabrication conforming to ASTM A153, Class B-2, 1.5 oz./sq. ft.
- B. Galvanized dove-tailed anchor slots with anchors at 24 inches on center shall be furnished for anchorage to concrete framework or walls.
- C. Approved 16-gauge corrugated nonferrous metal ties manufactured for use with the anchor slots provided shall be spaced at a maximum of 8 inches o.c. vertically and 30 inches o.c. horizontally.
- D. The Contractor shall provide and install miscellaneous anchors and attachment members, required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.
- E. Control joints shall be factory extruded preformed rubber gaskets, unless otherwise shown on the Drawings, conforming to ASTM D-2000 2AA-205 and shall be as manufactured by Dur-O-Wal, Hohmann and Bernard, Inc., AA Wire Products or equal. Control joints shall be installed as shown on the Drawings.
- F. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

2.03 EMBEDDED FLASHING MATERIALS AND ACCESSORIES

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
1. Stainless Steel: 0.0156 inch (0.4 mm) thick.
 2. Copper: 10-oz./sq. ft. (3-kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.
 3. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.
- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 5-oz./sq. ft. sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Weep Hole/Vent: Free-draining open weave mesh; made from 100% recycled polyester; in color approved by Architect to match that of mortar. 2.25" x 3.5" x 0.5".
- F. Cavity Drainage Material: Free-draining open weave mesh; made from polyethylene, polyester, or nylon strands. Shaped to prevent blockage by mortar droppings. Thickness to match cavity size.

G. Available Products: Subject to compliance with requirements, products of manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Through-Wall Metal Flashing:
 - a. Cheney Flashing Company, Inc.
 - b. Keystone Flashing Co.
2. Copper-Laminated Flashing:
 - a. Copper Fabric Flashing; Advanced Building Products, Inc.
 - b. Copper Fabric; AFCO Products, Inc.
 - c. H & B C-Fab Flashing; Hohmann & Barnard, Inc.
 - d. Type FCC-Fabric Covered Copper; Phoenix Building Products.
 - e. Copper Fabric Flashing; Polytime Manufacturing Corp.
 - f. Copper Fabric Flashing; Sandell Manufacturing Co., Inc.
 - g. York Copper Fabric Flashing; York Manufacturing, Inc.
3. Asphalt-Coated Copper Flashing:
 - a. Cop-R-Cote; Advanced Building Products, Inc.
 - b. Cop-A-Cote; AFCO Products, Inc.
 - c. H & B C-Coat Flashing; Hohmann & Barnard, Inc.
 - d. Type ACC-Asphalt Bituminous Coated; Phoenix Building Products.
 - e. Coated Copper Flashing; Polytime Manufacturing Corp.
 - f. Coated Copper Flashing; Sandell Manufacturing Co., Inc.
 - g. Weep Hole/Vent:Copperseal; York Manufacturing, Inc.
 - h. Weep Vent; Mortar Net USA, Ltd.
4. Cavity Drainage Material:

- a. Mortar Maze; Advanced Building Products, Inc.
- b. Mortar net; Mortar Net USA, Ltd.

2.04 MASONRY CELL INSULATION

- A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Concrete Block Insulating Systems; Korfil.
 - b. Shelter Enterprises Inc.; Omni Core.

PART 3 - EXECUTION

3.01 MORTAR

- A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than five minutes, approximately two minutes of which shall be for mixing the dry materials and not less than three minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into a putty.
- B. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
- C. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.

3.02 MASONRY INSTALLATION

- A. Masonry shall not be laid at temperatures below 40 degrees F, without the approval of the Engineer, and all work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50 degrees F for a period of 72 hours after placing. Any completed work found to be affected by cold weather shall be taken down and rebuilt by the Contractor at his expense.
- B. All CMU's shall be laid in a full bed of mortar and fullhead, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joint for the full shell thickness. Units shall be set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test. Split faced CMU's shall be laid with the horizontal stringline control to the inside face of block.
- C.. Joints of all masonry shall be tooled in accordance with the following:
 - 1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as three hours in the shade and one hour in the sun in the summertime.
 - 2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.
 - 3. Both vertical and horizontal joints shall be maintained uniform in spacing.
 - 4. Joints for CMU shall be 3/8-inch wide.
 - 5. Joints for standard CMU shall be rubbed with a sponge to provide a flush, neat, rubbed joint.
- D. Install all frames required to be set in masonry. Set masonry tightly against frames, build in all frame anchors, and fill frames with mortar.
- E. Control joints shall be installed at the intersection of masonry walls with structural concrete and elsewhere as detailed on the Drawings. Joints shall be raked out to a depth of 3/4-inch for the full height of the wall suitable for caulking. The maximum length, horizontally, between vertical control joints shall be 26 feet, but joints shall be located only as directed or shown. Joints shall be equal in width to the standard mortar joint.

- F. All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the points affected. No chase shall be cut into any wall constructed of hollow units after it is built, except as directed and approved by the Engineer.
- G. Surfaces shall be brushed as work progresses and maintained as clean as it is practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind. Before continuing work previously laid, the previous work shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards or other means approved by the Engineer.
- H. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds, and exterior electrical conduits and fixtures, and shall cooperate with other trades whose work is to be coordinated with the work under this Section.
- I. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- J. All ties and reinforcing for masonry shall be furnished and installed by the Contractor.
- K. Loose lintels shall be set in a full bed of mortar and supported by solid or mortar filled hollow concrete blocks as detailed on the Drawings.
- L. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

3.02 MASONRY CELL INSULATION

- A. For new construction fill all non-grouted cells with sprayed-foam polyisocyanurate insulation into masonry cells.

3.03 CLEANING

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.
- C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturer's printed directions. No acid or metal scrapers shall be used on masonry.
- D. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 square feet in a location approved by the Engineer. No further cleaning work may proceed until the sample area has been approved by the Engineer, after which time the same cleaning materials and method shall be used on the remaining wall area.

3.04 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
 - 1. At lintels and shelf angles, extend flashing to first vertical masonry joint beyond masonry opening and fold corners to turn up 1 inch (25 mm) to form an end dam; extend to wall face. At heads and sills, extend flashing at ends and turn flashing up not less than 2 inches (50 mm) to form a pan. Turn up back edge as indicated.
 - 2. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

3. Extend sheet metal flashing 1/4 inch (6 mm) beyond face of masonry at exterior and turn flashing down to form a drip where not part of counterflashing.
 4. Under copings terminate both edges beyond face of wall approximately 1/4 inch (6 mm) with drip edge.
 5. Where dowels, reinforcing bars and fastening devices penetrate flashing, form penetration openings to fit tight against dowel or other item with edge turned up and seal penetration as recommended by manufacturer.
 6. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
 7. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 6 inches (150 mm) on center.
 8. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 3-inch (75 mm) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 1 1/2-inch (38 mm).
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Use polyester mesh weep vents to form weep holes.
 2. Place cavity drainage material immediately above flashing in cavities.
- E. Install vents in vertical head joints at the top and bottom of each continuous cavity at 48" o/c. Use polyester mesh weep vents to form vents.
- F. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.05 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

- B. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
- C. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- D. Placing Reinforcement: Comply with requirements ACI 530.1/ASCE 6/TMS 602.
- E. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
- F. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
- G. Limit height of vertical grout pours to not more than **60 inches**. All lintels must be poured before installing CMU above.

3.06 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Contractor shall provide 24 hr notice min. on all grout pours. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: special inspections according to the Florida Building Code.
- C. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- D. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
- E. Place grout only after inspectors have verified proportions of site-prepared grout.

END OF SECTION

SECTION 04230

REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

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

1.02 SUBMITTALS

- A. Submit shop drawings, product data, mixes, etc., in accordance with Section 01340.
- B. Submit complete shop drawings, including bar lists and placement drawings.
- C. Submit mill test certificate for reinforcing steel.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Refer to Section 04050 for masonry materials and accessories not included in this Section.
- B. Reinforcing Steel: ASTM Designation A 615, Grade 60, unless otherwise specified.
- C. Construct all building exterior walls of reinforced concrete masonry as follows:
 - 1. Concrete Masonry Units: ASTM C 90, Type II normal weight units with minimum compressive strength of 1900 psi on net area.
 - 2. Premix Mortar: ASTM C 270, Type S.
 - 3. Vertical Reinforcing: Provide as shown on the Drawings.
 - 4. Concrete Grout for Filling Cells: 3/8-inch pearock mix with minimum compressive strength of 3,000 psi.

5. Horizontal Reinforcing: 9-gauge ladder type at 16" o.c. (hot-dipped galvanized)

PART 3 - EXECUTION

3.01 PLACING REINFORCEMENT

- A. Clean reinforcement of loose rust, mill scale, earth or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Place reinforcement accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch, whichever is greater.
- C. For columns, piers and pilasters, provide a clear distance between vertical bars as shown, but not less than 1 1/2 times the nominal bar diameter or 1 1/2-inches, whichever is greater. Provide lateral ties as shown.

Splice reinforcement bars only as shown. Do not splice at other points unless approved by the Engineer. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, tie splices with wire.

- D. Provide not less than the minimum lap shown, or if not shown, as required by governing code.
- E. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8-inch on exterior face of walls and 1/2-inch at other locations.
- F. Anchor reinforced masonry work to supporting structure as indicated.

3.02 INSTALLATION, GENERAL

- A. Perform general installation of unit masonry in accordance with the requirements specified in Section 04050.
- B. Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erection, support, bracing and maintenance of formwork is the Contractor's responsibility.

- C. Construct formwork to conform to shape, line and dimensions shown and sufficiently tight to prevent leakage of mortar grout, or concrete (if any).
- D. Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction. Do not remove forms and shoring supporting the weight of concrete in beams, slabs and other members until concrete has attained its specified 28 day compressive strength.
- E. Coordinate cell reinforcing layout with electrical and mechanical contractors. Contact Engineer regarding conflicts.

3.03 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General:

1. Do not wet concrete masonry units (CMU).
2. Place CMU with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths as shown, or if not shown, provide 3/8-inch joints.
3. Where solid CMU units are shown, lay units with full mortar head and bed joints.

B. Walls:

1. Pattern Bond: Lay CMU wall units as specified in Section 04050. Bond and interlock each course at corners and intersections and use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide aluminum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

4. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout, in which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams will not apply.

C. Columns, Piers and Pilasters:

1. Use CMU of the size, shape and number of vertical core spaces shown. If not shown, provide units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond as shown, or if not shown, provide alternate head joints in vertical alignment.
3. Where bonded pilaster construction is shown, construct wall and pilaster units together to the maximum pour height specified.

D. Grouting:

1. Use fine grout for filling spaces less than 4 inches in both horizontal directions.
2. Use course grout for filling 4 inch spaces or larger in both horizontal directions.
3. Place grout within 1.5 hours from introducing water in the mixture and prior to initial set.
4. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.
5. Consolidate grout by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

E. Low-Lift Grouting:

1. Provide a minimum clear dimension of 2 inches and clear area of 8 sq. in. in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU. Extend vertical reinforcement above elevation of maximum pour height as required to allow for splicing and support it in position at vertical intervals not exceeding 192 bar diameters nor 10 feet.

3. Lay CMU to maximum pour height. Limit pour height to 5 feet. If bond beam occurs below the 5 feet height stop, pour at course below bond beam.
4. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond.
5. Pour grout using container with spout or by chute and rod or vibrate during placing. Place grout continuously. Do not interrupt pouring of grout for more than one hour. Terminate grout pours 1 1/2-inches below top course of pour.
6. Bond Beams: Terminate grout in vertical cells 1 1/2-inches below bond beam course. Place horizontal reinforcement in bond beams with corners and intersections lapped as shown. Place grout in bond beam course before filling vertical cores above bond beam.

F. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3 inches and 10 sq. in., respectively.
2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
3. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
4. Limit grout lifts to a maximum height of 5 feet and grout pour to a maximum height of 24 feet, for single wythe hollow concrete masonry walls, unless otherwise indicated. See Section 04050, Section 1.02.D regarding highwall construction.
5. Place vertical reinforcement before grouting. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10 feet.

6. Where reinforcement is prefabricated into cage units before placing, fabricate the units with vertical reinforcement bars and lateral ties of the size and spacing shown.
7. Place horizontal beam reinforcement as the masonry units are laid.
8. Embed lateral tie reinforcement in mortar joints where shown as masonry units are laid.
9. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gage wire ties spaced 16 inches o.c. for members with 20 inches or less side dimensions, and 8 inches o.c. for members with side dimensions exceeding 20 inches.
10. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
11. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
12. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Engineer.
13. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5 feet. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Vibrate each grout lift during pouring operation.
14. Place grout in lintels or beams over openings in one continuous pour.
15. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1 inch of vertically reinforced cavities, during construction of masonry.

16. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1 1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION

DIVISION 5

METALS

SECTION 05400
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Floor Joist Framing

- B. Related Requirements:

- 1. Section 05500 "Metal Fabrications" for masonry shelf angles and connections.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.

- B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. ClarkDietrich Building Systems.
 - 4. Consolidated Fabricators Corp.; Building Products Division.
 - 5. Craco Manufacturing, Inc.
 - 6. Custom Stud Inc.
 - 7. Design Shapes in Steel.
 - 8. Formetal Co. Inc. (The).
 - 9. Marino\WARE.
 - 10. MBA Building Supplies.
 - 11. MRI Steel Framing, LLC.
 - 12. Nuconsteel, A Nucor Company.
 - 13. Olmar Supply, Inc.
 - 14. Quail Run Building Materials, Inc.
 - 15. Quail Run Building Materials, Inc.
 - 16. SCAFCO Corporation.
 - 17. Southeastern Stud & Components, Inc.
 - 18. State Building Products, Inc.
 - 19. Steel Construction Systems.
 - 20. Steel Network, Inc. (The).
 - 21. Steel Structural Systems.
 - 22. Steeler, Inc.

23. Super Stud Building Products Inc.
24. Telling Industries.
25. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01400 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 1. Design Loads: For the ceiling/floor, design for 20 psf live load; 10 psf dead load.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Floor Joist Framing: Vertical deflection of 1/360 for live loads and 1/240 for total loads of the span.
 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch (13 mm).
- C. Cold-Formed Steel Framing Design Standards:
 1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
 2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 33 (230).
 2. Coating: G60 (Z180).

2.4 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance.
 2. Flange Width: As required by structural performance.
 3. Section Properties: As required by structural performance.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance.
 2. Flange Width: As required by structural performance.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
 - 1. Joist Spacing: 16 inches (406 mm).
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05500

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

- A. Concrete joint accessories are included in Section 03300.
- B. Masonry reinforcement, ties and accessories are included in Division 4.
- C. Metal doors and frames are included in Division 8.
- D. Painting is included in Division 9.
- E. Louvers are included in Division 10.
- F. Slide gates, operators and appurtenances, including wall thimbles, are included in Division 02.
- G. Pipe hangers and sleeves are included in Division 15.
- H. Equipment anchor bolts are included in the respective Sections of Divisions 11, 14 and 15.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Shop drawings, showing sizes of members, method of assembly, anchorage and connection to other members.
- B. Samples
 - 1. Submit samples as requested by the Engineer during the course of construction.

C. Design Data

1. Submit calculations or test data demonstrating that the railings will resist the loads specified in the 2014 Florida Building Code at the post spacing provided.
2. Submit manufacturer's load and deflection tables for grating.

D. Test Reports

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

E. Certificates

1. Submit certification that the railing system is in compliance with OSHA requirements and the 2014 Florida Building Code.
2. Certify that welders have been qualified under AWS, within the previous 12 months, to perform the welds required under this Section.

1.04 REFERENCE STANDARDS

A. Aluminum Association (AA)

1. AA M31C22A41
 - a. M31: Mechanical Finish, Fine Satin
 - b. C22: Finish, Medium Matte
 - c. A41: Clear Anodic Coating, Class I

B. American Society for Testing and Materials (ASTM)

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A48 - Standard Specification for Gray Iron Castings.
3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
4. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
5. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 7. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 8. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
 9. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength.
 10. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 11. ASTM A366 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 14. ASTM A536 - Standard Specification for Ductile Iron Castings.
 15. ASTM A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 16. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 17. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
 18. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- C. American Iron and Steel Institute (AISI).
1. Specification for Structural Steel Buildings.
- D. American Welding Society (AWS)
1. AWS D1.1 - Structural Welding Code Steel.

- 2. AWS D1.2 - Structural Welding Code Aluminum.
- E. Federal Specifications
 - 1. FS-FF-B-575C - Bolts, Hexagonal and Square
- F. Occupational Safety and Health Administration (OSHA)
- G. 2014 Florida Building Code. (FBC)
- H. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The work of this Section shall be completely coordinated with the work of other Sections. Verify, at the site, both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.
- B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.
- C. All welding shall be performed by qualified welders and shall conform to the applicable AWS welding code. Welding of steel shall conform to AWS D1.1 and welding of aluminum shall conform to AWS D1.2.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.
- B. Repair items which have become damaged or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

1.07 PROJECT/SITE REQUIREMENTS

- A. Field measurements shall be taken at the site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

PART 2 PRODUCTS

2.01 GENERAL

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

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

2.02 MATERIALS

- A. Unless otherwise noted, materials for miscellaneous metals shall conform to the following standards:

- | | |
|---|---|
| 1. Structural Steel | ASTM A36 |
| 2. Structural Steel Tubing | ASTM A500, Grade B |
| 3. Welded and Seamless Steel Pipe | ASTM A501 or ASTM A53, Type E or S, Grade B Schedule 40. Use standard malleable iron fittings, galvanized for exterior work |
| 4. Steel Sheets | ASTM A366 |
| 5. Gray Iron Castings | ASTM A48, Class 35 |
| 6. Ductile Iron Castings | ASTM A536, Grade 65-45-12 |
| 7. Aluminum Extruded Pipe | ASTM B429, Alloy 6063 T6 |
| 8. Aluminum Extruded Shapes | ASTM B221, Alloy 6061 T6 |
| 9. Aluminum Sheet and Plate | ASTM B209, Alloy 6061 T6 |
| 10. Stainless Steel Plates, Sheets, and Structural Shapes | |
| a. Exterior, Submerged or Industrial Use | ASTM F593, Type 316 (Type 316L for welded) |
| b. Interior and Architectural Use | ASTM F593, Type 304 |
| 11. Stainless Steel Bolts, Nuts, and Washers | ASTM F593 and ASTM F594, Type 316 |
| 12. Carbon Steel Bolts and Studs | ASTM A307, Grade A (hot dip galvanized nuts and washers where noted) |

- | | |
|---|--|
| 13. High Strength Steel Bolts, Nuts and washers | ASTM A325 (mechanically galvanized per ASTM B695, Class 50, where noted) |
| a. Elevated Temperature Exposure | Type I |
| b. General Application | Type I or Type II |
| 14. Galvanizing | ASTM A123, Zn w/0.5 percent minimum Ni |
| 15. Galvanizing, hardware | ASTM A153, Zn w/0.5 percent minimum Ni |

2.03 ANCHORS, BOLTS AND FASTENING DEVICES

- A. Anchor bolt material shall be ASTM F593 (316) unless otherwise noted.
- B. Unless otherwise noted, expansion anchors shall be ASTM F593 (316) wedge type anchors complete with nuts and washers. Type 316 stainless steel, wedge type anchors shall be used where they will be submerged or exposed to the weather or where stainless steel wedge type anchors are required. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least 1-in behind the concrete reinforcing steel.
- C. Compound masonry expansion anchors shall be lead expansion sleeve type anchors complete with nuts and washers. Anchors shall be precision die-cast zinc alloy with a minimum of two lead alloy expansion sleeves. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least 1-in behind the concrete reinforcing steel. Expansion anchors shall be Star Expansion Industries, Star Slugin or equal.
- D. Adhesive capsule anchors shall be a two-part stud and capsule chemical resin anchoring system. Capsules shall contain premeasured amounts of polyester or vinyl ester resin, aggregate and a hardener contained in a separate vial within the capsule. Stud assemblies shall consist of an all-thread anchor rod with nut and washer.
- E. Adhesive anchors, for fastening to hollow concrete block or brick, shall be a three-part stud, screen and chemical dispenser anchoring system. Adhesive cartridges shall contain premeasured amounts of resin and hardener which are mixed and deposited in a screen tube by a dispenser. Stud assemblies shall consist of an all-thread anchor rod with nut and washer. Anchors shall be Hilti HY 70 System or approved equal.

