

## **PART 4 – TECHNICAL SPECIFICATIONS**

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### PART 4

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## **SECTION 02230 - CLEARING AND GRUBBING**

### **PART 1        GENERAL**

#### 1.01        WORK INCLUDED

- A.    Clear and grub the areas to be occupied by the facilities or utility systems to be constructed, including all areas to be excavated, filled, paved or planted as shown on the Plans and as specified herein.

#### 1.02        DEFINITIONS

- A.    Clearing shall consist of the cutting, removal and disposal of all trees, stumps, brush, shrubs, rubbish and any other objectionable material within the designated areas.
- B.    Grubbing shall consist of the removal and disposal of all stumps larger than 1-1/2 inches in diameter and other objectionable material to a depth of at least 12 inches below the ground surface.

#### 1.03        QUALITY ASSURANCE

- A.    In the course of the work, it may become necessary to remove trees if they interfere with the work. Miami-Dade County and various municipalities have ordinances regulating the removal, relocation and pruning of trees in the public right-of-way; these ordinances shall be strictly adhered to. The Contractor shall obtain a permit from Miami-Dade County, Public Works and Waste Management Department and/or other regulatory agencies having jurisdiction over the work area before removing, relocating and/or pruning any tree. The Contractor shall comply with all requirements and conditions of the permit at no additional cost to the Town.

### **PART 2        PRODUCTS**

NOT USED

### **PART 3        EXECUTION**

#### 3.01        CLEARING AND GRUBBING

- A.    The Contractor shall remove and replace, where required all existing shrubbery, trees, grass, sprinklers, fences, signs, mailboxes, structures, roadways, sidewalks, curbs and similar items or structures in the way of the work

necessary for the construction of the Project.

- B. The Contractor shall remove hedges causing damage to the site perimeter fence, which may require coordination with adjacent property owners.

### 3.02 PROTECTION OF ADJACENT AREAS

- A. The Contractor shall protect areas shown on the Plans or designated by the Engineer to remain protected from damage by construction operations by erecting suitable barriers or other acceptable means.

### 3.03 DISPOSAL OF WASTE MATERIALS

- A. All roots, vegetation and other refuse removed from the site during clearing and/or grubbing operations shall be legally disposed of by the Contractor. Burning of any material on site will not be permitted.
- B. The Contractor shall provide the Engineer tickets indicating proof of legal disposal of unsuitable backfill material. If the unsuitable material has beneficial use, the transport destination needs to be reported to the Engineer. Payment for disposal of the unsuitable material shall not be made until the Town has proof of legal disposal at a particular destination.

**END OF SECTION**

## SECTION 02822 - CHAIN LINK FENCES AND GATES

### PART 1 – GENERAL

#### 1.01 WORK INCLUDED

- A. The work included in this Section consists of repairing and/or replacing sections of galvanized steel chain link fence, complete with gates and single arms with barbed wire, where permitted, to be constructed as shown on the Plans.
- B. Minimum fence height shall be six (6) feet.
- C. Repair existing entry gate. If current gate is in disrepair, replace with a chain link fence gate to be approved by the Engineer.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

##### A. Fabric:

The chain-link fence fabric shall meet the requirements of ASTM Standard A392, "Zinc-Coated Steel Chain-Link Fence Fabric", latest edition. Zinc coating of the fabric shall be not less than 2 ounces per square foot of wire surface (Class 2 coating). Fabric shall be one-piece fabric height as shown on the Plans, with 2-inch by 2-inch mesh of No. 9 gauge wire, unless otherwise specified. Top and bottom selvages shall be twisted. The fence shall have a single strand of 7 gage galvanized coil spring wire at the bottom, fastened at each post, and at 2 foot centers, with hog rings, extending to within 1-inch of the ground.

##### B. Posts and Other Appurtenances:

All tubular members including gate members shall comply with ASTM Standard A 53-90b, "Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses", Type S Grade A or B, and shall be plain-end steel pipe, with zinc coating applied inside and out by the hot-dip process. Zinc coating shall be not less than 1.8 ounces per square foot of pipe area. Gate frames shall be hot-dip galvanized after fabrication. All fence posts shall have weather proof caps which shall conform with the specifications detailed elsewhere in this section. Fence components shall be as follows:

<u>Components</u>	<u>Nominal Pipe Size</u>	<u>Outside Diameter</u>	<u>Weight Per Foot</u>
Top rail and braces	1 ¼ inches	1.660 inches	2.27 pounds
Gate frames	1 ½ inches	1.900 inches	2.72 pounds
Line Posts	2 inches	2.375 inches	3.65 pounds
Corner Posts	2 ½ inches	2.875 inches	5.79 pounds

Gate Posts (less than 10 ft. leaf)	3 inches	3.500 inches	7.56 pounds
Gate Posts (greater than 12 ft. leaf)	6 inches	6.625 inches	18.97 pounds

- C. Top Rail: The top rail shall be provided with couplings approximately every 20 feet. Couplings are to be the outside sleeve type, at least 6 inches long.
- D. Concrete: Concrete shall have a minimum compressive strength of 3,000 psi at 28 days.
- E. Barbed Wire: The fence shall have three newly strung strands of barbed wire mounted on the existing single arm post top extensions. Barbed wire shall meet the requirements of ASTM Standard A121, "Zinc- Coated (Galvanized) Steel Barbed Wire", latest edition, for wire gage No. 12-1/2 (2 strands) with a minimum zinc coating of 0.5 ounce per square foot of wire surface (Class 2 coating), applied before fabrication. The individual barb shall be four points, twisted around both wires, with the barbs spaced no more than 5 inches apart.
- F. Gate:
1. Repair existing entry gate. If current gate is in disrepair, replace with a chain link fence gate to be approved by the Engineer.
  2. The gate frames shall be assembled by welding and shall be hot-dip galvanized after fabrication. The gate shall be installed complete with all hardware, including hinges, locking devices, drop bars, center stops, holdbacks and other items, as required. Padlock will be furnished by the Town.
  3. The gate frame shall be made of 1-1/2 inch diameter Schedule 40 pipe and shall be welded at all corners so as to form a rigid one piece unit for each leaf. Fabric shall be securely stretched and held in the center of the tubing by use of hooks, bolts and tension rods on all four sides of the gate opening frame.
  4. If permitted, the gate shall have three strands of barbed wire mounted on frame top extensions and barbed wire shall be as specified above.
  5. Gates shall have a center stop and drop rod with padlock hardware and padlock. Gate stops and latches shall all be hot-dip galvanized.
  6. Gate posts shall be equipped with caps designed to exclude moisture from the post.
- G. Accessories: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain Line Fence Manufacturer's Institute. All parts shall be galvanized except ties and clips may be of aluminum. The Contractor shall install all of the hardware necessary for a complete and working installation, and shall include the following:
1. Existing Single Arm Post Extensions for Barbed Wire:  
Barbed wire supporting arms shall form an angle of approximately 45 degrees with the

vertical fence and be fitted for attaching three (3) strands of barbed wire. The top wire shall project approximately 12-inches horizontally from the fence line. The other wires shall be spaced uniformly between the top of the fence fabric and the outside strand. The barbed wire supporting arm shall be manufactured from pressed steel or malleable iron capable of withstanding 200 pounds applied at outer strand of barbed wire. It shall be designed as a combination weather-tight closure cap and a barbed wire supporting arm, where barbed wire is required.