- F. Automatic end welded headed anchor studs shall be flux ended studs made from cold drawn steel, ASTM A108 Grades C-1010 through C-1020. Headed anchor studs shall be Nelson, H4L Headed Concrete Anchors or equal.
- G. Machine bolts and nuts shall conform to Federal Specification FF-B-575C. Bolts and nuts shall be hexagon type. Bolts, nuts, screws, washers and related appurtenances shall be Type 316 stainless steel.
- H. Toggle bolts shall be Hilti, Toggler Bolt or equal.

2.04 MISCELLANEOUS ALUMINUM

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Welding shall be on the unexposed side as much as possible in order to prevent pitting or discoloration of the aluminum exposed surface. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous aluminum items shall include: beams, angles, closure angles, hatches, floor plates, stop plates,, and any other miscellaneous aluminum called for on the Drawings and not otherwise specified.
- D. Angle frames for hatches, beams, grates, etc, shall be complete with welded strap anchors attached.
- E. Aluminum diamond plate and floor plate shall have a minimum thickness of 3/8-in. Frames and supports shall be of aluminum construction. Fastening devices and hardware shall be Type 304 stainless steel. Plates shall have a mill finish.
- F. Miscellaneous aluminum items shall have a cleaned and degreased mill finish.

2.05 MISCELLANEOUS STEEL

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous steel items shall include: beams, angles, lintels, metal stairs, support brackets, base plates for other than structural steel or equipment, closure angles, bridge crane rails, monorail hoist beams, holddown straps and lugs, door frames, splice plates, subframing at roof openings and any other miscellaneous steel called for on the Drawings and not otherwise specified.
- D. Structural steel angle and channel door frames shall be shop coated with primer. Frames shall be fabricated with not less than three anchors on each jamb.
- E. Steel pipe pieces for sleeves, lifting attachments and other functions shall be Schedule 40 pipe unless otherwise shown on the Drawings. Wall and floor sleeves, of steel pipe, shall have welded circumferential steel waterstops at mid-length.
- F. Lintels, relief angles or other steel supporting masonry or embedded in masonry shall be shop coated with primer.
- G. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust and foreign matter and shall be given one shop coat of primer compatible with the finish coat after fabrication but before shipment. Paint shall be omitted within 3-in of proposed field welds. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces.
- H. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Coating shall be not less than 2 oz/sq ft of surface.

2.06 MISCELLANEOUS STAINLESS STEEL

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous stainless steel items shall include: beams, angles, bar racks and any other miscellaneous stainless steel called for on the Drawings and not otherwise specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all items except those to be embedded in concrete or other masonry which shall be installed under Division 3 and Division 4 respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted.
- B. Abrasions in the shop primer shall be touched up immediately after erection. Areas left unprimed for welding shall be painted with primer after welding.
- C. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damage area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint conforming to the requirements of Military Specifications MIL-P-15145. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight.
- D. Specialty products shall be installed in accordance with the manufacturer's recommendations.

- E. Expansion bolts shall be checked for tightness a minimum of 24 hours after initial installation.
- F. Install adhesive capsule anchors using manufacture's recommended drive units and adapters and in compliance with the manufacturer's recommendations.
- G. Headed anchor studs shall be welded in accordance with manufacturer's recommendations.
- H. All steel surfaces that come into contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.
- I. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.
- J. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.
- K. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

END OF SECTION

SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Ladders and safety devices.
 - 2. Safety Railing System.
- B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1.04 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Drawings showing fabrication and installation of handrails and railings, including plans, elevations, sections, details of components, and attachments to other units of Work.
 - 2. Where installed products are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by a qualified Professional Engineer, licensed in the state of Florida, responsible for their preparation.
 - 3. Product Data for each type of product specified.

4. Samples for verification purposes of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.
 - a. 6-inch-long sections of each distinctly different linear railing member including handrails, top rails, posts, balusters, and ladder rungs.
 - b. Fittings and brackets.
 - c. Welded connections.

B. Product Test Reports:

1. Based on tests performed by qualified independent testing laboratory evidencing compliance of railing components and systems with requirements based on comprehensive testing of current products.

C. Quality Assurance Submittals:

1. Qualification data for firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Engineers and Owners, plus other information specified.

1.05 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.
- B. Engineering Responsibility: Engineer handrails and railing systems by qualified Professional Engineer legally authorized to practice in jurisdiction where Project is located. Design shall be in accordance with ASCE 7-10 and the 2014 Florida Building Code.

1.06 STORAGE

- A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field

measurements before fabrication; show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying Work, warranty dimensions and proceed with fabrication of products without field measurements. Coordinate other construction to ensure that actual dimensions correspond to warranted dimensions.

1.08 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:

1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.
2. Mount handrails only on gypsum board assemblies reinforced to receive anchors and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Nonshrink, Nonmetallic Grouts:
 - a. "Bonsal Construction Grout," W.R. Bonsal Co.
 - b. "Kemset," Chem-Masters Corp.
 - c. "Diamond-Crete Grout," Concrete Service Materials Co.
 - d. "Sure-Grip High-Performance Grout," Dayton Superior Corp.
 - e. "Crystex," L&M Construction Chemicals, Inc.
 - f. "Vibropruf No. 11," Lambert Corp.
 - g. "Masterflow 713," Master Builders.
 - h. "Sealtight 588 Grout," W.R. Meadows, Inc.
 - i. "SonogROUT," Sonneborn Building Products Division, ChemRex, Inc.
 - j. "Stoncrete NM1," Stonhard, Inc.
 - k. "Five Star Grout," U.S. Grout Corp.
2. Erosion-Resistant Anchoring Cement:
 - a. "Super Por-Rok," Minwax Construction Products Division.

2.02 METALS

- A. Provide metal forms and types that comply with requirements of referenced standards and that are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.03 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Pre-mixed, factory packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Interior Anchoring Cement: Factory pre-packaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.
- C. Erosion Resistant Anchoring Cement: Factory pre-packaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.04 LADDER

- A. Fabricate ladders for locations shown, with dimensions, spacings, materials, details, and anchorages as indicated on Drawings. Comply with requirements of ANSI A14.3.
 - 1. Provide nonslip surfaces on top of each FRP rung by factory applying a permanently bonded epoxy nonslip surface.
 - 2. Provide nonslip surfaces on top of each metal rung by coating with abrasive material metallurgically bonded to the rung by a proprietary process.
 - a. Mebac, IKG Borden.

2.05 SAFETY RAILING SYSTEM

- A. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, all accessories required for a complete installation, and complying with 29 CFR 1910.23 requirements.
1. Height: 42 inches above finished roof deck.
 2. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
 3. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.
 4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 5. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
 6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
 7. Fabricate joints that will be exposed to weather in a watertight manner.
 8. Close exposed ends of handrail and railing members with prefabricated end fittings.
 9. Fasteners: Manufacturer's standard.
- B. Basis of Design: "Bil-Guard" Hatch Railing System by The Bilco Company.

2.06 SAFETY CAGES

- A. Fabricate safety cages for locations shown with dimensions, spacings, materials, details, and anchorages as indicated on Drawings.

2.07 LADDER SAFETY DEVICES

- A. Ladder climbing safety devices shall be provided for ladder lengths of 20 feet or greater. Certification that the equipment meets the requirements of Federal specifications, in lieu of testing as provided in the Federal specification, shall be submitted. Material of carrier rail and ladder rung clamps shall match ladder material. Ladder safety climbing device shall be SAF-T-CLIMB as manufactured by North Safety Products or approved equal. Provide 2 ladder safety harnesses to OWNER for use with device.

- B. Provide wall mounted confined space commercial grade rescuer anchor point kit at access ladder locations as detailed and indicated on drawings.

2.08 WELDING MATERIALS, FASTENERS, AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Railings to other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.
- C. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work, except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
- D. Cast-In-Place and Post-Installed Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, load imposed within a safety factor of 4 as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.
 - 1. Cast-in-place anchors.
 - 2. Chemical anchors.
 - 3. Expansion anchors.

2.09 FABRICATION

- A. Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated on Drawings. Comply with requirements of ANSI A14.3.
 - 1. Provide nonslip surface on top of each rung either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.
- B. Pre-assemble railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- C. Welded Connections for steel and stainless steel: Fabricate railing systems and handrails for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
 - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- D. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- G. For handrails and railing systems that are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water.
- I. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- J. Toe Boards: Provide toe boards at railings around openings and at the edge of open-sided floors and platforms unless otherwise indicated. Fabricate to dimensions and details indicated for connection to, and centered between, each railing post.
- K. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.10 FINISHES

- A. Comply with NAAMM Metal Finishes Manual for recommendations relative to application and designations of finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are not acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples and they are assembled or installed to minimize contrast.
- D. Galvanized Finish:
 - 1. Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:
 - a. ASTM A 153 for galvanizing iron and steel hardware.
 - b. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.
 - 2. For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.
 - 3. For interior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.
 - 4. For interior steel railings formed from steel pipe with black finish, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 - 5. Factory-Primed Finish: Apply air-dried primer immediately following cleaning and pre-treatment, to provide a minimum dry film thickness of 2.0 mils per applied coat, to surfaces that will be exposed after assembly and installation and to concealed, nongalvanized surfaces.
- E. Steel Finishes:
 - 1. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation

specifications and environmental exposure conditions of installed metal fabrications:

- a. Exteriors (SSPC Zone 1B): SSPC-SP6, "Commercial Blast Cleaning."
 - b. Interiors (SSPC Zone 1A): SSPC-SP7, "Brush-Off Blast Cleaning."
2. Apply shop primer to uncoated surfaces of handrails and railing components, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1, Paint Application Specification No. 1, for shop painting.
 3. Shop Primer: Manufacturer's or fabricator's standard, fast curing, lead-free universal primer, selected for resistance to normal atmospheric corrosion, compatibility with substrate and field-applied finish paint system indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 - a. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Site.

3.02 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
 1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.
 3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.

3.03 ANCHORING POSTS

- A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.
- B. Anchor posts to concrete with circular or rectangular flanges, floor or wall type, as required by conditions, connected to posts and secured to concrete with expansion anchors.

3.04 RAILING CONNECTIONS

- A. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

3.05 ANCHORING RAIL ENDS

- A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with post-installed anchors and bolts.
- B. Anchor rail ends to metal surfaces with oval or round flanges.
 1. Connect flanges to rail ends using nonwelded connections.

2. Bolt flanges to metal surfaces.
- C. Install removable railing sections where indicated in slip-fit sockets of same material surface mounted to concrete. Accurately locate sockets to match post spacing.

3.06 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 of these specifications.
- C. For galvanized surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

3.07 PROTECTION

- A. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Rough carpentry for the following:
 - 1. Wood grounds, nailers, and blocking.
 - 2. Plywood backing panels.
- B. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to this Section.

1.02 DEFINITIONS

- A. Rough carpentry includes carpentry work not specified as part of other Sections and which is generally not exposed, except as otherwise indicated.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under Section. Shop Drawing submittals shall include:
 - 1. Product Data: Manufacturer's specifications and installation instructions for materials listed below:
 - 2. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.
 - 3. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and conformance with applicable standards.
 - 4. For water-borne treatment, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to Site.
 - 5. Fire-Retardant Treatment: Certification by treating plant that treated material complies with specified standard and other requirements.

1.04 PRODUCT HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.05 PROJECT CONDITIONS

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other Work.

PART 2 - PRODUCTS

2.01 LUMBER

- A. Lumber Standards: Manufacture lumber to comply with PS 20, American Softwood Lumber Standard, and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:
 - 1. SPIB - Southern Pine Inspection Bureau.
 - 2. WCLIB - West Coast Lumber Inspection Bureau.
 - 3. WWPA - Western Wood Products Association.
- C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20 for moisture content specified for each use.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide lumber with 15 percent maximum moisture content at time of dressing and shipment for Sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.02 BOARDS

- A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:
 - 1. Moisture Content: 15 percent maximum, "MC-15."
 - 2. Where transparent or natural finish or no finish is indicated, provide Redwood, Select Heart Grade (RIS).
 - 3. Where painted finish is indicated, provide No. 1 Boards per SPIB rules, Select Merchantable Boards per WCLIB rules, or No. 2 Common Boards and Better per WWPA rules.

2.03 MISCELLANEOUS UNTREATED LUMBER

- A. Provide wood for support or attachment of other Work including bucks, nailers, blocking, furring, grounds, stripping, cants, rooftop equipment bases and support curbs, and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
 - 1. Moisture content: 15 percent maximum.
 - 2. Grade: Standard grade, light framing size lumber of any species or board size lumber as required. No. 2 Common or Standard grade boards per WCLIB or WWPA rules or No. 2 boards per SPIB rules.

2.04 TREATED LUMBER

- A. Rooftop Equipment Curbs, cant strips, support bases, and wood which will come in contact with water or concrete shall be No. 2, Grade dense or better, Southern Yellow Pine or Douglas Fir, moisture content of 15 percent maximum. All of the above shall be treated as specified under wood treatment for termite and decay protection.

2.05 CONSTRUCTION PANELS

- A. Standards: Comply with PS 1 U.S. Product Standard for Construction and Industrial Plywood for plywood panels and, for products not manufactured under PS 1 provisions, with APA Performance Standard and Policies for Structural-Use Panels, Form No. E445.
- B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

- C. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire retardant treated-plywood panels with grade designation, APA C-D PLUGGED INT, with exterior glue, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch.

2.06 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

2.07 WOOD TREATMENT BY PRESSURE PROCESS

- A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWWA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark requirements.
 - 1. Pressure-treat aboveground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 15 percent. Treat indicated items and the following:
- B. Fire-Retardant Treatment: Where fire-retardant-treated wood ("FRTW") is indicated, pressure impregnate lumber with fire-retardant chemicals to comply with AWWA C20 for treatment type indicated below; identify "FRTW" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection, or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Interior Type A: Use where "FRTW" wood is indicated for interior applications.
 - 2. Exterior Type: Use where "FRTW" wood is indicated for exterior, exposed applications.
 - 3. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 2304.9.1, "Fastening Schedule," in the Michigan Building Code.
- D. Countersink nail heads on exposed carpentry work and fill holes.
- E. Use common wire nails except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
- F. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.03 INSTALLATION OF CONSTRUCTION PANELS

- A. Comply with applicable recommendations contained in Form No. E 30K, APA Design/Construction Guide - Residential and Commercial, for types of plywood products and applications indicated.
 - 1. Comply with "Code Plus" provisions in above-referenced guide.

3.04 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered

borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07100

WATER REPELLENT MASONRY COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This contract includes work to prevent water intrusion into the following structures where the exterior wall has been modified.

1. Maintenance Building.
2. Storage Building.

The work includes pressure washing exterior wall surfaces (existing structures only), door and windows. Removal and replacement of existing sealants at expansion joints, doors, windows, vents, wall penetrations and grade level masonry joints. Miscellaneous hurricane protection devices shall be removed and replaced as needed to seal behind such obstructions.

Waterproofing shall be applied with two equal coats of specified product in accordance with the manufactures instruction in terms of surface, preparation, and product coverage.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300- Submittals.
- B. Product Specification Data: Submit manufacturer's technical literature, specifications, and application instructions for the specified clear water repellent material.
- C. Samples: Obtain liquid samples of the specified clear water repellent for mock-up application. Mock-up application is covered in Section 1.04 QUALITY ASSURANCE.

- D. **Applicator Qualifications:** Submit certification stating applicator has a minimum of three (3) years experience using the specified product. Provide a list of several most recently completed projects where the specified material was used. Include the project name, location, architect and method of application.
- E. **Environmental Regulations:** Submit certification stating the water repellent material to be applied is in compliance with federal environmental Volatile Organic Compounds (VOC) regulations.

1.04 QUALITY ASSURANCE

- A. **Manufacturer:** A firm with no less than (10) years experience in manufacturing the products specified in this section.
- B. **Applicator Qualification:** A firm with no less than three (3) years experience in the application of the products specified in _this section: In addition, applicator must state the intended use of the proper application equipment and that it has been well maintained.
- C. **Mock-Up:**
 - 1. Apply water repellent per manufacturer's application, instructions as directed by the Architect to substrate material that matches actual job conditions. Determine the acceptability of appearance and optimum coverage rate required for application.
 - 2. After sample treatment has cured in accordance with manufacturers recommendations, water test to verify that substrate is coated with sufficient water repellent to effectively repel liquid water from the surface.
 - 3. Obtain Engineer and/or Project Owner approval prior to full scale application of water repellents.
- D. **Pre-Application Meeting:** Convene a pre-application meeting prior to the start of application of the specified material attended by the Contractor, the Engineer, and the water repellent manufacturer. Each of the attendees shall be notified by the Contractor at least three (3) days prior to the meeting time.

1.05 PRODUCT DELIVERY

- A. **Material Delivery:** Deliver materials to the job site in original sealed containers, clearly marked with manufacturer's name, brand name, and type of material. Verify the product matches that of the original sample applied on the mock-up wall.

- B. Record Keeping: Contractor/applicator shall record product batch number or lot number for warranty purposes.
- C. Storage & Protection: Store materials inside if possible, away from sparks and open flame. Store in a secure area to avoid tampering and contamination. Water based materials must be kept from freezing. Store and handle in accordance with manufacturers written instructions.

1.06 PROJECT CONDITIONS

- A. Surface Preparation: Surface must be free of cracks, dirt, oils, paint or other contaminants which may affect the appearance or performance of the water repellent material.
- B. Environmental Requirements:
 - 1. Air and substrate temperature must be above 45°F (7°C) or below 95°F (35° C) unless otherwise specified by manufacturer.
 - 2. Do not proceed with application if the substrate is wet or contains frozen water.
 - 3. Do not apply material when rain is predicted within 48 hours; or earlier than five (5) days after the substrate became wet.
 - 4. Do not apply materials in high or gusty winds.
- C. Protection:
 - 1. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.
 - 2. Protect shrubs, metal, wood trim, glass, asphalt and other building hardware during application from over-spray.
 - 3. Do not permit spray mist or liquid to drift onto surrounding properties.

1.07 SCHEDULING

- A. Engineer shall be notified not less than 48 hours before each application of water repellent is scheduled.

1.08 WARRANTY

- A. Contractor shall provide a warranty against water intrusion through above grade concrete and masonry surfaces for a period of one (1) year from the date of application. Warranty does not include deterioration failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints or cracks in excess of 1/16 inch, fire, vandalism, or abuse by maintenance equipment.
- B. Complete and submit the manufacturer's "Pre-Application Warranty Form" to manufacturer a minimum of ten (10) days prior to application.
- C. After completion of the water repellent application, submit manufacturer's "Warranty Application" to manufacturer for processing. Include material batch number/lot number previously recorded. Upon receiving a validated warranty, submit copies to Engineer and building owner.
- D. Contractor shall replace any vegetation, in kind, that has died due to overspray during the three (3) month period following final completion of work. The definition of vegetation includes but is not limited to grass, shrubbery, and trees.

1.09 PERFORMANCE REQUIREMENTS

- A. Provide water repellents with the following properties based on testing manufacturers standard products, according to test methods indicated, applied to substrates simulating Project conditions using same material and application methods to be used for Project.
 - 1. Water Vapor Transmission: Maximum 8 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens per ASTM E-96.
 - 2. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E-514.
 - 3. Durability Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G-53.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable manufactures shall be as follows:
1. Chemprobe Coating Systems, L.P - Masonry Division of Tnemec Inc.
2805 Industrial Lane, Garland TX. 75041 - PH 1-800-760-6776
 2. Degussa Building Systems, 889 Valley -Park Drive, Shakopee, MN 55379
PH 386-679-7597

2.02 WATER REPELLENT

- A. GENERAL: All products shall be solvent based, less than 600 grams per liter VOC, and a blend of silane and siloxane. No fillers, sterates, paraffins will be allowed. Products shall be a minimum of 42 percent solids.
1. PRIME A PELL PLUS – by Masonry Division of Tnemec Inc.
 2. ENVIROSEAL PBT BY – by Degussa Building Systems

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify the following:
1. The required joint sealants have been installed.
 2. New masonry and mortar has cured a minimum of twenty-eight (28) days.
 3. Surface to be treated is clean, dry and contains no frozen water.
 4. Environmental conditions are appropriate for application.