2. Padlocking Device shall be a fulcrum type latch assembly for double gates.
  3. Post Caps shall be of cast steel or cast iron and shall be designed to provide a drive fit over the top of the post to exclude moisture.
  4. Tension Bars shall be one piece for the fence height of the fabric with a minimum cross-section of 3/16" x 3/4". Provide one (1) tension bar for each end post, and two (2) for each corner and pull post. The gate shall have tension bars as shown on the Plans.
- H. Tension bars, the tension bar bands, post caps, barbed wire arms, brace rods, top rail clamps, turnbuckles, nuts and bolts, all gate hardware and remaining accessories shall be zinc coated in accordance with the ASTM Standard A153 "Zinc Coating (Hot Dip) On Iron and Steel Hardware", latest edition.
- I. Hardware: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain Link Fence Manufacturer's Institute. All parts shall be galvanized except ties and clips, which may be aluminum.

### **PART 3 – EXECUTION**

#### **3.01 ARRANGEMENT**

- A. Posts: Existing Posts shall be utilized and repaired as needed. If existing post is beyond repair, a new post shall be placed in the location of the existing post. Intermediate post shall have waterproof tops which have integrally cast openings through which the top rails shall pass. Terminal posts shall consist of one (1) end, corner and pull posts.
- B. Braces: Braces shall be provided at each gate, corner, pull and end post.
- C. Ties and Clips: Fabric shall be fastened to all intermediate posts with 9 gauge tie wires, spacing not to exceed 14-inches apart. Fabric shall be tied to top rail with 9 gauge tie wires, spacing not to exceed 24-inches on centers.

#### **3.02 INSTALLATION**

- A. All posts shall be installed in accordance with ASTM F567, "Practice for Installation of Chain Link Fence", latest edition. Where conflict between said standard and these specifications exists, the more stringent shall apply.

- B. Post Setting: Line posts shall be set in holes 12 inches in diameter, 38 inches deep with 36-inch post embedment. Terminal posts shall be set in holes 15 inches in diameter, 38 inches deep with 36-inch post embedment. Gate posts for double swing gates shall be set in holes 18 inches in diameter, 38 inches deep with 36-inch post embedment. Gate posts for single swing gates shall be set in holes 15 inches in diameter, 38 inches deep with 36-inch post embedment. After the post has been set and plumbed, the hole shall be filled with concrete. The exposed surface of the concrete shall be crowned to shed water.
- C. Terminal and Gate Posts: Terminal and gate posts shall be set as specified above and shall be braced to the nearest post with a galvanized horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and truss tightener used as a tension member.
- D. Fabric: Fabric shall not be stretched until concrete footings have cured a minimum of three (3) days. Chain link fabric shall be placed on the side designated by the Engineer of Record and shall be stretched taut approximately 1-inches above finish grade and securely fastened to all posts. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

### 3.03 PAINTING

- A. Surface preparation, priming and painting shall be done in accordance with Specification 09900 – Painting and as recommended by the paint/coating manufacturers.
- B. Surface Preparation shall be performed to remove all dust, debris, rust and flaking paint using a pressure washer, wire brush or other suitable tools.
- C. Surrounding area including but not limited to plants, grass, property, buildings, utility poles, etc. shall be protected during painting using plastic sheeting, cardboard or suitable alternative.
- D. Coat the fence with primer product specified for galvanized metal in Section 2.02 of Specification 09900 or approved equal.
- E. Fence shall be painted green with finishing product specified for galvanized metal in Section 2.02 of Specification 09900 or approved equal. Paint color to be submitted to Engineer for approval.

**END OF SECTION**

## SECTION 02900 - LANDSCAPING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. Work included in this Section includes tree removal, tree relocations, furnishing and planting trees, plants and grass of the species, sizes and quality specified, fertilizing, watering, maintaining plants, and guarantee.
- B. The schedule of trees and plants, if applicable, is shown on the drawing, and indicates the common and botanical names, the quantities and sizes of plants to be used.
- C. Plant material, if required, is defined as trees and shrubs as scheduled on the drawing.

### PART 2 PRODUCTS

#### 2.01 SODDING

##### D. General:

- 1. Solid sod shall be planted in the unpaved areas abutting the structures and extending to the limits shown on the Plans.

##### E. Materials:

- 1. Solid Sod:
  - a. Solid sod shall be certified Bahia. The sod shall be firm touch texture having a compact growth of grass with good root development. It shall contain no weeds or other objectionable vegetation.
  - b. The soil embedded in the sod shall be good clean earth, free from stones and other debris. The sod shall be free from fungus, vermin and other diseases. The sod and soil shall be approximately 1-½" thick.
  - c. Before being cut and lifted, the sod shall have been mowed at least three times with a lawn mower, with the final mowing not more than seven days before the sod is cut. The sod shall be cut into uniform dimensions. Sod shall be laid with closely abutting joints with a tamped or rolled surface.
- 2. Top Soil: Soil utilized for planting grasses shall be a mixture of pulverized

50% rock free siliceous sand and 50% clean mulch from an approved source. All ingredients shall be free of sticks, roots, rocks, lumps or other impurities or debris. All soil shall be delivered in a loose friable condition. Top soil may be "unsuitable top soil" removed during the course of other work hereunder if approved by the Engineer.

#### F. Planting of Grass:

1. Solid Sod: The ground area shall be saturated with water. Sod shall be placed on the graded and watered ground firmly butted on all sides by sod without leaving holes, slots, or depressions. Sod shall be top dressed with soil (herein before specified) where required to bring all fill to voids and provide a uniform grass matt. Soil shall firmly abut all structures to which it surrounds or contacts. Immediately after the grassing process, the entire grassed or mulched area shall be rolled thoroughly with a cultipacker traffic approved roller, or other 1,000 pound roller. At least two (2) trips over the entire area will be required.

#### G. Fertilizing Grass:

1. Commercial fertilizers shall comply with all Federal, State and County fertilizer laws.
2. The numeral designations for fertilizer indicate the minimum percentage (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water soluble potash, contained in the fertilizer.
3. Designations may be approved specifically for a particular project and if liquid fertilizer other than that of chemical designation 8-8-8 is used, the total nitrogen content shall not exceed 12 percent.
4. At the Contractor's option liquid or dry fertilizer may be used. All grass shall be fertilized and watered in during the planting operation using the application rate and method directed by the manufacturer of the fertilizer used.