3.02 PREPARATION

- A. Protection:
1. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.

2. Protect shrubs, metal, wood trim, glass, asphalt and other building hardware during application from over-spray.
 3. Do not permit spray mist or liquid to drift onto surrounding properties or parking lots.
- B. Other:
1. Verify lawn sprinklers are turned off where applicable, so as to avoid water contact prior to cure times required by the manufacturer.

3.03 APPLICATION

- A. Apply specified water repellent in accordance with manufacturer's written application instructions at a rate of 65-85 square feet per gallon for the first pass and 75-100 sq feet per gallon for the second pass.
- B. Material must be applied using solvent resistant, low-pressure application equipment designed for water repellent application.
- C. Apply material as shipped by the manufacturer. Do not dilute or thin.
- D. Apply saturating application of the product working from the bottom up. On porous substrates such as concrete masonry units allow a slight rundown (less than three inches). On high density materials such as pre-cast concrete panels, do not allow any run-down. On all substrates allow the product to penetrate the substrate for approximately 5-7 minutes, then apply again in the same manner. This second pass will require less material.

3.04 FIELD QUALITY CONTROL

- A. The Engineer shall be contacted 48 hours prior to application so as to provide supervision as required. The architect or the architect's representative shall inspect the progress as the work proceeds. Do not apply any water repellent that is not specified by the Engineer.
- B. After water repellent has cured for six (6) days at low humidity and temperature between 70°-90°F or eight (8) days at high humidity and low temperature between 50°-69° F, all surfaces shall be tested with a light water spray. Recoat any area that indicates water absorption after the water test has completely dried.

3.05 CLEANING

- A. Remove protective coverings from adjacent surfaces and other protected areas.

- B. Immediately clean water repellent coating from adjoining surfaces and surfaces soiled by water-repellent application as work progresses.
- C. At completion, remove from the job site, all excess material, debris, and waste resulting from this work. Dispose of water repellent containers according to state and local environmental regulations.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Vapor retarders.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

PART 2 - PRODUCTS

2.01 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
 2. Type X, 15 psi (104 kPa).
 3. Type IV, 25 psi (173 kPa).

4. Type VI, 40 psi (276 kPa).
5. Type VII, 60 psi (414 kPa).
6. Type V, 100 psi (690 kPa).

2.02 POLYISOCYANURATE BOARD INSULATION

- A. Rigid Polyisocyanurate Board Insulation: Cellular thermal insulation with glass fiber-reinforced Polyisocyanurate closed-cell foam core and aluminum foil facing laminated to both sides: complying with FS HH-I-1972/1, Class 2; aged r-values of 7.2 and 8 at 40 and 75 degrees F (4.4 and 23.9 degrees C), respectively, and as follows:
 1. Surface Burning Characteristics: Maximum values for flame spread and smoke developed of 20 and 150, respectively.

2.03 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. CertainTeed Corporation.
 2. Guardian Building Products, Inc.
 3. Johns Manville.
 4. Knauf Insulation.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.04 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils (0.25 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.02 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units loosely laid according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.03 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

3.04 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend

vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

- B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of each form and type of joint sealer as indicated on Drawings and Schedules.
- B. Section includes joint sealers for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below.
 - a. Control and expansion joints in unit masonry.
 - b. Joints between different materials.
 - c. Perimeter joints between materials and frames of doors and windows.
 - d. Other joints where indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below.
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
 - b. Joints between different materials.
 - c. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below.
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings.
 - c. Perimeter joints of toilet fixtures.
 - d. Other joints as indicated.
 - 4. Interior joints in horizontal traffic surfaces as indicated below.
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Other joints where indicated.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 SYSTEM PERFORMANCE

- A. Provide joints sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Submittals covering items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data from manufacturer for each joint sealer product required, including instructions for joint preparation and joint sealer application.
 - 2. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view.
 - 3. Samples for verification purposes of each type and color of joint sealer required. Install joint sealer samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealers.
 - 4. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.05 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 degrees F (4.4 degrees C).
 - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.

- B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealers to occur not less than 21 or more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Multi-Part Nonsag Urethane Sealant for Use NT:
 - a. "Dymeric 240," Tremco, Inc.
 - b. "Dynatrol II," Pecora Corp.
 - c. "Sikaflex 2c NS", Sika Corp.
 - 2. One-Part Nonsag Urethane for Use NT:
 - a. "Dymonic," Tremco, Inc.
 - b. "Dynatrol I-XL," Pecora Corp.
 - c. "Sikaflex-15LM," Sika Corp.
 - 3. One-Part Nonsag Urethane Sealant for Use T:
 - a. "Sonolastic NP 1," BASF Building Systems.
 - b. "MasterSeal NP 1," BASF Building System
 - c. "Sikaflex-1a," Sika Corp.
 - d. "Vulkem 45 SSL," Tremco Sealant/Weatherproofing Division, RPM.
 - 4. One-Part Pourable Urethane Sealant for Use T:
 - a. "Chem-Calk 950," Bostik Construction Products Division.
 - b. "Urexpan NR-201," Pecora Corp.
 - c. "Sikaflex-1CSL," Sika Corp.
 - d. "Vulkem 45," Tremco Sealant/Weatherproofing Division, RPM.

5. Multi-part Nonsag Immersible Polysulfide or Polyurethane Sealant:
 - a. "Synthacalk GC-2+," Pecora Corp.
 - b. "Sonolastic Polysulfide Sealant," Sonneborn, Degussa Building Systems.
 - c. "Vulkem 116," Tremco Sealant/Weatherproofing Division, RPM (non waste water facilities)

6. Pre-formed Foam Sealant:
 - a. Horizontal and Traffic Applications:
 - 1) "Emseal 20H," Emseal Corp.
 - 2) "Will-Seal EPS," Will-Seal Construction Foams Dw., Illbruck.

 - b. Vertical Applications Above Grade (Control and Expansion Joints):
 - 1) "Emseal Greyflex," Emseal Corp.
 - 2) "Polytite Standard," Sandell Manufacturing Co., Inc.
 - 3) "Will-Seal 150," Will-Seal Construction Foams Dw., Illbruck.

 - c. Below Grade Applications:
 - 1) "Emseal 20H," Emseal Corp.
 - 2) "Will-Seal 250," Will-Seal Construction Forms Dw., Illbruck.

 - d. Pre-formed Hollow Neoprene Gasket:
 - 1) The D.S. Brown Co.
 - 2) Watson-Bowman and Acme Corp.
 - 3) Williams Products, Inc.

7. Foamed-In-Place Fire-Stopping Sealant:
 - a. "Dow Corning Fire Stop Sealant," Dow Corning Corp.
 - b. "Pensil 851," General Electric Co.

8. One-Part Fire-Stopping Sealant:
 - a. "Dow Corning Fire Stop Sealant," Dow Corning Corp.
 - b. "Fyre Putty," Standard Oil Engineered Materials Co.
 - c. "Metachaulk 1100," The RectorSeal Corporation.
 - d. "RTV 7403," General Electric Co.
 - e. "3M Fire Barrier Caulk CP-25," Electrical Products Division/3M.

9. Joint Sealant Backing:
 - a. Expand-o-Foam, 1380 Series, Williams Products, Inc.

10. Joint Fillers for Concrete:
 - a. Cementone, W.R. Meadows.

- b. Concrete Grey Sponge Rubber, 1300 Series, Williams Products, Inc.

2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application as demonstrated by sealant manufacturer based on testing and field experience.

2.03 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for type, grade, class, and uses.

Abbreviations

Types, Grade, Uses (Exposure)

| | | |
|----|------------------|-------|
| S | Single component | Type |
| M | Multi-component | Type |
| P | Pourable | Grade |
| NS | Nonsag | Grade |
| NT | Nontraffic | Use |
| T | Traffic | Use |
| I | Immersion | Use |

Uses (Joint Substrates)

| | |
|---|----------|
| A | Aluminum |
| O | Other |
| G | Glass |
| M | Mortar |

Class

25 - Percent Movement Capability

- B. Multi-Part Nonsag Urethane Sealant for Use NT: Type M, Grade NS, Class 25, and complying with the following requirements for Uses:

- 1. Uses NT, M, A, and, as applicable to joint substrates indicated, O.

2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.
- C. One-Part Nonsag Urethane Sealant for Use NT: Type S, Grade NS, Class 25, and Uses NT, M, A, and, as applicable to joint substrates indicated, O.
1. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.
- D. One-Part Nonsag Urethane Sealant for Use T: Type S, Grade NS, Class 25, and complying with the following requirements for Uses:
1. Uses T, NT, M, G, A, and, as applicable to joint substrates indicated, O.
 2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.
- E. One-Part Pourable Urethane Sealant for Use T: Type S, Grade P, Class 25, and complying with the following requirements for Uses:
1. Uses T, M, A, and, as applicable to joint substrates indicated, O.
 2. Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.
- F. Multi-Part Nonsag Polysulfide or Polyurethane Sealant for Uses T, NT, I: Type M, Grade NS, Class 25, and complying with the following requirements for Uses:
1. Uses T, NT, I, M, G, A, and, as applicable to joint substrates indicated, O.
 2. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by OWNER to match the existing Point Place Pump Station from manufacturer's standard colors.

2.04 COMPRESSION SEALS

- A. Pre-formed Foam Sealant: Manufacturer's standard pre-formed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealers.
 2. Impregnating Agent:
 - a. Chemically stabilized acrylic (EMSEAL).
 - b. Neoprene rubber suspended in chlorinated hydrocarbons (WILL-SEAL).
 - c. Polymerized polybutylene (POLYTITE).
 3. Density: 8 - 10 pounds per cubic foot.
 4. Backing: None.
- B. Pre-formed Hollow Neoprene Gasket: Manufacturer's standard pre-formed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile, and cross-sectional design.

2.05 JOINT SEALANT BACKING

- A. Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Pre-formed, compressible, resilient, nonwaxing, nonextruding strips of flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.
- D. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F (-15 degrees C). Provide products with low compression set and of size and shape to provide a secondary seal, control sealant depth, and otherwise contribute to optimum sealant performance.
- E. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealer substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturer of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, do not leave oily residues, or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

2.07 JOINT FILLERS FOR CONCRETE

- A. Provide joint fillers of thickness and widths indicated.

Sponge Rubber Joint Filler: Pre-formed strips complying with ASTM D 1752 for Type I.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. Installer Qualifications: Engage an installer who has successfully completed, within the last 3 years, at least 3 joint sealer applications similar in type and size to that of this Project.

3.02 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust, paints (except for permanent, protective

coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealers, oil, grease, waterproofing, water repellants, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.04 INSTALLATION OF JOINT SEALERS

- A. Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.

- b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
 - d. See Standard Detail on Drawings for face brick control joint application.
 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
 4. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
 - a. Note: Install all sealant in interior joints after painting of adjoining surfaces have been performed. Do not paint over sealant joints.
- D. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 1. Provide concave joint configuration per Figure 6A in ASTM C 962 unless otherwise indicated.
 2. Provide flush joint configuration per Figure 6B in ASTM C 962 where indicated.
 3. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 4. Provide recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.
- E. Installation of Pre-formed Foam Sealants: Install each length of sealant immediately after removing protective wrappings, taking care not to pull or stretch material, and complying with sealant manufacturer's directions for installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

- F. Installation of Pre-formed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections, provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gaskets together to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 to 1/4 inch.

3.05 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as Work progresses, by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.06 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original Work.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Standard steel doors and frames as indicated on Drawings and Drawing Schedules.
- B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to Work of this Section.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Submittals covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturers' technical product data substantiating that products comply with requirements.
 - 2. Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 3. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Documents.
- B. Sample warranty.

1.03 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute, "Recommended Specifications: Standard Steel Doors and Frames," (ANSI A250.8) and as herein specified.

Design exterior steel doors to meet wind-loading requirements for the Florida Building Code (FBC). Refer to Structural Drawings for wind and design pressures.

- 1. All exterior door assemblies shall be compliant with the Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and Site storage. Provide additional sealed plastic wrapping for factory-finished doors.
- B. Inspect hollow metal work upon delivery for damage. Minor damage may be repaired provided refinished items are equal in all respects to new work and acceptable to ENGINEER; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building Site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of nonvented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Steel Doors and Frames:
 - a. Amweld; Div. American Welding & Mfg. Co.
 - b. Ceco Door Products.
 - c. Curries Mfg., Inc.
 - d. Kewanee Corp.
 - e. Mesker Industries, Inc.
 - f. Pioneer Industries; Div. CORE Industries, Inc.
 - g. Republic Builders Products Corp.; Subs. Republic Steel.
 - h. Steelcraft; Div. American Standard Co.

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- C. Galvanized Steel Sheets: Zinc coated carbon steel sheets of commercial quality complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.

- D. Supports and Anchors: Fabricate of not less than 18 gauge galvanized sheet steel.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls complying with ASTM A 153, Class C or D as applicable.
- F. Shop Applied Paint:
 - 1. Primer: Rust-inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints and which can be used on both submerged and nonsubmerged ferrous metal.

2.03 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Wherever practical, fit and assemble units in manufacturer's plant. Clearly identify Work that cannot be permanently factory assembled before shipment to assure proper assembly at Project Site. Comply with SDI-100 requirements as follows:
 - 1. Interior Doors: ANSI A250.8, Level 2, heavy-duty, Model 2, seamless 18 gauge minimum galvanized faces.
 - 2. Exterior Doors: ANSI A250.8, Level 3, extra heavy-duty, Model 2, seamless 16 gauge minimum galvanized faces.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled galvanized sheet steel.
- C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled 14-gauge galvanized steel (at fabricator's option).
- D. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted galvanized steel channels.
- E. Exposed Fasteners: Unless otherwise indicated, provide galvanized countersunk flat Phillips heads for exposed screws and bolts.
- F. Thermal-Rated (Insulating) Assemblies:
 - 1. At exterior locations and elsewhere as shown or scheduled, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 1363.

2. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.24 Btu/(hour per foot square per degree F).
- G. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and template provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at Project Site.
 2. Locate finish hardware as indicated on final Shop Drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.
- H. Shop Painting:
1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint. Primer shall be applied at the rate of 1.5 dry mils or as recommended by paint manufacturer to provide the proper base for the finish coat.
 4. Apply exposed factory finish coat of even consistency to provide a uniformly finished surface. Finish color to be selected by OWNER from manufacturer's full range of standard colors.

2.04 STANDARD STEEL DOORS

- A. Provide metal doors of types and styles indicated on Drawings or Schedules.
- B. Color: As indicated on plans or, if not otherwise indicated, as selected by OWNER from manufacturers' full range of standard colors.

2.05 STANDARD STEEL FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on Drawings and Schedules. Conceal fastenings unless otherwise indicated. Fabricate frames of minimum 14-gauge galvanized cold-rolled furniture steel.

1. Fabricate frames with mitered corners, welded construction, ground smooth for exterior applications and knocked-down for field assembly at new openings in existing wall applications.
 2. Form exterior frames of hot-dip galvanized steel.
 3. Color: As indicated on plans or, if not otherwise indicated, as selected by OWNER from manufacturers' full range of standard colors.
- B. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.
- C. Plaster Guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.06 OBSERVATION WINDOW PRESSED STEEL FRAME

- A. Provide observation window pressed steel frames as shown on Drawings and Schedules. Frames shall be double rabbeted 14-gauge galvanized steel, depth as shown or scheduled, with 2-inch jamb and sill widths. Head section shall be heights as shown or required. Frames shall be arc-welded and ground smooth. Provide glass stops and appropriate anchors for securely holding frames in walls.
1. See Standard Details on Drawings, Gas Tight Observation Window for Masonry Wall.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install standard steel doors, frames, and accessories in accordance with final Shop Drawings, manufacturer's data, and as specified in this Section.
- B. Placing Frames: Comply with provisions of SDI-105, "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.
1. Except for frames located in concrete or existing masonry and at drywall installations, place frames prior to construction at enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.

3. At in-place concrete or existing masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

3.02 ADJUST AND CLEAN

- A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Finish Coat Tough-up: Clean and repair exposed finish coat according to manufacturer's written instructions.
- C. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from pre-finished doors.
- D. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08330

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Overhead coiling doors as indicated on Drawings and Schedules. Types of overhead coiling doors include the following:
 - 1. Insulated overhead doors.
 - 2. Motorized-operated doors.
 - 3. Overhead fire doors.
- B. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanism, hardware, operators, and installation accessories.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 PERFORMANCE REQUIREMENTS

- A. Wind Loading: Design and reinforce overhead coiling doors to withstand a 45 pounds per square foot (180 mph) factored wind loading pressure unless otherwise indicated. Refer to Structural design criteria and components and cladding wind pressure schedule on Structural drawings for additional information.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturer's product data, electric operator wiring diagram, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door.
 - a. Provide operating instructions and maintenance information, and complete information describing fire release system including electrical rough-in instructions.

2. Quality Assurance Submittals: Submit UL certification for over-size fire-rated doors and frames that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

1.04 QUALITY ASSURANCE

- A. Provide each overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting, and installation components.
- B. Inserts and Anchorages: Provide inserts and anchoring devices which must be set in concrete or built into masonry for installation of units. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
 1. Refer to Section 04200 for installation of inserts and anchorage devices.
- C. Provide Florida FL Product Approval Number on overhead door shop drawing submittal.
- D. Fire Door Assemblies: Provide fire door assemblies which comply with NFPA No. 80 and have been fire tested, rated, and labeled in accordance with ASTM E 152. Provide each door with a metal UL label as evidence of rating, with label indicating rating in hours of duration of exposure to fire and letter designation of location for which assembly is designed.

1.05 WARRANTY

- A. Special Warranty: Submit a written warranty, executed by CONTRACTOR, Installer, and overhead door manufacturer, agreeing to repair or replace unit and components which fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to, structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation of hardware and operator system, and deterioration of paint finish, metals, metal finishes, and other materials beyond normal weathering.
 1. Submit written warranty in accordance with Division 1: Warranties.
 2. Warranty period is 3 years or 20,000 cycles after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
1. Atlas Door Corp.
 2. The Cookson Co.
 3. Cornell Iron Works, Inc.
 4. Kinnear Division, Harsco Corp.
 5. Mahon Rolling Door Division, RCM Corp.
 6. North American Rolling Door, Inc.
 7. Overhead Door Corp. (Basis of Design)
 8. Raynor Manufacturing Co.
 9. Windsor Door Division, The Ceco Corp.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading, of continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gauge recommended by door manufacturer for size and type of door required, and as follows:
1. Steel Door Curtain Slats: Structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication.
 2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane- foam type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectfully, according to ASTM E 84. Enclose insulation completely metal slat faces.
 3. Inside Curtain Face: To match material of outside metal curtain face.
- B. Endlocks: Galvanized metal castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Unless otherwise recommended by door manufacturer, provide windlocks on doors exceeding 16 feet wide. Space windlocks approximately 24 inches o.c. on both edges of curtain.

- B. Bottom Bar: Consisting of two angles, each not less than 1-inch by 1-inch by 1/8-inch-thick, galvanized or stainless steel or aluminum extrusions to suit type of curtain slats.
 - 1. Provide a replaceable gasket of flexible vinyl or neoprene between angles as a weather seal and cushion bumper for manually operated doors unless shown as an overlapping joint.
- C. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build-up units with minimum 3/16-inch-thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.
- D. Secure continuous wall angle to wall framing by 3/8-inch minimum bolts at not more than 30 inches o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise indicated. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain and continuous bar for holding windlocks.
- E. Weather Seals: Provide neoprene weather stripping for exterior exposed doors, except where otherwise indicated. At door heads, use 1/8-inch thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8-inch thick continuous strip secured to exterior side of jamb guide.