#### H. Guarantee and Maintenance of Grass:

1. Guarantee:
  - a. The Contractor shall guarantee all grasses for a period of six months from the date of acceptance of the completed overall project from the Contractor.
  - b. The Contractor shall guarantee the grasses shall be alive, free of disease and have a healthy appearance at the end of the guarantee period.
  - c. During the guarantee period, the Contractor shall replace any grass which is diseased, dead or visually unsightly within 3 days when requested in writing.

2. Maintenance:

- a. The Contractor shall maintain all grass guaranteed above for the period of the guarantee. Such maintenance shall include filling, leveling, and repairing eroded areas, replanting areas where the establishment of the grass does not develop satisfactorily, and watering as required. In no case shall such maintenance be less than three (3) weeks for watering and six (6) weeks for remaining maintenance care.
- b. The maintenance of the grass shall include, regular mowing, one (1) application of approved dry or liquid fertilizer to the grasses guaranteed above. The fertilizer shall be applied and watered in as directed by the manufacturer. The time of fertilizing shall be approved.
- c. The Contractor shall be required under the maintenance of the guaranteed grasses to safeguard and take all possible precautions against damage from the elements and other possible damage. The Contractor shall be required to clean up the effected landscape area during the maintenance period due to any such event. The Contractor shall not be responsible to replace grasses properly protected under this item of the specifications, damaged by the events beyond his control.

2.02 PLANTS AND TREES:(If required by relocation and if shown on the drawings)

A. Grade Standards and Quality:

1. Quality of all plants shall be at least equal to that defined as No. 1 by the State Plant Board of Florida in Grades and Standards for Nursery Plants, Part I, 1963 Revised Edition, and Part II, Palms and Trees.
2. All plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall have healthy, well developed root systems and shall be free of disease and insect pests, eggs or larvae.
3. No plants will be accepted unless they are healthy and show satisfactory foliage conditions.
4. All plants shall conform to the measurements specified or indicated on the Drawings except that up to ten (10) percent of undersized plants in any one variety or grade may be used provided there are sufficient oversized plants to make the average equal to or above specified grade. Plants larger than specified may be used if approved by the Engineer, but use of such plants shall not increase the Contract price. The spread of roots or ball of earth for larger plants shall be increased in proportion to the size of the plant.

B. Plant Designation: With reference to method of cultivation, root system status, etc., plants for landscaping shall be classified under the following designations:

1. Balled and Burlapped:

- a. Plants so classified shall be dug with firm natural root balls of earth, of sufficient diameter and depth to include most of the fibrous roots. The root ball of these plants shall be properly wrapped with burlap sack material and remain protected and moist until they are planted. Plants whose burlapped balls have cracked or become sagging, or plants showing scars from rope and cable marks or other improper handling are not acceptable. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet moss, or other acceptable material. The plants shall be set with the burlap cover intact and with the burlap showing, until inspection. At final inspection, the burlap may be cut away to ground level and completely covered with soil.
- b. As specified requirement, balled and burlapped materials, 1½ inches or more in caliper, shall be root-pruned at least 45 days before being dug and such fact shall be certified on accompanying invoices. Where, in the opinion of the Engineer following his inspection of the grower's stock, adequate root pruning is being obtained by the grower's general cultivating practices, he may consider such fact as meeting this requirement.

2. Wire Balled and Burlapped:

- a. Plants grown in soil of a loose texture which does not readily adhere to the root system shall have sound hog wire placed around the burlapped ball before the plant is removed from the excavation. The wire shall be looped and tensioned until the burlapped ball is substantially packaged so as to prevent loosening of the soil around the roots during handling.
- b. Wire balled and burlapped plants shall otherwise comply with the requirements for balled and burlapped plants described in 1 above.

3. Container Grown Plants:

- a. Container grown plants shall have been grown in a container large enough and for sufficient time for the root system to have developed well to hold its soil together firm and whole. No plants shall be loose in the container. Plants which have become pot bound or for which the top system is too large for the size of the container, will not be acceptable.
- b. All containers with vertical sides shall be cut and opened fully, in a manner such as will not damage the root system. Container grown plants shall not be removed from the container until immediately before planting, when all due care shall be taken to prevent damage to the root system.

4. Bare-Root Plants: No bare-root plants shall be used unless specifically required by the Engineer or called for on the drawings.

C. Transportation and Inspection:

1. Plant transportation shall comply with all Federal and State regulations therefor and, upon delivery at the site, all plants shall be inspected for conformity to specifications and for handling damage. Rejected plants shall be removed immediately from the site by the Contractor.
2. Foliage trees when moved in full leaf shall be treated with "Wilt Pruf" or "Plantgard", as they are loaded at their growing site. This material shall be applied to the entire tree with a fine spray at a dilution of 1 part "Wilt Pruf" or "Plantguard" to 15 parts of water.
3. Trees which have to be transported in excess of 10 miles to reach the job site shall be covered with a 70 percent shade-cloth-tarp, or equal in order to prevent wind burn.
4. Immediately following the delivery and inspection at the job, all plants with exposed roots shall be heeled-in moist soil or peat moss. All plants heeled-in shall be properly maintained by the Contractor until planted.
5. The balls of balled and burlap plants, must, if not immediately planted after delivery and inspection, be adequately protected by covering until removed for planting, in a manner appropriate to prevailing conditions and in accordance with accepted horticultural practices. The Contractor shall, in loading, unloading, or handling of plants, exercise utmost care to prevent injuries to the branches or roots of the plants. The solidity of the ball of balled and burlap plants shall be carefully preserved. Handling of the plant by parts other than the ball shall be cause for rejection of such plant. Bare root plants which have been heeled-in shall be properly handled during the distribution of planting beds.

D. Planting Materials:

1. Planting Soil: Planting soil shall be a pulverized mixture of 50% rock free siliceous sand and 50% clean mulch from an approved source. All ingredients shall be free of sticks, roots, rocks, lumps, or other impurities or debris. All soil shall be delivered in a loose friable condition.
2. Fertilizer:
  - a. Commercial fertilizers shall comply with the State fertilizer laws. The numeral designations for fertilizer indicate the minimum percentage (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash, contained in the fertilizer. Designations may be approved specifically for a particular project and if liquid fertilizer other than that of chemical designation 8-8-8 is used, the total nitrogen content shall not exceed 12 percent.
  - b. Fertilizer shall be selected and used as recommended by the

- manufacturer for each particular plant.
- c. At the contractor option liquid or dry fertilizer may be used. All plants and grass shall be fertilized and watered in during the planting operation and at the application rate and method directed by the manufacturer of the fertilizer used.
3. Mulch: Mulch shall be ground bark, bark peelings, peat, hay or straw.
  4. Anti-Desiccant: Anti-desiccant shall be "Wilt Pruf", "Plantguard", or equal, delivered in the manufacturer's containers and used in accordance with the manufacturer's instructions.
  5. Water:
    - a. Water for the irrigation of the new plantings during the progress of construction shall be provided by the Contractor in accordance with the provisions previously specified.
    - b. The Contractor shall furnish adequate watering equipment and shall continue watering to properly establish the new plantings throughout the maintenance period.
  6. Wire: Wire for the bracing and guying shall be pliable No. 12 or No. 14 gauge galvanized soft steel wire.
  7. Stakes and Ties: Stakes and ties shall be provided in accordance with the requirements of Section 3 EXECUTION, below.

### **PART 3 EXECUTION**

#### **3.01 EXCAVATION OF PLANT HOLES**

- A. Plant hole excavations shall be roughly cylindrical in shape, with the sides approximately vertical. Plants shall be centered in the hole, with the trunk location as shown in the Plans.
- B. Bottoms of the holes shall be loosened at least 6-inches deeper than the required depth of excavation.
- C. Holes for balled and burlapped and wire balled and burlapped plants shall be large enough to allow at least 8-inches of backfill around the earth ball. For root balls over 18-inches in diameter, this dimension shall be increased to 12-inches.
- D. Where excess material has been excavated from the plant hole, the excavated material shall be disposed of as and where directed by the Engineer.

#### **3.02 UNDERGROUND OBSTRUCTIONS**

- A. In the event that rock, underground construction work, utility lines or obstructions out of the ordinary are encountered in any plant hole excavation, alternative locations will be selected by the Engineer. Where locations cannot be changed and the obstructions may be removed, the obstructions shall be removed to a depth of not less than 3-feet below grade and not less than 6-inches below bottom of balls or roots when plant is properly set at the required grade.

### 3.03 SETTING OF PLANTS

- A. When lowered into the hole, the plant shall rest on a prepared hole bottom such that the roots are level with, or slightly above, the level of their previous growth and so oriented such as to present the best appearance. The Contractor, when setting plants in holes, shall make allowances for any anticipated settling of the plants.
- B. The backfill shall be made with planting mixture as specified hereinbefore and shall be firmly rodded and watered-in, so that no air pockets remain. The quantity of water applied immediately upon planting shall be sufficient to thoroughly moisten all the backfilled earth. Plants shall be kept in a moistened condition for the duration of the Contract.

### 3.04 STAKING AND GUYING

- A. When called for on the Drawings or directed by the Engineer, plants shall be staked in accordance with the following provisions:
  - 1. Small Trees: For trees and shrubs of less than 1-inch caliper, the size of stakes and the method of tying shall be such as to rigidly support the staked plant against damage caused by wind action or other effects. Trees larger than 1-inch and smaller than 1½ inch caliper shall be staked with a 2-inch least 24-inches in the ground and extending to the crown of the plant. The plant shall be firmly fastened to the stake with two strands of 14 gauge soft wire, enclosed in rubber hose, or other approved covering. The wire shall then be nailed or stapled to the stake to prevent slippage.
  - 2. Medium Trees: All trees, other than palm trees, larger than 1½-inch caliper and smaller than 2½-inch caliper shall be staked with two or more, 2-inch by 2-inch stakes, 8-feet long, set 2-feet in the ground. The tree shall be midway between the stakes and held firmly in place by two strands of 12 gauge wire, applied as specified above for single stakes. Tie wires shall be tightened and kept tight by twisting.
  - 3. Large Trees: All trees, other palm trees, larger than 2½-inch caliper, shall be guyed from at least 3 points with double strands of 12 gauge wire. Guy wires shall be anchored to 2-inch by 4-inch stakes, 24-inches long, driven into the ground at least 2-feet and sufficient that the top of the stake is at least 3 inches below the finished ground level. In firm rock soils, No. 4

steel reinforcing rods or ½-inch pipe may be used instead of 2 by 4s. Tie wires shall be securely fastened to the tree by means of a collar of rubber hose, or other approved material. Guy wires shall be tightened and kept tight by twisting.

### 3.05 PRUNING

- A. All broken or damaged roots shall be cut off smoothly and the tops of all trees shall be pruned in a manner complying with standard horticultural practice. At the time pruning is completed, all remaining wood shall be alive. All cut surfaces of 1-inch or more in diameter, above the ground, shall be treated with an approved commercial tree paint.

### 3.06 MULCHING

- A. Within one (1) week after the planting, mulch material, approved by the Engineer, shall be uniformly applied to a minimum thickness of 2-inches, over the entire area of the backfilled hole or bed. The mulch shall be maintained continuously in place until the time of final inspection. Mulch is not required if other ground surface covers, such as rooted cuttings are called in the Plans.

### 3.07 INSPECTION

- A. On completion of the work, the Engineer will inspect all planting work. The Contractor shall repair or replace all defective work, whichever is satisfactory to the Engineer. Final acceptance of all plant materials will be given only after the materials are planted and after meeting all requirements prescribed herein.

### 3.08 MAINTENANCE

- A. Maintenance shall begin immediately after each plant is planted and shall continue until all work under this Contract has been completed and accepted by the Town, however, the minimum period of this maintenance shall not be less than 60 days even if it extends beyond said acceptance. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Settled plants shall be reset to proper grade position, planting saucer restored and dead material removed. Guys shall be tightened and repaired.
- B. Defective work shall be corrected as soon as possible after it becomes apparent. Upon completion of planting, the Contractor shall remove from the site excess soil and debris, and repair any damage to structures, etc., resulting from planting operations.

### 3.09 GUARANTEE

- A. The Contractor shall guarantee all planting work for a period of six (6) months after the date of final acceptance. During the guarantee period, the Contractor shall replace at no cost to the Town any plant that dies or is not established within the guarantee period. Any plants missing or defective shall be furnished or replaced in a manner satisfactory to the Engineer.

**END OF SECTION**

## SECTION 03300 - CAST-IN-PLACE CONCRETE, REINFORCING AND FORMWORK

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Work included: Provide all labor, materials, equipment, fabrication, incidentals, transportation, placing and supervision necessary to complete all cast-in-place concrete work, its finishing, and all related work called for by the Contract Drawings and/or Specifications, or reasonably inferable from either or both, as needed for a complete and proper installation.
  
- B. Related work: Work affecting this Section includes, but is not limited to:
  - 1. Shop Drawings-Per General Conditions and as specified herein.
  - 2. Materials and storage thereof.
  - 3. Reinforcing-Bar and fabric.
  - 4. Accessories of every nature, including form tie system.
  - 5. Formwork and removal thereof, including shoring and reshoring.
  - 6. Concrete proportions and mixes.
  - 7. Placing of concrete.
  - 8. Admixtures.
  - 9. Joints, metal joint screeds and joint fillers.
  - 10. Finishes of all types.
  - 11. Protection and curing.
  - 12. Patching.
  - 13. Laboratory Testing.