2.03 COUNTERBALANCING MECHANISM

- A. Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and mounted in a spring barrel and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03 inch per foot of span under full load.
 - 1. Provide spring balance of one or more oil tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.
 - 2. Fabricate torsion rod for counterbalance shaft of case-hardened steel, of required size to hold fixed spring ends and carry torsional load.

- C. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.
- D. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and any portion of between-jamb-mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
 - 1. Fabricate hoods for doors of not less than 24 gauge galvanized steel.

2.04 PAINTING

- A. Shop clean and prime ferrous metal and galvanized surfaces, exposed and unexposed, except faying and lubricated surfaces, with door manufacturer's standard rust-inhibitive primer. Finish coating of door shall be factory applied manufacturer's finish for caustic environments.

2.05 ELECTRIC DOOR OPERATORS

- A. Provide electric door operator assembly of size and capacity recommended, and provided by door manufacturer complete with electric motor and factory pre-wired motor controls, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.
- B. Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- C. Design operator so that motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.
- D. Door Operator Type: Provide wall- or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for emergency manual operation. Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.
- E. Electric Motors: Provide high-starting torque, reversible constant duty, Class A insulated electric motors with overload protection, sized to move door in either

direction from any position at not less than 2/3 foot or more than 1 foot per second.

1. Coordinate voltage, wiring requirements, and current characteristics of motors with building electrical system. (See electrical Drawings for NEMA type area classifications.).
 2. Provide open drip-proof type motor and controller with NEMA Type 4X enclosure.
- F. Automatic Closing: Provide automatic closing device and governor, operating when activated by temperature rise and melting of 160 degrees F (71 degrees C) fusible link. Construct governor unit to be inoperative during normal door operations. Design release mechanism for easy resetting.
1. Provide manufacturer's standard UL labeled smoke detectors and electromechanical door holder release devices where indicated.
 - a. Fabricate unit to permit manual lifting of curtain for emergency exit after automatic closing with curtain returning to closed position when released.
- G. Remote Control Station: Provide momentary contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Provide interior units, full-guarded, surface-mounted heavy-duty NEMA Type 4X enclosure.
- H. Automatic Reversing Control: Provide each motorized door with automatic safety sensor extending full width of door opening. Activation with sensor will immediately stop downward travel and reverse direction to fully opened position.
1. Pressure Sensor Edge: Provide each motorized door with an automatic safety sensor edge located within astragal or weather stripping mounted to bottom door rail. Contact with switch will immediately reverse downward door travel. Furnish manufacturer's standard take-up reel or self-coiling cable.
 - a. Provide electrically actuated automatic bottom bar.
 2. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
- I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with final Shop Drawings, manufacturer's instructions, and as specified in this Section.
- B. Upon completion of installation, including Work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Aluminum entrances and storefronts as indicated on Drawings and Drawing Schedules. Aluminum entrances and storefront types required for the Project include:
 - 1. Exterior entrance doors.
 - 2. Vestibule doors matching entrance doors.
 - 3. Frames for exterior entrances.
 - 4. Storefront type framing system.
- B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to Work of this Section.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide aluminum entrance and storefront assemblies that comply with specified performance characteristics. Each system shall be tested by a recognized testing laboratory or agency in accordance with specified test methods. Provide certified test results.
- B. Thermal Movement: Provide systems capable of withstanding thermal movements resulting from an ambient temperature range of 120 degrees F (67 degrees C) that could cause a metal surface temperature range of 180 degrees F (100 degrees C) within the framing system.
- C. Wind Loading: Provide assemblies capable of withstanding a uniform test pressure of 20 pounds per square foot inward and 20 pounds per square foot outward when tested in accordance with ASTM E 330.
- D. Fixed Framing Transmission Characteristics: Provide aluminum entrance and storefront framing system that complies with requirements indicated for transmission characteristics.
 - 1. Air Infiltration: Provide framing system with an air infiltration rate of not more than 0.06 cubic feet per minute per square foot of fixed area (excluding operable door edges) when tested in accordance with ASTM E 283 at an inward test pressure differential of 6.24 pounds per square foot.

2. Water Penetration: Provide framing system with no water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 6.24 pounds-force per square foot.
3. Condensation Resistance: Where framing systems are thermal-break construction, provide units tested for thermal performance in accordance with AAMA 1502 showing condensation resistance factor (CRF) of not less than 45.
4. Air Infiltration: Provide doors with an air infiltration rate of not more than 0.50 cubic feet per minute for single doors, and 1.0 for pairs of doors when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.567 pounds per square foot.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 1. Drawings for fabrication and installation of entrances and storefronts.
 2. Elevations.
 3. Detail sections of typical composite members.
 4. Hardware, mounting heights.
 5. Anchorages and reinforcements.
 6. Expansion provisions.
 7. Glazing details.
 8. Product Data: Manufacturer's product specifications, technical product data, standard details, and installation recommendations for each type of entrance and storefront product required. Include the following information:
 - a. Fabrication methods.
 - b. Finishing.
 - c. Hardware.
 - d. Accessories.
- B. Test and Inspection Report: Certified test results showing that entrance and storefront systems have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of equipment, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years.

- B. Single Source Responsibility: Provide entrance and storefront produced by a single manufacturer capable of showing prior production of units similar to those required for this Project.
- C. Design Criteria: Drawings indicating sizes, spacing of members, profiles, and dimensional requirements of entrance and storefront work. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in ENGINEER's sole judgment, such deviations do not materially detract from the design concept or intended performances.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay in Work. Where necessary, proceed with fabrication without field measurement, and coordinate fabrication tolerances to ensure proper fit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Aluminum Entrances and Storefronts:
 - a. Amarlite/Arco Metals Co.
 - b. Cronstroms Manufacturing, Inc.
 - c. Guaranteed Products.
 - d. Harcar Aluminum Products Co.
 - e. Kawneer Company, Inc.
 - f. PPG Industries, Inc.
 - g. Rebco, Inc.
 - h. Tajima, Inc.
 - i. Tubelite Division, Indal, Inc.
 - j. United States Aluminum Corp., International Alum. Corp.
 - k. United States Metals and Manufacturing Corp.
 - l. Vistawall Architectural Products.
 - m. YKK Architectural Products.

2.02 MATERIALS

- A. Aluminum Members: Provide alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.
- B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors, and other components.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125-inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
 - 2. Exposed Fasteners: Except where unavoidable for application for hardware, do not use exposed fasteners. For the application of hardware, use fasteners that match the finish of member or hardware being fastened.
 - a. Provide Phillips flat-head machine screws for exposed fasteners.
- C. Concealed Flashing: Provide 26-gauge minimum dead-soft stainless steel, or 0.026-inch minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- E. Concrete/Masonry Inserts: Provide concrete and masonry inserts fabricated from cast iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- F. Compression Weather Stripping: Provide the manufacturer's standard replaceable compressible weather-stripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.
- G. Sliding Weather Stripping: Provide the manufacturer's standard replaceable weather stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.
- H. Glass and Glazing Materials: Glass and glazing materials shall comply with requirements of Section 08800.

2.03 COMPONENTS

- A. Storefront Framing System: Provide inside-outside matched, resilient flush-glazed storefront framing system with provisions for glass replacement. Shop-fabricate and pre-assemble frame components where possible.
 - 1. Thermal Break Construction: Fabricate storefront framing system with integrally concealed, low conductance thermal barrier located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.
- B. Stile-and-Rail Type Aluminum Doors:
 - 1. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.
 - 2. Design: Provide 1-3/4-inch thick doors of design indicated. Bottom rail shall be 10 inches high.
 - 3. Medium stile (3-1/2-inch nominal width).
 - 4. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops with exterior stops anchored for nonremoval.

2.04 HARDWARE

- A. Refer to hardware in Section 08710 for requirements for hardware items other than those indicated to be provided by the aluminum entrance manufacturer.
- B. Provide manufacturer's heavy-duty hardware units as indicated, scheduled, or required for operation of each door, including the following items of sizes, number, and type recommended by manufacturer for service required; finish to match door.
 - Offset Pivot Sets: Provide offset pivot assemblies complying with ANSI A156.4, Grade 1. Provide exposed parts of cast aluminum alloy; provide an intermediate pivot for doors over 7'-6" high.
 - Overhead Concealed Closers: Provide independently hung, single-acting overhead concealed closers with concealed arm and track, complying with ANSI A156.4, Grade 2. Comply with manufacturer's recommendations for size of closer depending on door size, exposure to weather, and anticipated frequency of use. Include the following:
 - 1. Non-hold-open.

- C. Keyed Cylinders: Provide mortise type, 5-pin tumbler, inside cylinder units with cast aluminum face; comply with ANSI A156.5, Grade 1.
 - 1. See Section 08710 for keying requirements.
- D. Deadlocks: Provide mortised, maximum security type deadlocks, with minimum 1-inch-long pivoted bolt and stainless steel strike box; comply with ANSI A156.5, Grade 1. Match profile of aluminum door stile edge. Provide single cylinder for key lock. Lever Handles: Provide cast aluminum alloy inside lever handle units.
- E. Panic Hardware: Provide concealed-rod type panic exit devices actuated by full-widths crash bar; comply with UL 305.
 - 1. At CONTRACTOR's option provide concealed-rod type panic device, complying with UL 305, with latch releasing mechanism recessed into crossrail of the doors and actuated by a push panel.
- F. Keyless Access Controls: Electronic and mechanical keyless access and egress controls where indicated at storefront entrance.
- G. Flush Bolts: Provide standard edge mortised lever extension type flush bolts complying with ANSI A156.16, for inactive leaves of pairs of doors. Provide flush bolts at both the top and bottom of doors.
- H. Push / Pulls: Provide door manufacturer's heavy-duty 1 inch diameter satin stainless steel push bar and pull handle set of style indicated.
 - 1. Pull Handles: Provide stainless steel pull handle approximately 8 inches center-to-center, straight, with 2-1/2 inch projection.
 - 2. Push Bars: Provide the manufacturer's standard full door width single bar push bar.
- I. Thresholds: Provide extruded aluminum threshold of for exterior entry doors in mill finish, complete with anchors and clips, coordinated with pivots and floor-concealed closers.

2.05 FABRICATION

- A. Sizes of door and frame units and profile requirements are indicated on Drawings. Variable dimensions are indicated, with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Pre-fabrication: Before shipment to Site, complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible. Disassemble components only as necessary for shipment and installation.

- C. Welding: Comply with AWS recommendations; grind exposed welds smooth and restore mechanical finish.
- D. Reinforcing: Install reinforcing as required for hardware and necessary for performance requirements, sag resistance, and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator that will prevent corrosion.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
 - 1. Uniformity of Finish: Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submittal.
- G. Fasteners: Conceal fasteners wherever possible.
- H. Weather Stripping: For exterior doors, provide compression weather stripping against fixed stops; at other edges, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 1. Provide EPDM or vinyl blade gasket weather stripping in bottom door rail, adjustable for contact with threshold.
 - 2. At interior doors and other locations without weather stripping, provide neoprene silencers on stops to prevent metal-to-metal contact.
 - 3. Provide finger guards of collapsible neoprene or PVC gasketing securely anchored into frame at hinge jamb of center-pivoted doors.

2.06 FINISHES

- A. High-Performance Organic Coating: Provide NAAMM AA-C12C42R1x coating (cleaned with inhibited chemicals, conversion coated with acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below). Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' instructions.
 - 1. Fluorocarbon Coating: Provide manufacturer's standard multicoat thermo-cured system, composed of specially formulated primer and fluorocarbon topcoats, complying with AAMA 605.2.
 - 2. Color: Provide color as selected by OWNER from standard choices available from the coating manufacturer.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. Installer's Qualifications: Entrances and storefront shall be installed by a firm that has not less than 5 years successful experience in the installation of systems similar to those required for this Project.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Provide proper support and anchor securely in place.
 - 1. Separate aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials. Comply with requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101-85.
- C. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealant, fillers, and gaskets.
- D. Refer to Section 08800 for installation of glass and other panels indicated to be glazed into doors and framing, and not pre-glazed by manufacturer.

3.03 ADJUSTING

- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

3.04 CLEANING

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation complying with requirements contained in Section 08800 for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.05 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Finish or door hardware required for swing, sliding, and folding doors, except special types of unique hardware specified in the same Section as the door and door frames on which they are installed. Finish and door hardware includes:

1. Hinges.
2. Pivots.
3. Spring hinges.
4. Key control system.
5. Lock cylinders and keys.
6. Lock and latch sets.
7. Bolts.
8. Exit devices.
9. Closers.
10. Overhead holders.
11. Miscellaneous door control devices.
12. Door trim units.
13. Protection plates.
14. Weather stripping for exterior doors.
15. Astragals or meeting seals on pairs of doors.
16. Thresholds.
17. Security products.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Submittals covering the items included under this Section. Shop Drawing submittals shall include:

1. Product data, including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Final Door Hardware Schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

3. Final Door Hardware Schedule Content: Based on door hardware indicated, organize schedule into hardware sets, indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross-referenced to indications on Drawings, both on floor plans and on Door and Frame Schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained on Schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.
- B. Submittal Sequence: Submit initial draft of final Schedule along with essential product data to facilitate the fabrication of other work that is critical in the Project Construction Schedule. Submit final Schedule after samples, product data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
- C. Keying Schedule: Submit separate detailed Schedule indicating clearly how OWNER's final instructions on keying of locks has been fulfilled.
- D. Templates for doors, frames, and other Work specified to be factory prepared for the installation of door hardware. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of door hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Supplier Qualifications: A recognized architectural door hardware supplier with warehousing facilities in Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project, and employs an experienced architectural hardware consultant (AHC) who is available to OWNER, ENGINEER, and CONTRACTOR, at reasonable times during the course of the Work, for consultation.
 1. Require supplier to meet with OWNER to finalize keying requirements and to obtain final instructions in writing.

1.04 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final Door Hardware Schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by door hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate door hardware set number to match set numbers of approved Door Hardware Schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of the door hardware supplier and the door hardware installer until each is satisfied that the count is correct.
- D. Deliver individually packaged door hardware items at the proper times to the proper locations (shop or Site) for installation.
- E. Provide secure lock-up for door hardware delivered to Site but not yet installed. Control handling and installation of door hardware items which are not immediately replaceable so completion of Work will not be delayed by door hardware losses, both before and after installation.

1.05 MAINTENANCE

- A. Maintenance Tools and Instructions: Provide a complete set of specialized tools and maintenance instructions as needed for OWNER's continued adjustment, maintenance, and removal and replacement of door hardware.

1.06 WARRANTY

- A. Special Warranty: Submit a written warranty in accordance with Section 01740: Warranties and Bonds.

PART 2 - PRODUCTS

2.01 MANUFACTURERS (USE CORBIN RUSSWIN LOCKSETS)

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Butts and Hinges:
 - a. Bommer Industries, Inc.
 - b. Hager Hinge Co.
 - c. McKinney Products Co.
 - d. PBB, Inc.
 - e. Stanley Hardware, Division Stanley Works.
 - f. Ives

2. Cylinders and Locks: (USE CORBIN RUSSWIN LOCK SETS)
 - a. Corbin and Russwin Architectural Hardware, Division Black and Decker Corp.
3. Bolts:
 - a. Corbin/Russwin.
 - b. Glynn-Johnson Corp.
 - c. Rockwood.
 - d. Sargent.
 - e. Stanley Hardware Division, Stanley Works.
 - f. Trimco.
4. Exit/Panic Devices:
 - a. Corbin and Russwin Architectural Hardware.
 - b. Sargent Manufacturing Company.
 - c. Von Durpin, Division Ingersoll-Rand door Hardware Group.
 - d. Yale.
 - e. Precision Hardware Inc.
 - f. Falcon
5. Overhead Closers:
 - a. Corbin and Russwin Architectural Hardware.
 - b. Kawneer (for aluminum entry).
 - c. LCN, Division Ingersoll-Rand Door Hardware Group.
 - d. Sargent Manufacturing Company.
 - e. Rixson.
6. Door Control Devices:
 - a. Corbin and Russwin Architectural Hardware.
 - b. Glynn-Johnson Corp.
 - c. Hager Hinge Co.
 - d. Stanley Hardware Division, Stanley Works.
7. Door Trim Units:
 - a. Hager Hinge Co.
8. Kick, Mop, and Armor Plates:
 - a. Brookline Industries, Division Yale Security, Inc.
 - b. Rockwood.
 - c. Trimco.

- d. Ives
9. Thresholds:
- a. Kawneer (for aluminum entry).
 - b. National Guard Products, Inc.
 - c. Reese Enterprises, Inc.
 - d. Zero International, Inc.
10. Door Stripping and Seals:
- a. National Guard Products, Inc.
 - b. Reese Enterprises, Inc.
 - c. Zero International, Inc.

2.02 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated on Legend of Hardware Types and Schedule of Door Hardware Sets at the end of this Section. Products are identified by using hardware designation numbers of the following.
- 1. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required in the Legend of Hardware Types for purposes of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which complies with requirements, including those specified elsewhere in this Section and supply comparative and cross-referenced product data.

2.03 MATERIALS AND FABRICATION

- A. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Provide each item of hardware for proper installation and operation of door movement as shown.
- B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to ENGINEER.
- 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable

hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish optional materials or forming methods for those indicated, except as otherwise specified.

- D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws except as specifically indicated.
 - 1. Provide screws for installation with each hardware item. Provide Phillips flat-head screws, except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other Work, to match finish of such other Work as closely as possible, including prepared-for-paint surfaces to receive painted finish.
 - 2. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use through-bolts for installation where bolt head or nut on the opposite face is exposed in other Work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each through-bolt or use sex screw fasteners.
- E. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for OWNER's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.04 HINGES, BUTTS, AND PIVOTS

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Screws: Provide Phillips flat-head or machine screws complying with the following requirements:
 - 1. For metal doors and frames, install machine screws into drilled and tapped holes.
 - 2. For wood doors and frames, install wood screws.
 - 3. For fire-rated wood doors, install No. 12 by 1-1/4-inch, threaded-to-the-head steel wood screws.
 - 4. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - 1. Steel Hinges: Steel pins.

2. Nonferrous Hinges: Stainless steel pins.
3. Exterior Doors: Nonremovable pins.

2.05 LOCK CYLINDERS, AND KEYING

- A. Supplier shall meet with OWNER to finalize keying requirements and obtain final instructions in writing.
- B. Review the keying system with OWNER, and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with OWNER's existing system.
- C. Equip Locks with:
 1. Manufacturer's standard 6-pin tumbler cylinders.
 2. Manufacturer's special 6-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal.
- D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.
- E. Comply with OWNER's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
 1. Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation: "DO NOT DUPLICATE."
- F. Key Material: Provide keys of nickel silver only.
- G. Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.
 1. Deliver keys to key control system manufacturer.
 2. Deliver keys to OWNER's Representative.

2.06 LOCKS, LATCHES, AND BOLTS (USE CORBIN RUSSWIN)

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt with curved lip extended to protect frame, finished to match hardware set.
 1. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.

2. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
 3. Provide flat lip strikes for locks with 3-piece, antifriction latch bolts as recommended by manufacturer.
 4. Provide extra-long strike lips for locks used on frames with applied wood casing trim.
 5. Provide recess type top strikes for bolts locking into head frames unless otherwise indicated.
- B. Lock Throw: Provide 5/8-inch minimum throw of latch and deadbeat used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
1. Provide 1/2-inch minimum throw of latch for other bored and pre-assembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.
- C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

2.07 CLOSERS AND DOOR CONTROL DEVICES

- A. Size of Units: Except as otherwise specifically indicated, comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
 2. Provide parallel arms for all overhead closers except as otherwise indicated.
- B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.
1. Provide integral smoke detector device in combination door closers and holders complying with UL 228.
- C. Provide black resilient parts for exposed bumpers. Color selection by Owner.

2.08 DOOR TRIM UNITS

- A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops, and similar units); either machine screws or self-tapping screw.
- B. Fabricate edge trim of stainless steel not more than 1/2 inch or less than 1/16 inch smaller in length than door dimension.
- C. Fabricate protection plates (armor, kick, or mop) not more than 1-1/2-inch less than door width.
 - 1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gauge).