#### 1.02 QUALITY ASSURANCE

- A. Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of ACI 301-96 "Specifications for Structural Concrete for Buildings", except as modified by supplemental requirements hereinafter.

#### 1.03 STANDARDS

- A. ACI 301-10 Specifications for Structural Concrete.

- B. ACI 318-11 Building Code Requirements for Reinforced Concrete.
- C. Florida Building Code, latest edition.
- D. ACI 117-10 Standard Specifications for Tolerances for Concrete Construction and Materials.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Materials for Concrete:
  - 1. Cement shall conform to the following: Portland Cement ASTM C150, normal, type I or type II. Provide domestic cement of one type and from same source for entire project.
  - 2. Mineral Admixtures:
    - a. Fly Ash: Shall conform to ASTM C 618. 20% maximum of total cementitious weight.
    - b. Ground Blast Furnace Slag: Shall conform to ASTM C 989-93. 30% maximum of total cementitious weight.
  - 3. Chemical Admixtures: The following admixtures are permitted, but require written approval from the Engineer:
    - a. Air Entraining Admixture: Comply with ASTM C260. "Specifications for Air-Entraining Admixtures for Concrete.
    - b. Water Reducing Admixture: Comply with ASTM C494 "Specifications for Chemical Admixtures for Concrete, Type A and compatible with air entraining admixture.
    - c. Water Reducing and Retarding Admixture: Comply with ASTM C494, "Specifications for Chemical Admixtures for Concrete, Type D, and compatible with air entraining admixture.
    - d. High Range Water Reducing Admixture: Comply with ASTM C494, "Specifications for Chemical Admixtures for Concrete, Type F or G, and

compatible with air entraining admixture. (Including superplasticizer to reduce water content.)

e. Admixtures containing added calcium chloride are not permitted.

4. Aggregates: Shall conform to ASTM C 33 and shall be quarried/mined in fresh water. Aggregates from salt water or brackish water are not permitted. Manufactured sand and screenings are not permitted. Fine aggregate shall be silica (Quartz) sand. Coarse aggregate size shall not exceed:

<u>Concrete member</u>	<u>Size</u>	
Walls	3/4"	67#
Beams or structural slabs not on ground	3/4"	67#
Columns and all other concrete	1"	57#
Drilling concrete pad or slabs on ground	1"	57#

5. In sanitary sewage applications, where called for in the plans and/or specifications an antimicrobial admixture as specified below shall be utilized:

- a. An antimicrobial agent, ConShield<sup>®</sup>, or approved equal, shall be used to render the concrete uninhabitable for bacteria growth.
- b. Contractor shall mix the liquid antimicrobial additive with the total water content of the concrete mix design in a proportion of 1 gallon per cubic yard. In the case of repairs to damaged concrete a proportion of 2 gallons per cubic yard shall be utilized.
- c. In some instances all of the concrete in the structure in will receive the additive and in other instances only a portion of the concrete will receive the additive. Hence, the Contractor shall apply the additive only as directed in the specific instance.
- d. Contractor shall submit a letter of certification to the Town, stating that the correct amount and correct mixing procedure was followed for all antimicrobial concrete.
- e. ConShield<sup>®</sup> antimicrobial additive shall be as manufactured by ConShield<sup>®</sup> Technologies, Inc.; 541 Tenth Street NW #233, Atlanta, GA 30318; Phone: (877)543-2094.

B. Portland cement and reinforcing steel: Comply with ACI 301-10 and, with all modifications and supplements thereto listed in Part 3 of this specification.

C. Burlap mats: Conform to AASHTO Specification M182. (Burleen non-staining

mats.)

- D. Epoxy bonding agent: A two (2) component, solvent free, moisture insensitive structural epoxy adhesive conforming to ASTM C881-13 Type II, Sikadur 32 Hi-Mod, as manufactured by Sika Corp., Concrete 1090 Liquid by Master Builders or approved equal.
- E. Anchor bolts, nuts and washers: Conform to ASTM A449-10, hot-dip galvanized.
- F. Dovetail slots: Galvanized steel, 22 gauge, 1"x 1", with 5/8" throat, fiber filled.
- G. Forms:
  - 1. Plywood Forms: PS-1, B-B Concrete Form, Class I, exterior type, mill oiled and edge sealed. Thickness shall be as required to support concrete at the rate placed, but not less than 3/4".
  - 2. Steel Forms: Uncoated steel, 3/16"-inch minimum thickness, fabricated to close tolerances, protected only by the specified release agent, braced so as not to dent, bend or dimple under wet concrete loads, vibrator impact and tool impact. Maintain steel forms in rust free condition by use of steel wool and light grinding, followed by coats of the specified release agent. Forms should be adjustable to be brought into true alignment without steps or ridges.
- H. Form release agent:
  - 1. For plywood forms use a natural non-petroleum base, non-staining and non-retarding release agent that will effectively prevent absorption of moisture and prevent bond with concrete, and leaves the concrete with a paintable surface.
  - 2. For steel forms, use an approved material that will not stain, color or otherwise affect the finish of the concrete. Form coating shall not be detectable on finished surfaces.
  - 3. Round column forms: Provide seamless fiber forms with the three plies nearest to the interior surface of the form deckled or scarfed and overlapped to minimize spiral gaps or seams on the column surface.
- I. Form Ties: Steel rod type with integral waterstops and cones, and with ends or end fasteners that can be removed without spalling the concrete and which leave

a hole equal in depth to the required reinforcement clearance, but not less than 2 inches from the formed face of the concrete. Wire tie, banding wire and wood spreaders will not be permitted.

J. Form Inserts:

1. Bevel or chamfer strips: Wood or non-staining plastic, 3/4" wide on each leg at exposed edges of concrete members, unless otherwise noted on plans.
2. Tongue and Groove Joint Forms: Minimum 24 gauge with steel stakes and splice plates. Forms shall be designed for joints not to receive a poured seal.
3. Pipe hangers and other utility supports: AISI Type 316 stainless steel.

K. Non-Shrink Grout: Non-shrink, non-metallic grout conforming to ASTM C 1107-13 Grade B or Grade C only. Grout must meet ASTM C 1107-13 at a temperature range of 50 F to 90 F at a flowable consistency.

L. Grout for Surface Repair and Bond Coat:

1. For repair, one part Portland cement to two parts fine sand, and a 50% of water and 50% Acryl 60 or equal (Thoroseal or Acryl Set Bonding Agent by Master Builders) to produce a stiff mortar.
2. For bond coat, one part Portland cement to one part sand, and a 50% of water and 50% Acryl 60 or equal (Thoroseal or Acryl Set Bonding Agent) to produce a slurry mix.