2.09 WEATHER STRIPPING AND SEALS

- A. Except as otherwise indicated, provide continuous weather stripping at each edge of every exterior door leaf. Provide type, sizes, and profiles shown on Drawings or Schedules. Provide noncorrosive fasteners as recommended by manufacturer for application indicated. Provide smoke, light, or sound seals on interior doors where indicated or Scheduled.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.
- C. Weather Stripping at Jambs and Heads:
 - 1. Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semi-mortised, of following metal, finish, and resilient bumper material:
- D. Weather Stripping at Door Bottoms:
 - 1. Provide threshold consisting of contact type resilient insert and metal housing of design and size shown on Drawings or Schedules, of following metal, finish, and resilient seal strip:
 - 2. Solid neoprene wiper or sweep seal complying with MIL R 6055, Class II, Grade 40.

2.10 THRESHOLDS

- A. Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown on Drawings or Schedules.

2.11 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door or opening to the greatest extent possible and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch or lock sets) for color and texture.
- B. Provide finishes which match those established by BHMA, or if none established, match ENGINEER's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate no lacquer.
- E. The designations used on Schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18, Materials and Finishes Standard, by BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- F. Rust-Resistant Finish: For iron and steel base metal required for exterior work and in areas shown as high-humidity areas (and also when designed with the suffix -RR), provide 0.2 mil thick copper coating on base metal before applying brass, bronze, nickel, or chromium-plated finishes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by ENGINEER.

- B. Install each hardware item in compliance with manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage, and re-installation or application of surface protections with finishing work specified in Division 9. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than 1 month prior to acceptance or occupancy of a space or area, return to Work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct OWNER's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately 6 months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct OWNER's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials, or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

SCHEDULE OF DOOR HARDWARE SETS -

INTERIOR

Single Doors

SET 1.0

| | | |
|------------|--------|--------------------------------|
| 1-1/2 Pair | Butts | Type A |
| 1 Only | Lock | Type B |
| 1 Only | Closer | Type B |
| 1 Only | Stop | See Door and Frame Schedule |

Double Doors

SET 2.0

| | | |
|--------|--------|--------------------------------|
| 3 Pair | Butts | Type A |
| 1 Only | Lock | Type B |
| 1 Only | Closer | Type A (Active leaf) |
| 2 Only | Bolt | Type A |
| 2 Only | Stops | See Door and Frame Schedule |

SET 3.0

| | | |
|------------|--------|--------------------------------|
| 1-1/2 Pair | Butts | Type A |
| 1 Only | Lock | Type H |
| 1 Only | Closer | Type B |
| 1 Only | Stop | See Door and Frame Schedule |

LEGEND OF HARDWARE TYPES

Butts

Type A - Full Mortised (US32D finish)

| | | | |
|---|----------|--------|--------------------|
| 1 | Stanley | FBB191 | 4-1/2 x 4-1/2 NRP* |
| 2 | McKinney | TB2314 | 4-1/2 x 4-1/2 NRP* |
| 3 | Hager | BB1191 | 4-1/2 x 4-1/2 NRP* |
| 4 | Bommer | BB5002 | 4-1/2 x 4-1/2 NRP* |
| 5 | PBB | BB51 | 4-1/2 x 4-1/2 NRP* |
| 6 | Ives | 5BB1 | 4-1/2 x 4-1/2 NRP* |

Substitute steel butts for UL labeled doors.

Electric Monitor Hinges

| | | | |
|---|-------|-----|------------------|
| 1 | Hager | EMN | Suffix to Type A |
| 2 | PBB | EM | Suffix to Type A |
| 3 | | | |

Type B - Half Mortised (US32D finish)

| | | | |
|---|----------|--------|--------------------|
| 1 | Stanley | FBB108 | 4-1/2 x 4-1/2 NRP* |
| 2 | McKinney | TB3374 | 4-1/2 x 4-1/2 NRP* |
| 3 | Hager | BB1108 | 4-1/2 x 4-1/2 NRP* |
| 4 | Bommer | BB5102 | 4-1/2 x 4-1/2 NRP* |
| 5 | Ives | 5BB2 | 4-1/2 x 4-1/2 NRP* |

Type C - Pivots for Aluminum Entry

| | | |
|---|---------|--|
| 1 | Kawneer | Top offset pivot Intermediate offset pivot Bottom offset pivot |
|---|---------|--|

Lock

Corbin and Russwin keying for all locksets
 Type A - Single Panic (BHMA 630/US32D Satin Stainless Steel finish)
 (Pushbar Rim Device with ANSI function 08 Exit Device front door outside lever lock trim)

| | | |
|---|----------------|--------------|
| 1 | Corbin/Russwin | ED 5200 x R1 |
|---|----------------|--------------|

Type B - Classroom (US32D finish) with ANSI function F84 lever trim.

| | | |
|---|----------------|-------------|
| 1 | Corbin/Russwin | ML 2055 RWA |
|---|----------------|-------------|

Type C - For Aluminum Entry

| | | |
|---|---------|---|
| 1 | Kawneer | MS Lock w/cylinders (Key and thumb operated) |
|---|---------|---|

Type D - Privacy Lock (US32D finish)

| | | |
|---|---------------|-------------|
| 2 | Corbin/Russwi | ML 2030 RWA |
|---|---------------|-------------|

Type E - Passage Latch (US32D finish)

| | | |
|---|---------------|-------------|
| 2 | Corbin/Russwi | ML 2010 RWA |
|---|---------------|-------------|

Type F - Panic 2-Point (Entrance) US32D (Crossbar Mortise Device for narrow stile w/ext. Cylinder)

| | | |
|---|-------------|------|
| 2 | Dor-o-matic | 1992 |
|---|-------------|------|

Type G - Deadlock (Entrance) US32D finish

| | | |
|---|----------------|---------|
| 2 | Corbin/Russwin | ML 2013 |
|---|----------------|---------|

Type H - Office (US32D finish) with ANSI function F04 with inside thumb-turn and lever lock trim.

| | | |
|---|----------------|---------|
| 1 | Corbin/Russwin | ML 2051 |
|---|----------------|---------|

NOTE: All hardware in hazardous areas (i.e., Boiler, Chlorine Rooms) shall have knurled finish.

Closer

Type A - Type. Parallel Arm w/H.O. (Alum)
(For out-swinging doors)

| | | |
|---|----------------|-------------------|
| 1 | LCN | 4111H Cush Series |
| 2 | Corbin/Russwin | DC 6210 A5 |
| 3 | Stanley | D-4550H EDA |
| 3 | Sargent | 281 CPHS |

Type B - Int. Pull Side W/H.O. (Alum)
(For in-swinging doors)

| | | |
|---|----------------|---------------|
| 1 | LCN | 4011 H Series |
| 2 | Corbin/Russwin | DC 6200 A1 |
| 3 | Sargent | 281 H10 |
| 3 | Stanley | D-4550H REG |

NOTE: Delete H.O. on all closers for label doors.

Type C - For Aluminum Entry

| | | |
|---|---------|----------------------------------|
| 1 | Kawneer | Sam-11 Concealed overhead closer |
| 2 | LCN | 2030 or 5030 series |
| 3 | Rixson | 70 series |

Type D - For Entrance (not alum) Concealed Overhead.

| | | |
|---|--------|-------------|
| 1 | LCN | 2030 Series |
| 2 | Rixson | 70 Series |

Type E - Int. Push Side, Double Lever Arm.

| | | |
|---|-----|------|
| 1 | LCN | 4824 |
|---|-----|------|

Plates

Type A - Push (US32D finish)

| | | |
|---|----------|-------------|
| 1 | Baldwin | 2124 |
| 2 | Rockwood | 70 - 4 x 16 |
| 3 | Trimco | 1001-1 |
| 4 | Ives | 8200 4 x 16 |

Type B - Pull (US32D finish)

| | | |
|---|----------|-----------|
| 1 | Baldwin | 2367 |
| 2 | Rockwood | 107 x 70C |
| 3 | Trimco | 1017-3B |
| 4 | Ives | 8302 |

Type C - Kick (clear plastic)

| | | |
|---|----------|-----------------------------------|
| 1 | Rockwood | K4125 1/8" x 8" x 1 1/2" LDW** |
| 2 | Burns | 1/8" x 8" x 1 1/2" LDW** |
| 3 | Ives | 1/8" x 8" x 1 1/2" LDW** |

Type D - For Aluminum Entry (US32D)

| | | |
|---|-----------|-------------------------|
| 1 | Brookline | 1 - 050 B.B. 8-inch |
| 1 | Kawneer | 1 - CO-9 B.B. 9-inch |
| 1 | Trimco | 1 - 1191-1 |
| 1 | Rockwood | 1 - 150 |

Type E - Kick (US32D)

| | | |
|---|----------|-------------------------------|
| 1 | Rockwood | 0.050 x 8" x 1 1/2" LDW |
| 2 | Trimco | KOO50 0.050 x 8" x 1 1/2" LDW |
| 3 | Ives | 0.050 x 8" x 1 1/2" LDW |

Threshold

Type A - Aluminum (Saddle, Mill Finish)

| | | |
|---|----------------|-----------------|
| 1 | Zero | 8655A 5" x 1/2" |
| 2 | National Guard | 425E 5" x 1/2" |
| 3 | Reese | S205A 5" x 1/2" |

Type B - for Aluminum Entry

| | | |
|---|---------|-----------------------------------|
| 1 | Kawneer | Offset pivot for over-head closer |
|---|---------|-----------------------------------|

Coordinator

Type A - (USP)

| | | |
|---|---------------|-------|
| 1 | Rockwood | 1672 |
| | Glynn-Johnson | COR-2 |

*NRP = Nonremovable Pin

**LDW = Less door width

Bolts

Type A - Extension Concealed Flush (US26D finish)

| | | |
|---|---------------|----------------|
| 1 | Trimco | W3917-12 |
| 2 | Glynn-Johnson | FB6 |
| 3 | Rockwood | 555 x 12" Min. |

Type B - Surface (US26D finish)

| | | |
|---|---------------|-------------|
| 1 | Stanley | CD4060 x 8" |
| 2 | Glynn-Johnson | GR1642 8" |

Type C - Two Point Concealed Automatic Flush (US26D finish)

| | | |
|---|----------------|---------|
| 1 | Corbin/Russwin | ED 6800 |
| 2 | Sargent | 3710 |

Type D - Surface Spring Action with Chain (US26D)

| | | |
|---|---------|------------------|
| 1 | Stanley | SP1055 x 6" Bolt |
|---|---------|------------------|

Weatherseal

Type A - Head and Jamb (Aluminum finish; color to be selected)

| | | |
|---|----------------|------|
| 1 | Zero | 139 |
| 2 | National Guard | 130 |
| 3 | Reese | DS78 |

Type B - Door Bottom (Neoprene w/ Alum. finish; color to be selected) for doors opening out

| | | |
|---|----------------|-----|
| 1 | Zero | 39 |
| 2 | National Guard | 200 |
| 3 | Reese | 323 |

Type B - Door Bottom (Neoprene w/ Alum. finish; color to be selected) for doors opening in

| | | |
|---|----------------|-------|
| 1 | Zero | 153 |
| 2 | National Guard | 113 |
| 3 | Reese | DB593 |

Type C - Applied Stop at Head and Jamb (Neoprene w/ Alum. Finish; color to be selected)

| | | |
|---|----------------|-----|
| 1 | Zero | 170 |
| 2 | National Guard | 103 |
| 3 | Reese | 599 |

Type D - Monorail Weatherseal (Neoprene w/ Alum. Finish; color to be selected)

| | | |
|---|----------------|-------|
| 1 | Zero | 316* |
| 2 | National Guard | 203* |
| 3 | Reese | DS78* |

Type E - Astragals

Vertical and Horizontal

| | | |
|---|----------------|--------------|
| 1 | Zero | 44A + 188 |
| 2 | National Guard | 139SP + 5050 |
| 3 | Reese | 183SP + 737B |

Horizontal

| | | |
|---|----------------|------------|
| 1 | Zero | 87m x drip |
| 2 | National Guard | 123 x 124 |
| 3 | Reese | 202 x 203 |

Smoke seal (Required on all Labeled Fire-Rated Doors)

| | | |
|---|----------------|------|
| 1 | Zero | 188 |
| 2 | National Guard | 5050 |
| 3 | Reese | 797 |

Lock Guard

| | | |
|---|---------------|-----------------|
| 1 | Precision | 1625 NL (US32D) |
| 2 | Glynn-Johnson | LP12 |

Stop Type (Fed. Spec. 1161A)

Type A - Overhead (US26D)

| | | |
|---|----------------|---------------|
| 1 | Glynn-Johnson | GJ90MS Series |
| 2 | Corbin/Russwin | DH 5400 |
| 3 | Sargent | 590S Series |

Type B - Wall (US26D finish)

| | | |
|---|---------------|----------|
| 1 | Glynn-Johnson | GJWB60C |
| 2 | Trimco | 1270CVSV |
| 3 | Rockwood | 404 |

Type C - Base w/Holder (US26D finish)

| | | |
|---|---------------|-------|
| 1 | Glynn-Johnson | GJW20 |
| 2 | Trimco | 1207 |
| 3 | Rockwood | 476 |

Type D - Floor (US26D finish)

| | | |
|---|---------------|--------|
| 1 | Glynn-Johnson | GJFB14 |
| 2 | Trimco | 1211 |
| 3 | Rockwood | 442 |

Type E - Wall w/ Hold Open (US26D finish)

| | | |
|---|---------------|---------|
| 1 | Glynn-Johnson | GJW-45A |
| 2 | Rockwood | 494 |
| 3 | Trimco | 1254 |

Type F - Floor w/ Hold Open (US26D finish)

| | | |
|---|---------------|------|
| 1 | Glynn-Johnson | F20X |
| 2 | Rockwood | 485 |

* Provide closed cell sponge neoprene per Government Specification MIL R 61 30A, Type II per Standard Detail appended.

END OF SECTION

SECTION 08800

GLASS AND GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Glass and glazing work as indicated on Drawings and Schedules. Types of Work in this Section include glass and glazing for:
1. Window units not indicated as pre-glazed.
 2. Storefront construction.

1.02 SYSTEM DESCRIPTION

- A. Provide glass and glazing that has been produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable) without failure. Includes loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials, and other defects in Work.
1. Deterioration of insulating glass is defined as failure of hermetic seal due to causes other than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
1. Product Data: Manufacturer's technical data for each glazing material and fabrication glass product required, including installation and maintenance instructions.
 2. Samples: For verification purposes, 12-inch square samples of each type of glass indicated, and 12-inch-long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.
- B. Quality Assurance Submittals: Submit certificates from respective manufacturers attesting that glass and glazing materials provided for Project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.
- C. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

1.04 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FMGA), Glazing Manual and Sealant Manual, except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this Section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
- C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:
1. Insulating Glass Certification Council (IGCC).
- D. Single Source Responsibility: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage, and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Manufacturers of Insulating Glass:
 - a. AFG Industries, Inc.
 - b. Cardinal IG.
 - c. Guardian Industries Corp.
 - d. PPG Industries, Inc.
 - e. Viracon, Inc.
 - f. Visteon.

2.02 GLASS PRODUCTS, GENERAL

- A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality and, if applicable, form, finish, mesh, and pattern.

2.03 PRIMARY GLASS PRODUCTS

- A. Clear Float Glass: Type I, (transparent glass, flat), Class 1, Quality q3 (glazing select).

2.04 SEALED INSULATING GLASS UNITS

- A. Provide pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated, as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design, and desiccant.
 - 1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products indicated.
 - 2. Performance Classification per ASTM E 774, Class A.

3. Thickness of each Pane:
 - a. 1/4 inch.
 4. Air Space Thickness:
 - a. 1/2-inch.
 5. Sealing System:
 - a. Manufacturer's standard.
 6. Spacer Material:
 - a. Manufacturer's standard metal.
 7. Corner Construction: Manufacturer's standard corner construction.
- B. Uncoated Insulating Glass Units: Manufacturer's standard units complying with the following requirements:
1. Exterior Pane:
 - a. Clear float glass.
 2. Kind:
 - a. As indicated.
 3. Interior Pane of Glass: Clear float glass.

2.05 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions of size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542; black.
1. Neoprene, ASTM 864.

2.06 MISCELLANEOUS GLAZING MATERIALS

- A. Compatibility: Provide products of material, size, and shape with referenced glazing standard, requirements of manufacturers of glass, and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Elastomeric material with a Shore Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric material with a Shore Type A durometer hardness recommended by glass manufacturer to maintain glass lites in place for application indicated.
- E. Edge Blocks: Elastomeric material of hardness required to limit lateral movement (side-walking).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Require Glazier to inspect Work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 GLAZING

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from Site and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by pre-construction sealant-substrate testing.
- E. Install setting blocks of proper size in sill rabbet, located one-quarter of glass width from each corner, but with edge nearest corner not closer than 6 inches from corner unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- F. Provide spacers inside and out of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- H. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- I. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- J. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- K. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- L. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not walk out when installation is subjected to movement.
- M. Miter-cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits, or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- E. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of Substantial Completion in each area of Work. Wash glass by method recommended by glass manufacturer.

3.05 GLASS SCHEDULE

- A. Refer to drawings for size and location.

END OF SECTION

DIVISION 9

FINISHES

SECTION 09250
GYPSUM DRYWALL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board screw attached to steel framing and furring members.
2. Trim accessories.
3. Joint treatment materials.
4. Miscellaneous materials.
5. Moisture and Mold-Resistant Gypsum Board Ceilings.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Product data from manufacturers for each type of product specified.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain gypsum board and joint treatment materials from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Minimum Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board maintain not less than 50 degrees F (10 degrees C) for 48 hours prior to application and continuously thereafter until drying is complete.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Steel Framing and Furring:
 - a. Bostwick Steel Framing Co.
 - b. Dale Industries, Inc.
 - c. Gold Bond Building Products Division, National Gypsum Co.
 - d. Incor, Inc.
 - e. Marino Industries Corp.
 - f. United States Gypsum Co.
 - 2. Grid Suspension Systems:
 - a. Chicago Metallic Corp.
 - b. National Rolling Mills Co.
 - 3. Gypsum Boards and Related Products:
 - a. Centex American Gypsum Co.

- b. Domtar Gypsum Co.
 - c. Georgia-Pacific Corp.
 - d. Gold Bond Building Products Division, National Gypsum Co.
 - e. United States Gypsum Co.
4. Type X gypsum Wallboard
- a. "Gyprock Fireguard 'C' Gypsum Board," Domtar Gypsum Co.
 - b. "Fire-Shield G," Gold Bond Building Products Division, National Gypsum Co.
 - c. "Sheetrock Brand Firecode 'C' Gypsum Panels," United States Gypsum Co.
5. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
- a. Core: 5/8 inch, Type X.
 - b. Long Edges: Tapered.
 - c. Mold Resistance: ASTM D 3273, score of 10.

2.02 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. Provide components which comply with ASTM C 754 for materials and sizes unless otherwise indicated.
- B. Concrete Inserts: Inserts designed for attachment to concrete forms and for embedment in concrete, fabricated from corrosion-resistant materials, with holes or loops for attachment of hanger wires and capability to sustain, without failure, a load equal to 3 times that imposed by ceiling construction, as determined from testing per ASTM E 488, conducted by the independent testing laboratory.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1, zinc coating soft temper.
- D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, protected with rust-inhibitive paint, and as follows:
 - 1. Carrying Channels: 1-1/2-inch deep, 475 pounds per 1,000 feet unless otherwise indicated.
 - 2. Furring Channels: 3/4-inch deep, 300 pounds per 1,000 feet unless otherwise indicated.

- G. Steel Studs for Furring Channels: ASTM C 645 with flange edges bent back 90 degrees and doubles over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:
 - 1. Thickness:
 - a. 0.0179 inch unless otherwise indicated.
 - b. 0.0329 inch unless otherwise indicated.
 - 2. Depth:
 - a. 3-5/8 inches unless otherwise indicated.
- H. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.