M. Moisture Barrier: Kraft paper and glass reinforcing fibers sandwiched between 2 layers of polyethylene film with a permeance rating of maximum 0.1 as per ASTM E-96-00, Procedure A.

N. Preformed Expansion Joint Filler: Non-extruding type, self expanding cork, 3/4", 1", and 1½" cork (not to be used for sidewalks), conforming to plans or as otherwise noted on drawings, conforming to the requirements of ASTM D1752 -04a (2013), Type II, and compatible with joint sealant compound.

O. Joint Sealant Compound: Non-sag, 2 component, solvent free, moisture insensitive, flexible, epoxy resin conforming to the requirements ASTM C920-14 Type M, Grade NS. Additionally, the sealant must be recommended by the

manufacturer to perform under continuous immersion in water.

P. Polyurethane Elastomeric Sealant: Sikaflex-2c, NS/SL or approved equal. Provide a 2-component, premium-grade, polyurethane-based, elastomeric sealant. It is principally a chemical cure in a non-sag and self-leveling consistency. Sealant shall meet ASTM C-920-14 and Federal Specifications TT-S-00227E.

1. Joint Movement: +50%.

Q. Waterstops:

1. Volclay Waterstop-RX or approved equal. Flexible strip of bentonite waterproofing compound in coiled form.

a. Chemical Composition:

- 1) Butyl Rubber-Hydrocarbon: 24.9% by weight; ASTM D-297.
- 2) Bentonite: 75 % by weight; SS-S-210-A.
- 3) Volatile Matter: Below 1 %; ASTM D-6.
- 4) Waterstop shall not contain any asbestos fibers or asphaltics.

b. Physical Properties:

- 1) Specific Gravity: 1.57; ASTM D-71.
- 2) Application Temperature Range: 5-125 F.
- 3) Flash Point: 365; ASTM D 93-97.
- 4) Accelerated Aging: Maintained 99% solids.
- 5) Dimensions: 1" x 3/4" x 16'-6"

2. Polyvinyl chloride (PVC): Conforming to the requirements of U.S. Army Corps of Engineers Specification CRD-C-572 and of the following type:

- a. Expansion Joints: 9-inches by 3/8-inch, ribbed center bulb.
- b. Construction Joint: 9-inches by 3/8-inch, flat ribbed.
- c. Only where specified on Plans at construction and expansion joints: 9-inches by 3/8-inch, split ribbed.
- d. Install waterstops as shown as manufactured structures.

- R. Fiber Reinforcement: Fiber reinforcement shall not be used in the concrete unless ordered by the Engineer in writing. It shall consist of 100% virgin polypropylene fibrillated fiber-dosage of 2 lbs. per cubic foot.
1. Compressive Strength: 1 psi (.006895 M Pa), ASTM C-39.
  2. Flexural Strength: 288 psi (2.0 M Pa) after 7 days, 390 psi (2.7 M Pa) after 28 days; ASTM C-78.
  3. Splitting Tensile Strength: 194 psi (1.3 M Pa) after 7 days, and 290 psi (2.0 M Pa) after 28 days; ASTM C-496.
  4. Source: Fibermesh Micro-Reinforcement System by Fibermesh Company, Division of Synthetic Industries, Inc. Or approved equal.
- S. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.
- T. A shrinkage reducing admixture (Teraguard) or equivalent at the rate of 2.2% by weight of cement may be used in the concrete to meet the shrinkage limitations.
- U. To protect the concrete slab against the elements, the Engineer may direct the Contractor to spray an evaporation retarder on the finished concrete slab immediately behind the cement finishing process at no additional cost to the Town. This is not a curing compound.

## **PART 3 EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work.

### **3.02 SUPPLEMENTAL REQUIREMENTS**

- A. All phases of concrete construction, including materials formwork, and all other

related procedures shall comply with the most stringent allowed tolerances of ACI-301 and ACI-117 Standards (Latest Edition) - Non compliance with these standards will cause full rejection of any work done.

- B. Comply with ACI 301-10 and with all modifications and supplements thereto listed herein. In addition to the ACI Standards on finished concrete, the Engineer will only approve quality finished concrete which in his opinion is ready to receive a grout finish, paint or liquid membrane.
  
- C. The following modifications and supplements to ACI 301-10 shall also apply to the work.
  - 1. General
    - a. These specifications cover cast-in-place structural concrete for use in buildings and appurtenances, including foundations, curbs, sidewalks, concrete pavements and utility structures, water containment tanks, and piles.
    - b. Keep minimum two (2) copies of ACI 301-10 "Specifications for Structural Concrete" in field office at all times.
  
  - 2. Proportioning and Design of Mixes:
    - a. General: Proportion concrete to meet properties as specified. Prepare mix designs for each type and strength of concrete. Submit with mix design the chemical admixture manufacturer's statement that the admixture proposed complies with the requirements of this specification. Where concrete of different strengths are specified for the same location, the higher strength concrete shall be used. Concrete proportions shall be established on the basis of previous field experience, or laboratory trial batches as specified in ACI 301-96 Sections 4.2.2 & 4.2.3.
  
    - b. Classes of Concrete:
      - 1) Structural concrete of normal weight for portions of the structure that are required to be watertight containments or tremie concrete, the water/cementitious ratio shall not exceed 0.45 if exposure is to be to fresh water.
      - 2) If the concrete is exposed to salt or brackish water, or if exposed to

injurious concentrations of sulfate-containing solutions (1500 ppm or more of Sulfate in water) or other chemically aggressive solutions, use Type II cement with Rheobuild 1000 admixture by Master Builders, or approved equal; water/cementitious ratio shall not exceed 0.34.

- 3) Other Concrete: (This would be slabs-on-grade, concrete thrust blocks, and miscellaneous concrete). The water cementitious ratio shall not exceed 0.50 to 0.55.
- 4) Minimum f'c @ 28 days shall be 3000 PSI.
- 5) Minimum f'c @ 28 days shall be 4000 PSI with a Water/Cement ratio of 0.45. see 1 above.
- 6) Minimum f'c @ 28 days shall be 7000 PSI with a Water/Cement ratio of 0.34. see 2 above.

c. Slumps:

- 1) All structural concrete, pumped concrete and tremie concrete shall contain a High Range Water Reducing Admixture and be designed with a maximum water content of 270 pounds per cubic yard (32.36 gallons). The initial water slump prior to addition of the High Range Water Reducing Admixture shall be 2-inch maximum. Concrete at point of placement shall not exceed 10-inches. Concrete shall be non-segregating.
- 2) Slabs including slabs-on-grade, and all other concrete shall have a maximum water content of 287 pounds per cubic yard and have a 5-inch maximum slump with a water reducer, or water reducer and retarder admixture added (34.4 gallons).