2.03 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1. Thickness:
 - a. 0.329 inch unless otherwise indicated.
 - 2. Depth: 3-5/8 inches unless otherwise indicated.
- B. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth and minimum thickness of base (uncoated) metal as follows:
 - 1. Depth:
 - a. 1-1/2 inches.
 - 2. Thickness:
 - a. 0.0329 inch unless otherwise indicated.
- C. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

- D. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for base metal, finish and widths of face and fastening flange, fabricated to form 1/2-inch-deep channel of the following configuration:
1. Single Leg Configuration: Asymmetric-shaped channel with face connected to a single flange by a single slotted leg (web).
 2. Double Leg Configuration: Hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double slotted or expanded metal legs (webs).
 3. Configuration: Either one indicated above.
- E. Z-Furring Members: Manufacturer's standard Z-shaped furring members with slotted or nonslotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with a minimum base metal (uncoated) thickness of 0.0179 inch, face flange of 1-1/4 inches, wall-attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.
- F. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring power members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

2.04 GYPSUM BOARD

- A. Provide gypsum board to comply with ASTM C 840 for application system and support spacing indicated in maximum lengths available to minimize end-to-end joints. Provide Water-Resistant Gypsum Backing Board at wet side locations of plumbing chases.
- B. Gypsum Wallboard: ASTM C 36, and as follows:
1. Type:
 - a. Regular, unless otherwise indicated.
 - b. Type X for fire resistance-rated assemblies.
 2. Edges: Tapered.
 3. Thickness: 5/8 inch unless otherwise indicated.
- C. Water-Resistant Gypsum Backing Board: ASTM C 630, and as follows:
1. Type:

- a. Regular, unless otherwise indicated.
 - b. Type X for fire resistant-rated assemblies.
2. Edges: Manufacturer's standard.
 3. Thickness: 5/8 inch unless otherwise indicated.

2.05 TRIM ACCESSORIES

- A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim, and control joints which comply with ASTM C 1047 and requirements indicated below:
 1. Material: Formed metal, plastic, or metal combined with paper, with sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
 2. Edge trim shapes indicated below by reference to designations of Figure 1 in ASTM C 1047:
 - a. LC-bead, unless otherwise indicated.
- B. One-Piece Control Joints: Formed with V-shaped slot per Figure 1 in ASTM C 1047, with slot opening covered with removable strip.

2.06 GYPSUM BOARD JOINT TREATMENT MATERIALS

- A. Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for application indicated.
- B. Joint Tape: Paper reinforcing tape unless otherwise indicated.
- C. Setting-Type Joint Compounds: Factory pre-packaged, job mixed, chemical hardening powder products formulated for uses indicated.
 1. For pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
- D. Drying-Type Joint Compounds: Factory pre-packaged vinyl-based products complying with following requirements for formulation and intended use.
 1. Ready-Mix Formulation: Factory pre-mixed product.
 2. All-purpose compound formulated for use as both taping and topping compound.

2.07 MISCELLANEOUS MATERIALS

- A. Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and recommendations of manufacturer of gypsum board.
- B. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal doorframes.
- C. Gypsum Board Screws: ASTM C 1002.
- D. Asphalt Felt: ASTM D 226, Type I (No. 15).
- E. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Section 07900.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.
 - 1. Provide concrete inserts and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

3.02 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Screw furring members to wood framing.
- B. Secure hangers to structural support by connecting directly to structure where possible; otherwise, connect to cast-in concrete inserts or other anchorage devices or fasteners.
 - 1. Do not attach hangers to metal deck tabs.
 - 2. Do not attach hangers to metal roof deck.
- C. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.
 - 1. Wire Hangers: 0.1620-inch diameter (8-gauge), 4 feet on center.
 - 2. Carrying Channels (Main Runners): 1-1/2 inches, 4 feet on center.
 - 3. Rigid Furring Channels (Furring Members): 16 inches on center.

- D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.03 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum drywall stud system abuts other construction. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8 inch from plane of faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
- D. Install steel studs and furring at 16 inches on center, in sizes indicated but not less than that required by referenced steel framing installation standard.
- E. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in direction opposite to that of flange.
- F. Frame door openings to comply with detailed indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- G. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings, and install framing below sills of openings to match framing required above door heads.
- H. Install thermal insulation as follows:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches on center.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center.
- I. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner. On adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.04 APPLICATION AND FINISHING OF GYPSUM BOARD

- A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.
- B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- D. Install ceiling boards across framing in a manner which minimizes the number of end-butt joints, and which avoids end joints in central area of each ceiling. Stagger end joints at least 24 inches.
- E. Install wall/partition boards by parallel application method (long edges parallel to framing). At stairwells and similar high walls, install board horizontally with end joints staggered over studs and back-block edge joints for continuous support.
- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged, or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
- G. Located either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end or edge joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- H. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

- I. Spot grout hollow metal doorframes for solid core wood doors and hollow metal doors. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- J. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.
- K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are properly braced internally.
 - 1. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet area, and may be limited to not less than 75 percent of full coverage.
 - 2. Fit gypsum board around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4- to 1/2-inch-wide joint for sealant.
- L. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4- to 1/2-inch space and trim edge with U-bead edge trim. Seal joints with acoustical sealant.
- M. Floating Construction: Where feasible or where recommended by manufacturer, install gypsum board over wood framing with floating internal corner construction.
- N. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.05 METHODS OF GYPSUM BOARD APPLICATION

- A. Single Layer Application: Install gypsum wallboard as follows:
 - 1. On ceilings, apply gypsum board prior to wall/partition board application to the greatest extent possible.
 - 2. On partitions/walls, apply gypsum board vertically (parallel to framing) unless otherwise indicated, and provide sheet lengths which will minimize end joints.
 - 3. On ceilings, apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10 inches. Apply base layers at right angles to supports unless otherwise indicated.

4. On partitions/walls, apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.

B. Single Layer Fastening Method: Fasten gypsum boards to supports with screws:

3.06 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where U-bead (semi-finishing type) is indicated.
 1. Install LC-bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
- D. Install control joints at locations indicated or, if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by ENGINEER for visual effect.

3.07 FINISHING OF DRYWALL

- A. Apply joint treatment at gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare Work for decoration.
- B. Pre-fill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- D. Finish interior gypsum wallboard by applying following joint compounds in 3 coats (not including pre-fill of openings in base), and sand between coats and after last coat:
 1. Embedding and First Coat: Setting type joint compound.
 2. Fill (Second) Coat: Setting type joint compound.
 3. Finish (Third) Coat: Ready-mix drying type, all-purpose or topping compound.

- E. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer's recommendations for treatment of joints behind tile.
- F. Partial Finishing: Omit third coat and sanding on concealed drywall Work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating, or to act as air or smoke barrier.

END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of each type of acoustical ceiling as shown on Drawings and Scheduled.
- B. Types of acoustical ceilings specified in this Section include the following:
 - 1. Acoustical panel ceilings, exposed suspension.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to Work of this Section.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
 - 2. Samples for Initial Selection Purposes: Manufacturers' standard size samples of acoustical units, but not less than 6 inches square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures, and patterns available for each type of component required.
 - 3. Samples for Verification Purposes: Submit the following:
 - a. 6-inch-square samples of each acoustical panel type, pattern, and color.
 - b. Set of 12-inch-long samples of exposed runners and moldings for each color and system type required.
 - 4. Certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements.

1.03 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristic tested per ASTM E 84, as follows:
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 50 or less.
- B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other Work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to Site in original, unopened packages, and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.05 PROJECT CONDITIONS

- A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Acoustical Panels:

- a. Mineral Composition - Nodulated, Cast or Molded with Standard Washable Painted Finish, Fissured Pattern, Non-Fire Resistance Rated:
 - 1) Basis of Design: "Fine Fissured," High NRC, Dune Second Look II, Scored Tegular, 24" x 48" x 3/4" Armstrong World Industries, Inc.
 - 2) "Fine Fissured High NRC, CertainTeed.
 - 3) "'Fine' Fissured," High NRC, USG Acoustical Products Co.

2.02 ACOUSTICAL CEILING UNITS

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).
 - 1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.
- B. Colors, Textures, and Patterns: Provide products to match appearance characteristics indicated, or if not otherwise indicated, as selected by ENGINEER from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.03 METAL SUSPENSION SYSTEMS

- A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification, and finish indicated which comply with applicable ASTM C 635 requirements.
- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated on Drawings, or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc. - Basis of Design.
 - 2. CertainTeed Corp.
 - 4. USG Interiors, Inc.; Subsidiary of USG Corporation.
- C. For exposed suspension members and accessories with painted finish, provide color indicated, or if not otherwise indicated, as selected by ENGINEER from manufacturer's full range of standard colors.
- D. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.

1. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embodiment in concrete with holes or loops for attachment at hanger wires.
- E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gauge.
- F. Edge Moldings and Trim: Metal or extruded plastic of types and profiles indicated, or if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
 1. Provide concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other Work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and CISCA standards applicable to Work.
- B. Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.
 1. Install tile with pattern running in one direction.
- C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6 inches from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8-inch in 12'-0".
 1. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which shall not deteriorate or fail with age or elevated temperatures.

2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.
- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
 - E. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
 1. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer unless otherwise indicated or required.

3.03 CLEANING

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace Work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09653

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of resilient tile base and accessories, including locations and details, as indicated on Drawings and Schedules.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Shop Drawings showing location and extent of resilient base. Indicate columns, doorways, partitions, built-in cabinets, and stairs. Show installation details at special conditions.
 - 2. Product Data: Submit manufacturer's product literature and installation instructions for each type of resilient base and installation accessory required. Include methods of installation for each type of substrate.
 - a. Submit written data on physical characteristics, durability, and resistance to fading and flame resistance characteristics.
 - 3. Samples for Verification Purposes: Submit the following:
 - a. 12-inch samples of each type of resilient base specified.
 - b. Prepare samples from the same material to be used for the Work.
- B. Maintenance Data: Submit in accordance with requirements of Division 1, General Requirements covering the data items included under this Section.
- C. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide resilient base produced by a single manufacturer for each type required, including adhesives.

1.04 TESTING

- A. Test Reports: Submit certified test reports evidencing compliance with requirements for the following:
 - 1. Fire performance characteristics.
- B. Fire Performance Characteristics: Provide resilient base that is identical to that tested for the following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: As follows:
 - a. Flame Spread: Not more than 25.
 - b. Smoke Developed: Not more than 50.
 - c. Test Method: ASTM E 84.
 - d. Test Method: NFPA 255.
 - e. Test Method: UL 723.
- C. Physical Properties: Provide resilient base that is identical to that tested for the following physical properties according to the test method indicated.
- D. Certification: Submit manufacturer's certificate stating that materials furnished comply with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project Site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, pattern name, quality or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, and soiling.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.
 - 1. Maintain storage area at 55 degrees F (13 degrees C) and below 50 percent relative humidity.

1.06 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65 degrees F (18 degrees C) and maximum 85 degrees F (30 degrees C) in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation.

Maintain minimum temperature of 55 degrees F (13 degrees C) where Work is complete.

1.07 SEQUENCING AND SCHEDULING

- A. Sequence resilient base installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.08 MAINTENANCE

- A. Replacement Materials: After completion of Work, deliver not less than 2 percent of each type, color, and pattern of resilient base exclusive of material required to properly complete installation. Furnish accessory components as required. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Vinyl Wall Base:
 - a. Johnsonite, A Tarkett Company
 - b. Armstrong World Industries, Inc.
 - c. Flexco Company.
 - 2. Carpet and Resilient Floor Accessories:
 - a. Flexco Company.
 - b. Johnson Rubber Company.
 - c. Mercer Plastics Co.
 - d. R.C. Musson Rubber Co., Inc.
 - e. Roppe Rubber Corp.

2.02 WALL BASE

- A. Flexible ribbed-back straight and preformed or molded corner units with factory-cut ends.
 - 1. Height: 4 inches.
 - 2. Style: Cove (standard 5/8-inch toe).

3. Thickness: 1/8 inch.
4. Finish: Standard.

2.03 FINISHES

- A. Provide materials in colors and patterns (if applicable) as selected by ENGINEER from manufacturer's standard colors and patterns.
- B. Installation Accessories:
 1. Wall Base Adhesive: Waterproof bonding, quick setting to permit positioning before full bond, to suit material and substrate conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates for resilient base and accessories to determine if they are free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Notify ENGINEER/Designer in writing of all conditions detrimental to proper completion of the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install resilient accessories after other finishing operations, including painting and installation of flooring materials, have been completed.
- B. Install resilient accessories using methods indicated in strict compliance with manufacturer's printed instructions. Do not place seam joints in traffic areas.
- C. Tightly cement resilient accessories to subbase without open cracks, voids, raising, or puckering at joints, telegraphing of adhesive, or other surface imperfections.
- D. Apply wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practical, with preformed corner units or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece with continuous contact at horizontal and vertical surfaces.

1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- E. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.03 CLEANING

- A. Remove any excess adhesive or other blemishes using cleaner recommended by resilient accessory manufacturer.
- B. Remove surplus materials, rubbish, and debris resulting from resilient accessory installation upon completion of the work; leave areas of installation in neat, clean condition.

3.04 PROTECTION

- A. Advise CONTRACTOR of protection needed to ensure that resilient accessories will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 09671
RESINOUS FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Decorative resinous flooring systems.
 - 2. Industrial resinous flooring systems.
 - 3. High-performance resinous flooring systems.
- B. Related Sections:
 - 1. Division 7 Section "Joint Sealers" for sealants installed at joints in resinous flooring systems.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Material Certificates: For each resinous flooring component, from manufacturer.
- F. Material Test Reports: For each resinous flooring system.

- G. Maintenance Data: For resinous flooring to include in maintenance manuals.
- H. Warranty: Refer to Section 01740: Warranties and Bonds. All paint and coatings work performed under these specifications shall be guaranteed by the coatings applicator for 100 percent of the total coated area for both materials and labor against failures during the warranty period.
- I. Failure under this warranty shall include flaking, peeling, or delaminating of the coating due to aging, chemical attacked, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 - 2. Applicator to have at a minimum of 5 years' experience installation of flooring systems of this type.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
 - a. Include 48-inch (1200-mm) length of integral cove base with inside corner.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Atlas Minerals & Chemicals, Inc.; Polymer Flooring Division; (ChemPruf 121).
 - 2. Benjamin Moore & Co.; (Epoxy Novolac M79/M80)
 - 3. Dudick, Inc.; (Protecto-Coat 100XT)
 - 4. Epoxy Systems, Inc.; (#633)
 - 5. PolySpec; (NovoRez 350)
 - 6. Tamms Industries, Inc.; a division of The Euclid Chemical Company (Dural Tex 1807)
 - 7. Tnemec Company, Inc.; (Tneme-Glaze 282)

2.02 HIGH-PERFORMANCE RESINOUS FLOORING

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance-aggregate- filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.
- B. System Characteristics:
 - 1. Color and Pattern: As selected by Owner from manufacturer's full range.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: 1/16 inch (1.6 mm).
- C. Body Coats:
 - 1. Resin: Epoxy novolac.
 - 2. Formulation Description: Water based.
 - 3. Application Method: Self-leveling slurry.
 - a. Thickness of Coats: 1/16 inch (1.6 mm).
 - b. Number of Coats: One.
 - 4. Aggregates: Manufacturer's standard.
- D. Topcoat: Sealing or finish coats.
 - 1. Resin: Epoxy novolac.
 - 2. Formulation Description: Water based.
 - 3. Type: Clear.
 - 4. Finish: Gloss.
 - 5. Number of Coats: One.
- E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
 - 1. Compressive Strength: per ASTM C 579.
 - 2. Tensile Strength: per ASTM C 307.
 - 3. Flexural Modulus of Elasticity: per ASTM C 580.

4. Water Absorption: per ASTM C 413.
 5. Coefficient of Thermal Expansion: per ASTM C 531.
 6. Indentation: percent maximum per MIL-D-3134.
 7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.
 8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
 9. Abrasion Resistance: maximum weight loss per ASTM D 4060.
 10. Flammability: Self-extinguishing per ASTM D 635.
 11. Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.
 12. Hardness: Shore D per ASTM D 2240.
 13. Bond Strength: 100 percent concrete failure per ACI 503R.
- F. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to STM D 1308 for 50 percent immersion in the following reagents for no fewer than seven days:

2.03 ACCESSORIES

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated.
1. Formulation Description: Water based.
- B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 - 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.
 - b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.02 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 4 inches (100 mm) high.
- D. Apply self-leveling slurry body coats in thickness indicated for flooring system.
- E. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.

- F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.03 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09900

PAINTING

PART I - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor shall furnish all materials, labor, equipment, and incidentals required to provide a protective coating system for the surfaces listed herein and not otherwise excluded. All surfaces described, whether new or existing, shall be included within the scope of this Section.
- B. The work includes painting and finishing of interior and exterior exposed items and surfaces such as ceilings, walls, floors, miscellaneous metal, doors, frames, transoms, roof fans, construction signs, guardrails, posts, pipes, fittings, valves, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the Drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specifications as stated herein. The following major items of the Project shall be coated:
1. Interior of cast-in-place concrete and concrete block walls and concrete ceilings and exterior concrete block and stucco walls. This shall include the interior and exterior of the Maintenance Building and the Storage Building. Coatings are covered in the architectural drawings and in Specification Sections 09671, and herein. Water repellant masonry coating for decorative CMU is specified in Section 07100.
 2. Interior of concrete water retaining structures, where applicable.
 3. Exterior of concrete structures, where applicable.
 4. Submerged surfaces and surfaces exposed to potable water of any ferrous metal and aluminum components of equipment, piping, fittings and valves (except stainless steel).
 5. Exposed ferrous surfaces of equipment, pumps, motors, tanks and ferrous or galvanized metal fittings and accessories.
 6. Exposed surfaces of PVC components of piping, fittings, valves, electrical conduit and equipment.

7. Exposed exterior surfaces of all metallic piping, conduit, fittings and valves, and galvanized metals located on the interior and exterior of buildings and structures. This shall include new piping, conduit, fittings and valves for the Project. Paint all exposed conduits in buildings to match background color.
 8. Embedded aluminum or aluminum in contact with dissimilar metals or in contact with corrosive atmospheres.
- C. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, epoxies, sealers and fillers, and other applied materials whether used as a prime, intermediate or finish coats.
- D. The following items will not be painted unless otherwise noted:
1. Any code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.
 2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.
 3. Aluminum or fiberglass handrails, walkways, toeboards, windows, louvers, grating, checker plate, hatches, and stairways.
 4. Stainless steel angles, tube, pipe, etc.
 5. Products with polished chrome, aluminum, nickel or stainless steel finish.
 6. Stainless steel, brass, bronze, chromium plate, anodized aluminum, and aluminum other than exposed utility tubing.
 7. Flexible couplings, lubricated bearing surfaces, insulation and plastic pipe or duct interiors.
 8. Plastic switch plates and receptacle plates.
 9. Signs and nameplates.
 10. Finish hardware.
 11. Packing glands and other adjustable parts, unless otherwise indicated.

12. Prefinished items including architectural woodwork and casework, toilet enclosures, metal lockers, elevator equipment, light fixtures, and distribution cabinets.
13. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in, or in contact with, concrete shall be coated to prevent electrolysis.

1.02 RELATED WORK

- A. Paint piping and equipment for identification purposes in accordance to Section 09905: Piping and Equipment Identification System.
- B. Section 07100: Water Repellant Masonry Coating
- C. Section 09671: Resinous Flooring.

1.03 QUALITY ASSURANCE

- A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide undercoat paint produced by the same manufacturer as the finish coats. Undercoat and finish coat paints shall be compatible. Use only thinners approved by the paint manufacturer, and use only within recommended limits.
- C. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this project. Work shall be done in a safe and workmanlike manner. Training shall be provided by the manufacturer prior to the coating application.

Contractor shall fill out daily painting reports. See Form G-1 in this specification.

- D. Standards:
 1. ASTM.
 2. OSHA.
 3. NFPA.

4. SSPC.
 5. NACE.
 6. NSF.
 7. AWWA.
- E. Acceptable Manufacturers:
1. Tnemec Company, Inc.
 2. Carboline Company.
 3. Keeler & Long, Inc.
 4. Porter International.
 5. Crawford Laboratories, Inc. (Florock).

1.04 SUBMITTALS

- A. Materials and Shop Drawings: Submit to the Engineer as provided in the General Conditions and Section 01340: Shop Drawings, Working Drawings and Samples, shop drawings, manufacturer's specifications and data on the proposed paint systems and detailed surface preparation, application procedures and dry film thickness (DFT).
- B. Schedule:
1. The Contractor shall submit for approval a complete typewritten Schedule of Painting Operations within 90 days after the Notice to Proceed. This Schedule is imperative so that the various fabricators or suppliers may be notified of the proper ship prime coat to apply. It shall be the Contractor's responsibility to properly notify and coordinate the fabricators' or suppliers' surface preparation and painting operations with these specifications. This Schedule shall include for each surface to be painted, the brand name, generic type, solids by volume, application method, the coverage and the number of coats in order to achieve the specified dry film thickness, and color charts. When the Schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges may be utilized by the Owner or Engineer to verify the proper application while work is in progress.

2. It is the intent of this Section that as much as possible all structures, equipment and piping utilize coating systems specified herein supplied by a single manufacturer. All exceptions must be noted on the Schedule. For each coating system, only one (1) manufacturer's product shall be used.
3. Requests for substitutions shall be made within ten (10) days of Bid and shall include all of the information required in the Schedule plus a signed and notarized statement from the Chief (Manufacturing) Chemist that the products listed are equal to the specified products, test results, and a list of ten (10) municipal water plant projects where each product has been used and provided satisfactory service for at least ten years. No request for substitution shall be considered that would change the generic type of coating, decrease DFT, or decrease number of coats.

Test result submittals shall be certified by a qualified testing laboratory. A quality of paint that is measured by analytical written ASTM/Federal test procedures will provide assurances that quality products are utilized.

The results from the following testing procedures shall be submitted for determining quality:

- a. Abrasion: Federal Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 gram load.
 - b. Adhesion: Elcometer Adhesion Tester (0 to 1000 psi).
 - c. Exterior Exposure: Exposed at 45 degrees facing ocean (South Florida Marine Exposures).
 - d. Hardness: ASTM D-3363, latest revision.
 - e. Humidity: ASTM D-2247, latest revision.
 - f. Salt Spray (Fog): ASTM B-117, latest revision.
- C. Color Samples: Manufacturer's standard color charts for color selection by Owner.
- D. Samples- Painting:
1. Paint colors will be selected by Owner. Compliance with all other requirements is the exclusive responsibility of the Contractor.
 2. Samples of each finish and color shall be submitted to the Owner or Engineer for approval before any work is started.

3. Samples shall be prepared so that an area of each sample indicates the appearance of the various coats. For example, where three (3) coat work is specified, the sample shall be divided into three (3) areas:
 - a. One (1) showing the application of one (1) coat only.
 - b. One (1) showing the application of two (2) coats.
 - c. One (1) showing the application of all three (3) coats.
4. Such samples when approved in writing shall constitute a standard, as to color and finish only, for acceptance or rejection of the finish work.
5. For piping, valves, equipment and miscellaneous metal work, provide sample chips or color charts of all paint selected showing color, finish and general characteristics.
6. Rejected samples shall be resubmitted until approved.

1.05 DELIVERY, HANDLING AND STORAGE

- A. Deliver all materials to the job site in original, unopened packages and containers bearing manufacturer's name and label in accordance with Section 01600: Materials and Equipment.
 1. Provide labels on each container with the following information:
 - a. Name or title of material.
 - b. Fed. Spec. number if applicable.
 - c. Manufacturer's stock number, date of manufacture and expiration date (shelf life).
 - d. Manufacturer's formula or specification number.
 - e. Manufacturer's batch number.
 - f. Manufacturer's name.
 - g. Generic type.
 - h. Contents by volume, for major pigment and vehicle constituents.

- i. Application instructions: thinning, ambient conditions, etc.
 - j. Color name and number.
 - 2. Containers shall be clearly marked to indicate any hazards connected with the use of the paint and steps which should be taken to prevent injury to those handling the product. Material Safety Data Sheets shall be kept on-site and made readily available for all personnel.
- B. All containers shall be handled and stored in such a manner as to prevent damage or loss of labels or containers. Containers shall be kept sealed and ready for use.
 - C. All materials shall be stored in a cool, dry area out of the direct sunlight and away from any ignition source. The contractor shall refer to the manufacturer's literature and material safety data sheets for additional storage requirements.
 - D. The Owner shall designate areas for storage and mixing of all painting materials. Store only acceptable product materials on project site. Restrict storage to paint materials and related equipment. Storage of paint materials and related equipment shall comply with the requirements or pertinent codes and fire regulations. In addition, all safety precautions noted on the manufacturer's Material Safety Data Sheets and other literature shall be strictly followed. Proper containers outside of buildings shall be provided by the Contractor and used for painting wastes. No plumbing fixtures shall be used for this purpose.
 - E. Used rags shall be removed from the buildings every night and every precaution taken against spontaneous combustion.

1.06 WARRANTY AND GUARANTEES

- A. Refer to Section 01740: Warranties and Bonds.
- B. All paint and coatings work performed under these specifications shall be guaranteed by the coatings applicator for 100 percent of the total coated area for both materials and labor against failures during the warranty period.
- C. Failure under this warranty shall include flaking, peeling, or delaminating of the coating due to aging, chemical attack, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All paint shall be manufactured by one of the suppliers listed in Paragraph 1.03E., herein, and shall be their highest grade of paint.
- B. The following coating systems list a product by name to establish a standard of quality; other products of the same generic types may be submitted to the Engineer for approval as described in Paragraph 1.04., herein. When other than the specified coating system is proposed, the Contractor shall submit on a typewritten list giving the proposed coatings, brand, trade name, generic type and catalog number of the proposed system for the Engineer's approval.
- C. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Shop paint shall be of the same type and manufacture as used for field painting by the Contractor.
- D. Emulsion and alkyd paints shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements, including Federal Specification TT-P- 19.
- E. Finish coats containing lead shall not be allowed. Oil shall be pure boiled linseed oil.
- F. Rags shall be clean painter's rags, completely sterilized.

2.02 COATING SYSTEMS

- A. Class 1 Exposures – Interior Concrete and Masonry, Non-Immersion Excluding Floors.
 - 1. Examples of this classification include the following surfaces:
 - a. Interior masonry and plaster.
 - b. Concrete block walls.
 - c. Concrete walls, columns and supports.
 - d. Concrete ceilings and beams.

2. Surface Preparation: As specified in Paragraph 3.02, herein, including filling cracks, voids and other surface imperfections, removing mortar droppings, cleaning and air-blasting.
3. Class 1 Coating System:
 - a. Prime Coat: Epoxy Polyamide Filler for Concrete Block
 - (1) Tnemec Series 549-660 Masonry Filler at 75 to 100 sq.ft./gal. Actual coverage may be less than the minimum stated depending on the porosity of the substrate to be coated.
 - b. Finish coats: Epoxy Polyamide or Aine-Cure (Glossy):
 - (1) Tnemec Series 69 Hi-build Epoxoline II: Two (2) coats at 6 to 8 mils DFT each coat for a minimum total finish thickness of 14 mils DFT.

NOTE: MAXIMUM ELAPSE TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

B. Class 2 Exposures - Exposed Concrete, Immersion, Potable (Not Used)

C. Class 3 Exposures - Buried Exterior Concrete Surfaces

1. Class 3 exposures consist of all exterior below grade surfaces for precast concrete structures and all exterior below grade concrete or masonry surfaces for building stemwalls.
 - a. Exterior below grade surfaces of precast and/or cast-in-place concrete wet wells, sanitary manholes, and vaults.
 - b. Exterior below grade surfaces of building stemwalls.
2. Surface Preparation: Same as required for Class 2 exposure surface preparation specified in Paragraph 2.02.B.2 above.
3. Class 3 Coating System
 - a. Prime Coat: Polyamide cured coal tar epoxy thinned 33 percent by volume.
Kop Coat Bitumastic No. 300-M: One (1) coat, 4 mils DFT.
 - b. Finish Coats: Polyamide cured coal tar epoxy.

Kop Coat Bitumastic No. 300-M: Two (2) coats, 10 mils DFT per coat.

- c. Total minimum system finish coating thickness shall be 24 mils DFT.

D. Class 4 Exposures - Concrete and Masonry, Exterior, Non-Immersion

- 1. Class 4 exposures consist of exposed exterior concrete and masonry surfaces of new buildings and structures subjected to normal exterior elements and not subjected to water immersion. Class 4 exposures shall include the following:
 - a. Exterior, aboveground concrete surfaces of modified structures including the maintenance building and the storage building are covered in Specification Section 07100.
- 2. Surface Preparation: As specified in Paragraph 3.02 herein and in addition the following:
 - a. New masonry surfaces shall be prepared by filling cracks, voids and other surface imperfections, removing mortar droppings, cleaning and high pressure water blasting.
 - b. New concrete surfaces shall be prepared as required for Class 2 exposure surface preparation specified in Paragraph 2.02.B.2 above.
 - c. Existing concrete surfaces shall be prepared by high pressure water blasting or abrasive blast cleaning to remove existing deteriorated or disbanded coatings as required for adhesion of the new coating system.
- 3. Class 4 Coating System
 - a. Prime Coat for New Concrete Structures: Cement base waterproofing.
Thoro Systems Thoroseal: One (1) coat, 2 lbs per square yard.
 - b. Prime Coat for New Masonry Structures: Single-component cementitious acrylic masonry block filler.
Tneme Series 130-6602 Envirofill at 80-100 sf/gal.
 - c. Prime Coat for Previously Coated Structures: Two component waterborne epoxy primer.

Tnemec Series 151 Elasto-grip at 300 sf/gal.

- d. Finish Coats: High quality elastometric coating.
Tnemec Series 156 Envirofill; two coats at 5.0 mils DFT per coat.
 - e. Total minimum system finish coating thickness shall be 10.0 mils DFT over the primer or sealer.
- E. Class 5 Exposures – Exposed Concrete, Chemical Resistant (Not Used)
- F. Class 6 Exposures - Metals, Immersion (Interior and Exterior) and Non-Immersion (Interior)
- 1. Class 6 exposures consist of interior and exterior metal surfaces (immersion) and interior metal surfaces that do not come in direct contact with water or corrosive atmospheres and shall include the following:
 - a. Pumps, motors, equipment and appurtenances.
 - b. Aboveground piping, fittings, valves and metal electrical conduit.
 - c. Miscellaneous steel plates, shapes, hardware, etc.
 - d. Galvanized steel surfaces.
 - e. Other surfaces obviously requiring field coating or as specified to be field coated in Division 11 or in Section 09905: Piping and Equipment Identification Systems.
 - 2. Surface Preparation: As specified in Paragraph 3.02 herein and, in addition, the following:
 - a. Non-immersion metals shall be abrasive blast cleaned to SSPC-SP6. Immersion metals shall be abrasive blast cleaned to SSPC-SP10.
 - b. All bare metals or areas that were shop primed that have been damaged shall be abrasive blast cleaned to the appropriate, commercial blast cleaning standards.
 - c. Shop primed items, stored on site for a prolonged period prior to coating, shall be prepared for coating following the coating manufacturer's recommendations prior to applying touch-up and subsequent coats. Surface preparation may include brush-off abrasive blasting or spot blasting to the appropriate, commercial

blast cleaning standards, for areas where the primer has been damaged and bare metal is showing.

- d. Non-ferrous metals shall be degreased and cleaned by washing with a water based dispersant. Rinse thoroughly with clean water after cleaning.

3. Class 6 Coating System (Immersion)

- a. Prime Coat for Ferrous and Non-Ferrous Metals: NSF Part 61 approved, two-part epoxy polyamide primer.
Tnemec Series 140-1255 (Beige) Pota-Pox Plus at 4.0 mils DFT.
- b. Finish Coat for Non-Ferrous Metals: NSF Part 61 approved epoxy coating.
Tnemec Series 140-WH02 (Tank White) Pota-Pox Plus at 4.0 mils DFT.
- c. Finish Coats for Ferrous Metal: NSF Part 61 approved, two component, cross linked epoxy.
Tnemec Series 140 Pota-Pox Plus: Two coats at 5.0 mils DFT per coat.
- d. Total minimum system finish coating thickness shall be 14.0 mils DFT for ferrous metals and 8.0 mils DFT for non-ferrous metals.

4. Class 6 Coating System (Non-Immersion)

- a. Prime Coat for Ferrous and Non-Ferrous Metals: Two component, cross-linked epoxy primer.
Tnemec Series 69 Hi-Build Epoxoline II at 4 mils DFT.
- b. Finish Coat for Non-Ferrous Metals: Two-part epoxy.
Tnemec Series 69 Hi-Build Epoxoline II at 3.0 mils DFT.
- c. Finish Coat for Ferrous Metal: Two component, cross-linked epoxy.
Tnemec Series 69 Hi-Build Epoxoline II at 5.0 mils DFT.
- d. Total minimum system finish coating thickness shall be 9 mils DFT for ferrous metals and 7 mils DFT for non-ferrous metals.

NOTE: MAXIMUM ELAPSED TIME BETWEEN COATS, AS STATED BY THE COATING MANUFACTURER, SHALL NOT BE EXCEEDED.

G. Class 7 Exposures - Plastic Piping, Valves, Fittings and Conduit, Interior and Exterior

1. Class 7 exposures consist of PVC or fiberglass piping and structural shapes or electrical systems requiring color coding, and for protection of exposed, exterior plastic components from the elements, and shall include the following:
 - a. PVC and fiberglass piping, fittings, valves and electrical conduits requiring color coding in accordance with Section 09905: Piping and Equipment Identification System.
 - b. Exposed exterior plastic piping, valve and fitting components subject to UV degradation and weathering by the elements.
2. Surface Preparation: As specified in Paragraph 3.02 herein, including cleaning and washing with detergent to remove all dirt and foreign material, and light surface abrasion using medium grade sandpaper. Remove dust, dirt and debris with clean rags prior to coating.
3. Class 7 Coating System:
 - a. Prime Coat: Two component epoxy.
Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.
 - b. Finish Coats for exterior surfaces: Tnemec Series 73 Endurashield at 3.0 mils DFT.
 - c. Finish coat for interior exposure: Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.
 - d. Total minimum system finish coating thickness shall be 6 mils DFT.

H. Class 8 Exposures - Aluminum

1. Class 8 exposures consist of aluminum surfaces embedded or in contact with concrete, mortar or plaster, or aluminum in contact with dissimilar metals which may cause corrosion due to electrolysis, and shall include the following:
 - a. Aluminum surfaces in contact with concrete, mortar or plaster, such as hatch cover frames, stair stringers, portions of grating and frames, floor plate and frames, etc.

- b. Aluminum surfaces in contact with dissimilar metals which may cause corrosion due to electrolysis.
 - 2. Surface Preparation: As specified in Paragraph 3.02 herein, including solvent cleaning in accordance with SSPC-SP1 standards for solvent cleaning and scarification.
 - 3. Class 8 Coating System:
 - a. Prime Coat: Two component polyamide epoxy. Tnemec Series 66 Hi-Build Epoxoline at 3.0 mils DFT.
 - b. Finish Coats for Aluminum Exposed to View: Two-component, high build, acrylic urethane. Tnemec Series 73 Endurashield at 3.0 mils DFT.
 - c. Finish Coat for Aluminum Not Exposed to View: Polyamide cured coal tar epoxy. Tnemec Series 46H-413 Hi-Build Tneme-Tar applied at 16.0 mils DFT.
 - d. Total minimum system finish coating thickness shall be 19.0 mils DFT for areas not exposed to view or 6.0 mils for areas exposed.
- I. Class 9 Exposures - Metals Exterior Exposed
 - 1. Class 9 exposures consist of exterior metal surfaces exposed to the weather and environment.
 - a. Pumps, motors, equipment, and appurtenances
 - b. Above ground piping, fittings, valves, and metal conduit
 - c. Miscellaneous metal surfaces
 - d. Ladders, stairways, structural steel
 - e. Roof mounted equipment, hatches, fans, etc.
 - f. Galvanized and non-ferrous metal surfaces
 - g. Other surfaces obviously requiring field painting

2. Surface Preparation: As specified in paragraph 3.02 herein and, in addition, the following:
 - a. All bare metals or areas that were shop primed that have been damaged shall be abrasive blast cleaned to SSPC-SP6, commercial blast cleaning standards.
 - b. Shop primed items, stored on site for a prolonged period prior to coating, shall be prepared for coating following the coating manufacturer's recommendations prior to applying touch-up and subsequent coats. Surface preparation may include brush-off abrasive blasting or spot blasting to SSPC-SP6, commercial blast cleaning standards, for areas where the primer has been damaged and bare metal is showing.
 - c. Non-ferrous metals shall be degreased and cleaned by washing with a water based dispersant such as Carboline Surface Cleaner #3. Rinse thoroughly with clean water after cleaning.

3. Class 9 Coating System

- a. Prime coat for ferrous and non-ferrous metal: Two part epoxy primer.
Tnemec Series 69 Hi-Build Epoxoline II at 4.0 mils DFT.
- b. Intermediate coat for ferrous metal: Two part epoxy.
Tnemec Series 69 Hi-Build Epoxoline at 3.0 mils DFT.
- c. Finish coat for ferrous and non-ferrous metal: High Build Acrylic Polyurethane.
Tnemec Series 73 Endura-Shield at 3.0 mils DFT.
- d. Total minimum system finish shall be 7.0 mils for non-ferrous metal and 10.0 mils for ferrous metal surfaces.

J. Class 10 Exposures - Interior Floors (Painted) (Not Used)

K. Class 11 Exposures - Exposed Concrete Floors

1. Class 11 exposures consist of exterior concrete surfaces that are exposed to the weather elements and occasional immersion of water and receive light foot traffic, including the interior of the existing piping vaults.
2. Surface Preparation: As specified in Section 3.02F in addition to the following:

- a. Abrasive blast clean to remove laitance and roughen the surface equivalent to the surface of No. 80 grit.
3. Class 11 Coating System.
 - a. Primer: Tnemec Series 69 Hi-Build Epoxoline II. Two coats at 3-5 mils DFT.
 - b. Topcoat: Tnemec Series 291 Enhanced Aliphatic Polyester Polyurethane.
One coat at 2-3 mils DFT.
 - c. Minimum DFT for the three coats is 10.0 mils.
- L. Class 12 Exposures - Interior Floors (Epoxy)
 1. Class 12 exposures consist of interior concrete floors called out to have epoxy flooring in the Drawings. Coatings for the interior floors of the maintenance building where specified to have epoxy floors is covered in Section 09761.

PART 3 - EXECUTION

3.01 SHOP PAINTING

- A. Surface Preparation - All ferrous metal to be primed in the shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting or pickling in accordance with SSPC-SP5 or SP8, respectively. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Under no circumstances will cleaned metal be allowed to sit overnight before priming, or pretreatment and priming. All nonferrous metals shall be solvent cleaned prior to the application of primer. In addition, galvanized surfaces which are to be topcoated shall first be degreased then primed. All non-ferrous metal surfaces shall also be scarified prior to topcoating.
- B. Materials Preparation:
 1. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.
 2. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If

thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all clean-up. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

C. Applications:

1. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship. Coating systems shall be as specified herein.
2. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.
3. All paint and coatings materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.
4. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.
5. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness.
6. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.
7. Equipment manufacturer or supplier shall provide touch-up paint for items with shop applied finish coats.
8. Where specified in the individual sections, primer coat(s) shall be applied in the shop by the equipment manufacturer. The shop coats shall be as specified and shall be compatible with the field coat or coats.

D. Certification: The Contractor shall obtain from the equipment manufacturer or supplier, prior to shipment of equipment, a written certification that surface preparation, coating brand, material, DFT and application method complied with this Section.