3. Formwork

- a. Earth cuts are not permitted for forms for vertical surfaces. Footings, grade beams and slab edges shall be formed. Provide moisture barrier under all slabs on grade. Lap 6-inches and tape punctures.
- b. The contractor is responsible for the adequacy of forms and shoring including placing, fill and equipment on roof, and for safe practice in their use and removal. Submit formwork calculations, and shop drawings including shoring and reshoring. In addition, the calculations and shop drawings for formwork, shoring, and reshoring, if required by the Engineer or Town of Medley Building & Zoning Department, shall be signed and sealed by a Professional Engineer registered in the State of Florida.
- c. Design forms for the loads and lateral pressures resulting from the placement and vibration of concrete and for design considerations, wind loads, allowable stresses, and other applicable requirements of the South

Florida Building Code.

- d. Provide form facing materials as required by the specified finish of the formed surface. Do not use facing material with raised grain, torn surfaces, worn edges, patches, dents or other defects. No form may be reused more than three times without the Town's approval. The maximum deflection permitted of facing materials reflected in concrete surfaces exposed to view is 1/240 of the span between structural members.
  - 1) Forms shall be free from surface defects, tight to prevent leakage and braced to keep its position and shape when filled with concrete. Adjacent edges and end panels and sections shall be held together to provide accurate alignment and prevent forming ridges, fins, offsets or similar type defects in finished concrete. It shall be tight to prevent loss of water, cement or fines during placing and vibrating concrete. The bottom of the forms placed in continuous straight even footings or slabs shall be watertight to prevent loss of water, cement and fines during placement and vibration of concrete, a gasket may be required by the Engineer under the forms to provide water tightness at the Contractor expense. The Contractor shall not proceed to place forms for concrete work adjacent to or on top of previous placed concrete without the Engineer's approval, if the stripped forms reveals columns, walls or beams are out of level or plumb or there are cold joints or other objectionable work in the opinion of the Engineer. Contractor shall submit to the Engineer for approval, how he intends to correct or remove the defective work promptly at his expense. Contractor shall perform such corrections prior to proceeding to place concrete in the next Section.
- e. Provide positive means of adjustment (wedges or jacks) of shores and struts, and all settlement shall be taken up during concrete placing operation. Brace forms securely against lateral deflection. Do not anchor form bracing to poured concrete floors, or make holes in floor.
- f. Provide temporary openings in columns and wall forms to limit the free fall of concrete to five (5) feet. Place such openings at no more than eight (8) feet apart to facilitate placing and consolidation of concrete. Elephant trunks may be used to vertical heights of fifteen (15) feet for tremie and other purposes, if approved by the Engineer. Provide temporary openings at the bottom of wall and column forms and elsewhere as necessary to facilitate cleaning and observation immediately before concrete is placed. Blow formwork entirely clean of all saw dust, dirt, or other items not specifically intended to be a part of the final concrete. Any evidence of non-intended items in the forms is considered sufficient cause to stop concreting operation and/or require removal of concrete placed in such contaminated forms.
- g. Provide inserts, conduits, boxes, sleeves, anchors, ties, bolts, hangers,

dowels, thimbles, nailers, grounds and other devices in coordination with other trades.

- h. Set anchor bolts and other embedded items accurately and hold securely until concrete is placed and set. Anchor bolts shall be galvanized and of size and length as indicated on the Contract Drawings. Bolts not sized shall be 3/4-inch diameter.
- i. Insert galvanized dovetail anchor slot in forms, in columns, beams and slabs completely around in-fill masonry panels. Coordinate with Section 04220 Unit Masonry, Part 3 Execution, 3.01.J.2.c. for spacing of dovetails.
- j. Install wall spools, wall flanges and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools to the reinforcing steel.
- k. Do not use pinch bars, wrecking bars or other metal tools against as-cast concrete to wedge forms loose; use only wooden wedges carefully and gradually. Driving shall be accomplished by light tapping.
- l. The Contractor is responsible for the removal of forms and shores. Concrete shall be cured in accordance with ACI 308r-01. (Also see section 10 below) Do not remove forms or shores before the member has attained sufficient strength to support its weight and the loads imposed, nor sooner than listed below:

- 1) Wall forms: 24 hours.
- 2) Column forms: 24 hours.
- 3) Beam and girder side forms only (not bottom form): 24 hours.
- 4) Beam and Girder bottom forms: 7 days minimum unless otherwise approved by the Engineer.
- 5) Slab forms: 14 days.
- 6) Arch centers: 7 days.
- 7) Pan joist forms: 4 days.

#### 4. Reinforcement

- a. Prior to fabrication, submit for review shop drawings showing all fabrication dimensions, bar lists and location for placing of the reinforcing steel and accessories, including spacing of reinforcing, splices (lap, welded, Cadweld and/or mechanically threaded), grade of reinforcing and name of manufacturer. Note all deviations from the Contract Drawings and use the same designation mark as shown on the Contract Drawings where possible.
- b. Reinforcing bars: ASTM A615, Grade 60, deformed bars of USA manufacturer.
- c. Welded wire fabric: ASTM A185, galvanized.
- d. Metal bar supports: CRSI MSP-1, Chapter 3, Class 2, Type B stainless steel protected bar supports.
- e. Coupler Splice Devices: Cadweld®, tension couplers capable of

- developing the ultimate strength of the bar.
- f. Reinforcing steel upon which unauthorized welding has been done, shall be removed and replaced at no additional cost to the Town.
  - g. Place reinforcing bars to the most stringent tolerances indicated in ACI 301 and ACI 117 (Latest Edition). Tolerances specified in those standards shall govern over any other reference code or standard.
  - h. All reinforcement at time concrete is placed, shall be free of mud, oil or other materials that may affect or reduce the bond. Reinforcing with rust or mill scale will not be accepted without cleaning and/or brushing to remove scale and rust.
  - i. Support rebar and mesh reinforcing for slabs on grade 1½ inches from top of slab on masonry blocks not less than 4 sq. in., having a compressive strength equal to or greater than the specified strength of the concrete being placed. Space blocks at no more than 4 feet apart each way for rebars, and no more than 3 feet apart for mesh reinforcement.
  - j. Support reinforcing off from formwork for columns, walls and beams with stainless steel protected bar supports. Support slab reinforcing on #5 bars, or larger, spaced at no more than 48 inches on center. Space individual high chairs no more than 48 inches apart and support bars shall not exceed 24 inches past outermost chairs.
  - k. Overlap welded wire fabric in such a manner that the overlap measured between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches or 6 inches, whichever is greater. Do not extend fabric through expansion and/or contraction joints, unless otherwise noted on the Contract Drawings.
  - l. The minimum clear distance between parallel bars, both vertical and horizontally, shall not be less than the nominal diameter of the bars, or less than 1½ times the maximum size of the aggregate, or 1-inch in beams, or 1½ inches in columns, whichever is greater. Where reinforcement in beams is placed in two or more layers, the upper layer shall be placed directly above the bars in the bottom layer. Misplacement, misalignment or improper length of dowels shall be sufficient cause to require removal and reconstruction of affected work.
  - m. Unless allowed by the Engineer, bending of reinforcing partially embedded in concrete is not permitted. When permitted, bending shall be in accordance with CRSI Manual of Standard Practice.
5. Joints and Embedded Items.
- a. Provide premolded expansion joint filler strips of proper width and length as specified in the Contract Drawings. Place ½" expansion joint fillers every 20 feet in straight runs of walkways or sidewalks, at right angle turns and wherever concrete butts into vertical surfaces, unless otherwise noted on the Contract Drawings.
  - b. Provide waterstops in all construction joints, unless otherwise indicated on

the Contract Drawings.