3.02 SURFACE PREPARATION

- A. All dirt, rust, scale, splinters, loose particles, disintegrated paint, grease oil and other deleterious substances shall be removed from all surfaces which are to be coated.
- B. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items and surfaces not to be painted which are in contact with or nearby surfaces to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Refer to Paragraph 3.09B.
- C. Before commencing work, the painter must make certain that surfaces to be covered are in perfect condition and must obtain Engineer's approval to proceed. Should the painter find such surfaces impossible of acceptance, he shall report such fact to the Engineer. The application of paint shall be held as an acceptance of the surfaces and working conditions and the painter will be held responsible for the results reasonably expected from the materials and processes specified.
- D. Program the cleaning and painting so contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.
- E. Ferrous Metal Surfaces:
 - 1. Remove any oil or grease from surfaces to be coated with clean rags soaked in toluol or other solvent recommended by coating manufacturer in accordance with SSPC specifications. Any chemical contamination shall be eliminated by means of neutralization or flushing or both prior to additional surface preparation. Clean rags shall be changed each 100 square feet.
 - 2. For immersion service, all sharp edges and welds shall be ground smooth to a rounder contour, all weld splatter shall be removed, and all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.
 - 3. For non-immersion service, all sharp edges and welds shall be ground, all weld splatter shall be removed, all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.
 - 4. For immersion service, all surfaces to be coated shall be sandblasted to white metal in accordance with Steel Structures Painting Council Specification SP-5 of National Association of Corrosion Engineers Specification NACE-2. A white metal blast is defined as removing all rust, scale, paint, etc., to a clean white metal which has a uniform gray-white appearance. No streaks or stains or rust or any other contaminants are allowed. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent

printed application instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating.

5. For non-immersion service, or wherever specified in the coating manufacturer's most recent printed application instructions for other services, all surfaces to be coated shall be sandblasted to near white metal in accordance with Steel Structures Painting Council Specification SP-10 or National Association of Corrosion Engineers Specification NACE-2. A near white metal blast is defined as removing all rust, scale, paint, etc., except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coatings that may remain. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating. (This is 95 percent of any given surface area blasted to white metal).
6. For non-immersion service surfaces to be coated shall be sandblasted where specified to a commercial sandblast in accordance with Steel Structures Painting Council Specification SP-6 or National Association of Corrosion Engineers Specification NACE 3. A commercial sandblast is defined as removing all rust, scale, paint, etc., except for slight shadows, streaks or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues or paint or rust, may be found in the bottom of pits. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon a possible after the blasting preparation is finished and always before the surface starts to rust. no sandblasted surface shall stand overnight before coating. (This is 2/3 of any given surface area blasted to white metal).
7. Ferrous metal surfaces previously exposed to sulfides shall be sandblasted, flame cleaned, and sandblasted again in accordance with the recommended surface preparation for the particular service in question.

8. Where blast cleaning is done in the field, only "virgin" sand, grit, or abrasive will be used.
9. Inaccessible areas, such as, behind tank rafters or skip-welded lap joints, or in between back-to-back angle iron bracing, shall be coated before assembly to prevent corrosive action from taking place in these inaccessible areas. All surface voids shall be sealed-welded and back-to-back bracing and tank rafters either coated before assembly or eliminated from the design and construction. Sharp corners and edges shall be ground to a smooth contour and welds prepared as described above.

F. Concrete Surfaces:

1. All efflorescence, laitance, chalk, dust, dirt, oils, grease, concrete curing agents, form release agents, sealers, old coatings and other chemical contaminants shall be removed either by steam cleaning with detergent, by scrubbing with a hot trisodium phosphate solution consisting of 2 pounds of trisodium phosphate to each gallon of hot water (160°F), or by high pressure water blasting (3,000 psi or higher). Multiple cleaning operations may be required to remove all contaminants. Repeat the cleaning operation until the contamination is removed and flush the area with clean water to remove residual cleaning solution. Allow to dry thoroughly before coating.
2. All concrete surfaces to be coated shall be clean and dry. "Dry" is defined for new concrete as free of moisture and fully cured which is a minimum of 30 days at 75°F and 50 percent Relative Humidity or some equivalent cure time at other conditions (7 days minimum for stucco). Moisture content of concrete shall be determined by using both of the following methods.
 - a. The presence of moisture shall be checked by taping a one-foot square piece of 20 mil thick minimum plastic film on the surface. Pieces of test plastic film should be placed at various locations that are likely to be slow drying out, such as below grade, low spots in floors, inside corners and lower wall areas. The plastic film should be carefully sealed with tape to prevent the escape of any moisture or vapor that would be trapped behind the film. The film should be left in place over night or longer to allow sufficient time for moisture migration. After 16 hours minimum remove and examine the backside for moisture condensation and inspect the concrete surface for darkened areas. The source of the moisture, if present, shall be located, and the cause corrected prior to coating.

- b. The presence of moisture shall also be determined with a moisture detection device such as a Delmhorst Model DLM2E. Moisture determined by this method shall be less than 14 percent moisture content before coating operations shall be allowed to proceed.
3. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. The surface shall be flushed with fresh water and dried.
4. Do not use form oils incompatible with coating, concrete curing agents or concrete hardeners on concrete surfaces to be coated.
5. Concrete and/or cinder block walls to receive a coating shall be air-blasted with 100 psi clean, dry, oil-free air to remove dust, etc., and wire brushed to remove all loose and/or weak mortar. See requirements for sumps, tanks and other water-bearing structures below.
6. Concrete floors shall be thoroughly swept clean and then acid etched. Acid etching consists of first dampening the entire surface with clean water - avoid an excess of water that will form puddles. Acid etch the damp floor with a 10 to 15 percent solution of hydrochloric (muriatic) or phosphoric acid. Allow the acid to stand on the floor until the bubbling stops. For best results, while the acid is bubbling scrub the floor with a stiff bristled brush. Do not allow the "spent" acid to dry on the floor. Rinse the surface thoroughly with fresh water. If the surface does not appear as rough as medium grit sandpaper, repeat the above steps. Neutralize the surface with a 5 percent solution of soda ash, tri-sodium phosphate, or ammonium hydroxide in clean water. Let the solution stand for 10 minutes on the surface. Rinse thoroughly with water. The surface must be slightly alkaline (pH of 9.0) prior to coating.
7. The floors or concrete sumps, tanks or other water-bearing structures should be acid etched as described above or they may be sandblasted. The walls of concrete sumps and tanks must be sandblasted. Roughen the surface to a texture equivalent to that of medium grit sandpaper. Use compressed air blast nozzle with oil-free air. The abrasive used should be dry silica sand with the maximum particle size that will pass through a 16 mesh screen and minimum particle size retained on a 30 mesh screen. After blast cleaning is completed, sand, dust and loose particles should be removed from the surface by vacuuming or blowing off with high pressure oil-free air. Examine the surface for texture and uniformity, as well as the removal of dust, efflorescence and laitance. Patch voids and cracks that will cause discontinuities in the coating or unsightly appearance using a patching compound compatible with the coating system.

G. Wood Surfaces: Wood should be clean and dry. Remove surface deposits of sap or pitch by scraping and wiping clean with rags dampened with mineral spirits or VM & P Naphtha. Seal knots and pitch pockets with shellac reduced with equal parts of shellac thinner (denatured alcohol) before sandpaper and finishing with fine grit and remove sanding dust. After the prime coat is dry, fill cracks and holes with putty or spackling compound. When filler is hard, sand flush with the surface using fine grit sandpaper. Sand lightly between coats with fine grit, open-coated sandpaper

H. Galvanized Steel, and Non-Ferrous Metal:

1. Galvanized steel and aluminum will only be coated when so specified.
2. Surfaces shall be clean and dry. Remove dust and dirt by blowing off the surface with high pressure air or wiping clean with dry rags. Oil, grease and protective mill coatings should be removed by solvent cleaning in accordance with SSPC-SPI.
3. White rust should be removed from galvanized steel or aluminum by hand or power brushing. Care should be taken not to damage or remove the galvanizing. Rust should be removed from old galvanized steel by Hand or Power Tool Cleaning in accordance with SSPC-SP2 or SP3.
4. All surfaces shall be scarified by brush blasting for immersion service or hand sanding for non-immersion service.
5. Other surface preparation as outlined in the coating manufacturer's latest written Application Instructions shall be observed for more demanding exposures.

I. Stainless Steel:

1. Stainless steel will only be coated when so specified, or when it is adjacent to areas to be coated such as piping supports, anchor bolts or flange bolts.
2. Stainless steel requires only solvent cleaning prior to coating using any one of the methods in SSPC-SP1. Only solvents and cleaning solutions containing less than 200 ppm of halogens should be used to prevent stress corrosion cracking.
3. Stainless steel may be whip-blasted to provide a surface profile to increase the mechanical bond of the coating system. The height of the profile and the texture required should be defined for the operator and as a standard for the acceptance of the work. Pictorial standards for the surface

cleanliness of carbon steel are not applicable to stainless steel, since there are no corrosion products or mill scale to remove from the surface.

4. Abrasive blast cleaning procedures outlined by Steel Structures Painting Council for carbon steel may also be used for stainless steel. Only very hard silica sand or other abrasive media should be used for a fast cutting action and to obtain a sharp angular profile.

J. Previously-Painted Surfaces (except ferrous metal, non-immersion)

1. Careful examination of the old coating is necessary in order to determine the condition of the coating prior to recommending the degree of surface preparation that will be needed. The old coating should be shaved with a knife to ascertain its present adhesion to the substrate, as well as the flexibility of the film. If the old coating has a tendency to powder or shatter easily under the knife, or disbonds freely from the substrate or underfilms, it would indicate total removal is necessary.
 - a. When up to 10 percent of the total area has failed, spot blasting back to at least one-inch into sound film, feathering of edges and spot priming is required.
 - b. When the coating system has deteriorated to approximately 25 percent of the total area, or if the coating is brittle, eroded or underfilm rusting is present, completely remove original coating system by sandblasting as specified.
2. Tank linings, immersion-service coatings, and some other types of high performance coatings generally require total removal before recoating. Consult manufacturer's recommendations for which of the other types of high performance coatings require total removal.
3. In instances where the film has been eroded due to weathering or worn thin due to abrasion or impingement with no rusting, the surface contaminants may be removed through high pressure water blasting (approximately 2,000 to 3,000 psi, over 4 gallons per minute) with emulsifying agents or cleaners, rinsed and dried. Roughening of the surface shall be used to improve the adhesion of subsequent coats. Recoat with the recommended finish coat(s).

K. PVC or Other Plastic Piping or Structural Shapes or Ductwork:

1. Solvent clean.

2. Lightly abrade surface with medium grade sandpaper. Remove dust by wiping with clean rags.

3.03 APPLICATION

- A. Paint all exposed surfaces in rooms scheduled for painting whether or not colors are designated in schedules, except where the natural finish of material is obviously intended and specifically noted as a surface not be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color of finish is not designated, the Engineer will select these from standard colors available for the materials systems as specified.
- B. Color Selection
 1. Colors for Multi-coat Systems: Each coat shall be applied in a different color or shade from the preceding coat to aid in determining the uniformity and coverage of the coating. The finish coat color shall be selected by the Owner or Engineer. When a white finish coat is specified, the last two (2) coats shall be white.
 2. Color Coding Piping: All exposed piping shall be identified as specified in Section 09905: Piping and Equipment Identification System. Pipe identification system shall include color coding or banding, legends and arrows.
 3. Color Coding Conduit: All exposed electrical conduit with conductors over 120 volts shall be color banded as specified in Division 16: Electrical and Section 09905: Piping and Equipment Identification System (color code, if provided, takes precedence).
- C. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.
- D. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied. All equipment shall be maintained in good working order and shall be comparable to that described in the coating manufacturer's most recent Application Instructions. It shall be thoroughly cleaned and inspected daily. Worn spray nozzles, tips, etc., shall be replaced regularly. Effective oil and water separators shall be used and serviced on all air lines.
- E. All paints and coating materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.

- F. Apply additional coats when undercoats, stains or other conditions show through the final coat or paint, until the paint film is of uniform finish, color and appearance.
- G. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. Allow each coat to dry thoroughly before applying the next coat; follow manufacturer's recommendations taking into account temperature and relative humidity.
- H. All interior surfaces of structures shall be finish coated prior to installation of equipment, conduit and other exposed items by Mechanical, Electrical or Instrumentation.
- I. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.
- J. Finish exterior doors on tops, bottoms, and side edges the same as the exterior faces, unless otherwise indicated.
- K. Sand lightly between each succeeding enamel or varnish coat.
- L. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise specified.
- M. Retouching Existing Painted Surfaces: Existing painted surfaces damaged by the modification work or other operations of the Contractor shall be retouched to conform to the above coating systems and blend in with the new and existing work. Damaged surfaces shall be repainted with not less than two (2) coats, and other existing surfaces that are listed shall be repainted with the coating system specified.
- N. The prime and intermediate coats as specified for the various coating systems may be applied in the shop by the manufacturer. The shop coats shall be of the type specified and shall be compatible with the field coat or coats. Such items as pumps, motors, equipment, electrical panels, etc. shall be given at least one touch-up coat with the intermediate coat material and one complete finish coat in the field.

3.04 APPLICATION RESTRICTIONS

- A. Environmental Requirements:
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.

Contractor shall verify the following with supplied test equipment in presence of RPR and supply daily records in writing to RPR.

- a. The conditions below shall be adhered to even if manufacturer's recommendations are less stringent. If manufacturer's recommendations are more stringent, they shall apply.
 - b. No coatings shall be applied when the air, surface, and material temperature is below 55°F or above 95°F for 24 hours prior to and 24 hours after coating application. Surface temperature shall be at least 5°F above the dew point for 24 hours prior to and 24 hours after coating application. The dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Weather Bureau psychometric tables. Do not apply coatings when the relative humidity exceeds 85 percent or to damp or wet surfaces, unless otherwise permitted by the coating manufacturer's printed instructions. No painting shall be done when the surfaces may become damaged by rain, fog or condensation or when it is anticipated that these conditions will prevail during the drying period, unless suitable enclosures to protect the surface are used. Where heat is necessary, it shall be supplied by the painting applicator and shall be of such type that it will maintain an air and coated surface temperature of 55°F minimum prior to and after the coating application as described above, and 90°F minimum during the cure stage if hot air forced curing is recommended by the coating manufacturer for special coatings. Further, this heater shall be of such type as not to contaminate the surface area to be or being coated with combustion products. The Contractor shall supply utilities to run electric or gas heaters. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Owner or Engineer.
2. Do not apply finish in areas where dust is being or will be generated during application through full cure.
 3. All exterior painting shall be done only in dry weather.
 4. Spray application shall occur only when wind velocities, including gusts, are less than 10 miles per hour. All materials, equipment, etc. in the vicinity of spray application shall be protected from overspray.
- B. Application of materials shall be done only on properly prepared surfaces as herein specified. Between any two coats of material, unless specifically covered in the coating manufacturer's most recent printed application instructions, if more than one (1) week passes between subsequent coats, the coating manufacturer will

be contacted for his recommended preparation of the surface prior to application of the next coat. This preparation might include brush-off blasting, steam cleaning, or solvent wiping (with an indicated solvent) and shall be specified in writing by the material supplier and followed by the applicator. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Owner or Engineer.

- C. In no case shall paint be applied to surfaces which show a moisture content greater than 14 percent. The presence of moisture shall be determined prior to coating by testing with a moisture detection device such as a Delmhorst Model DLM2E.

3.05 MINIMUM COATING THICKNESS

- A. Coating thickness shall meet or exceed the specified minimum dry film thickness (DFT) in all areas. The average coating thickness as determined by multiple representative DFT measurements shall meet or exceed the mid-point of DFT range. If below this DFT value, the surface shall be recoated with at least the minimum DFT until the total DFT meets or exceeds the mid-point DFT.
- B. Coverage rates are theoretical as calculated by the coating manufacturer and are, therefore, the maximum allowable.
- C. Apply a prime coat to material which is required to be painted or finished, and which has not been prime coated by others.
- D. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.
- E. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3.06 FINISHES

- A. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- B. Complete Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specific requirements.

3.07 FIELD QUALITY CONTROL

- A. The Contractor shall request acceptance of each coat by the Owner's representative before applying the next coat; and the Contractor shall provide the necessary properly calibrated gauges. All nonferrous surfaces shall be checked for number of coats and thickness by use of a Tooke gauge. All ferrous surfaces shall be checked for film thickness by use of an Elcometer or Micro-Test magnetic dry film gauge properly calibrated. In addition, submerged tank linings and metals shall be tested for freedom from holidays and pinholes by use of a Tinker-Razor or K-D Bird Dog Holiday Detector. All defects shall be corrected to the satisfaction of the Owner.
- B. All training from manufacturer shall be provided prior to the coating application.
- C. Contractor to fill out daily reports.

3.08 PROTECTION

- A. All other surfaces shall be protected while painting.
- B. Protection of furniture and other movable objects, equipment, fittings, and accessories shall be provided throughout the painting operation. Remove all electric plates, surface hardware, etc., before painting; protect and replace when completed. Mask all machinery nameplates and all machined parts not to receive paint. Lay drop cloths in all area where painting is being done to adequately protect flooring and other work from all damage.

3.09 CLEANING

- A. The Contractor shall perform the work under this Section while keeping the premises free from accumulation of dust, debris and rubbish and shall remove all scaffolding, paint cloths, paint, empty paint containers, and brushes from buildings and the project site when completed.
- B. Cleaning: All paint brushed, splattered, spilled or splashed on any surface not specified to be painted shall be removed.
- C. The Contractor shall insure that all glass throughout that portion of the facility in which he worked is cleaned of dirt and paint before he leaves the job site. Further, the Contractor shall insure that all glass in this area is thoroughly washed and polished.
- D. Upon completion of the project, the job site shall be left neat and clean.

3.10 EXTRA STOCK

- A. Paint To Be Supplied To Owner: Upon completion of painting work, the Owner shall be furnished at no additional cost, unopened containers providing a minimum of one (1) gallon of each type and color of finish paint for touching up. Multi-component coatings shall have each component supplied in separate containers boxed together. Paint container labels shall be complete with manufacturer's name, generic type, number, color and location where used.

END OF SECTION

**FORM G-1
DAILY INSPECTION REPORT**

| | | | |
|-------|-------|-----------------|-------------|
| Date: | Spec# | Page ___ of ___ | Contract #: |
|-------|-------|-----------------|-------------|

Work Performed and Locations _____

Ambient conditions

| | | | | |
|-------------------------|---|---|---|--|
| Time | | | | |
| Dry Bulb Temp | ° | ° | ° | |
| Wet Bulb Temp | ° | ° | ° | |
| Dew Point | ° | ° | ° | |
| Relative Humidity | % | % | % | |
| Surf. Temp Min/Max | ° | ° | ° | |
| Outside wind speed/dir. | | | | |
| weather conditions | | | | |

Surface Preparation: Start _____ Finish _____ Est. sq/ft _____
 Method of paint removal _____ Specification requirement _____
 Compressor air check (blotter test) _____ Compressor pressure _____
 AB-2 Testing _____
 Dust collector _____ RPM Dust collector magnehelic gage reading _____
 Anchor profile required _____ Anchor profile achieved _____
 Other testing performed (i.e. scat testing) _____

Coating Application: Start _____ Finish _____ Est. sq/ft _____
 Prime _____ Mid _____ Top _____ Stripe _____ Other _____
 Manufacturer _____ Product name: _____
 Color _____ Kit size _____ Shelf life _____ Pot life 4hr Sweat-in time _____
 Batch number(s) of coatings _____

Date manufactured _____
 Reducer _____ Batch number: _____
 Mix method _____ Quantity mixed _____ Application method: _____
 Tip size _____ Temperature of coating being mixed _____
 WFT Required _____ WFT Achieved _____

Hold point inspections: Pre-paint removal _____ Paint removal _____ Mixing of coatings _____
 Coating application _____ Post cure/DFT _____ Corrective actions _____

Equipment used: Blast unit _____ Compressor _____ Dust Collector _____ Decon _____ Sprayer _____
 Office trailer _____ Box truck _____ heater _____ Other _____

QC Inspectors Signature: _____