- c. Join all waterstops at all intersections so that a continuous seal is provided. Center the waterstop in the joint. Hold water stop positively in correct position. In the event of damage to the waterstop, repair the water stop in an acceptable manner. Vibrate concrete to obtain impervious concrete in the vicinity of all joints.
- d. Install waterstop in accordance with instructions of the manufacturer. Prior to use of the waterstop material in the field, submit to the Engineer for approval a sample of each size and shape to be used. Fabricate sample so that the material and workmanship represent in all respects the fittings to be furnished under this Specification.
- e. Place all sleeves, inserts, anchors, and other embedded items prior to placing concrete. Anchors and bolts cast in concrete shall be hot dip galvanized or stainless steel. Where permitted by the Engineer, concrete expansion bolts shall be stainless steel and of the wedge anchor type. Take all necessary precautions to prevent embedded items from being displaced, broken or deformed during concreting operation. Protect drains from intrusion of concrete.

6. Placing:

- a. Equipment for mixing and transporting concrete must be clean. Forms shall be thoroughly clean and damp, and reinforcing shall be secured in place. Runways for transporting concrete shall not rest on reinforcing. When concrete is placed against earth, sprinkle sufficiently before placing.
- b. Deposit of concrete in forms no longer than ninety (90) minutes after the initial design water has been added to the cement and aggregates. Concrete which can not be so placed shall not be used and shall be wasted. **No additional water shall be added.** No retempering with water is permitted.
- c. In addition to the requirements of ASTM C94, the concrete delivery tickets shall indicate the cement content and water/cement ratio.
- d. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection and curing. Comply with ACI 305R "Hot Weather Concreting" recommendations.
- e. Do not place concrete in forms unless the water level is below the concrete to be placed, even if it is necessary to maintain the dewatering, or under rain.
- f. Do not place concrete under water except for tremie concrete as called for on the Contract Drawings. Submit for approval plan and details of means and methods for installation of seal tremie concrete prior to commencement of work. Seal concrete which subsequently fails to perform, shall be repaired or replaced at no additional cost to the Town.
- g. Place seal concrete under water in the space in which it is to remain, by means of a tremie, a closed-bottom dump bucket of not less than one cubic

yard capacity, or other approved method, and do not disturb after it is deposited. Deposit all seal concrete in one continuous pour. Do not place concrete in running water. Design all formwork, to retain concrete under water, to be watertight. Submit shop drawings for the design of formwork and excavation sheeting signed and sealed by a Florida Registered Professional Engineer.

- h. The tremie shall consist of a tube having a minimum inside diameter of ten (10) inches, and shall be constructed of sections having tight joints. No aluminum parts which have contact with the concrete will be permitted. The discharge end shall be entirely seated at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper, after which the flow shall be stopped by lowering the tremie. The means of supporting the tremie shall be such as to permit the free movement of the discharge end over the entire top surface of the work, and shall permit it being lowered rapidly when necessary to choke off or retard the flow. The flow shall preferably be continuous and in no case shall be interrupted until the work is completed. Exercise special care to maintain still water at the point of deposit.
- i. When the concrete is placed by means of a bottom dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be raised very slowly during the discharge travel; the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture. Aluminum buckets will not be permitted.
- j. Do not commence pumping, to dewater a sealed cofferdam, until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72 hours after placement of concrete.
- k. Notify Engineer a minimum of 24 hours prior to concreting and request a specific time for observation of reinforcing and formwork for portions of concrete work to be placed. No observation will be made by the Engineer until rebar installation for all work to be done and all formwork has been completed and approved by the Contractor's field superintendent. Do not order concrete until all correction and additions indicated by the Engineer have been made. Should the Engineer's observation reveal that work is improperly prepared and an additional observation will be required, he will so inform the Contractor and all above requirements shall also govern.

7. Repair of Surface Defects:

- a. Repair all concrete surface defects, which includes, but not limited to cracks, tie holes (no plastic cones), uneven holes, honey combs, rough frame work and other objectionable conditions deemed unacceptable to the Engineer immediately after form removal. This repair work is to be done for

all concrete expose surfaces, liquid applied surface or painted surfaces in or out of the water. Repair all cracks and defects in the concrete floors, beams, joists, columns, and other structural members, roof and walls, to the satisfaction of the Engineer, that may occur up to one year after acceptance of work regardless of the cause. Test unformed, surfaces such as monolithic slabs, for smoothness and verify placement tolerances specified for each surface and finish. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness. Repair unformed surfaces that contain surface defects which affect durability of concrete. Surface defects, as such, include cracking, cracks which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable and rough conditions.

- b. Proprietary compounds for adhesion or as patching ingredients may be used, if approved by the Engineer. All structural repair of surface defects to be made require the approval of the Engineer, as to the method and procedure. Approval of the completed work must be obtained from the Engineer.

#### 8. Finishing of Formed Surfaces.

- a. Apply rough form finish to exterior walls below grade not exposed to water.
- b. Apply smooth form finish to exterior and interior walls and columns exposed to water.
- c. Apply smooth form finish to interior walls and underside of floors, stairs and slabs.
- d. In addition to the smooth form finish, apply a grout cleaned finish to concrete walls and surfaces exposed to public view and underside of formed floors, stairs or slabs.
- e. Apply a rubber float grout mix to properly prepared concrete surface, only when approved by the Engineer. Mix shall have one part Portland cement to two parts fine sand in a 50% water and 50% Acryl #60 (Thoroseal or Acryl Set) mix or Acryl Set by Master Builders. Make a 10' by 10' sample on the concrete wall for the approval of the Engineer. Finished surface shall be a non dusting hard finish, when scratched with a ¼" metal edge.
- f. Finish concrete surface, interior or exterior, below or above water shall include all:
  - 1) Exposed concrete.
  - 2) Grout finished concrete.
  - 3) Painted surface concrete.
  - 4) Liquid membrane finished concrete shall comply with manufacturer's requirements.
  - 5) The entire surface of finished concrete shall have a smooth uniform

surface, there shall be no offsets, visually bulges, or wavering in the finished surfaces. The joints must be accurately aligned, they can not be uneven or in or out, a higher and lower, there shall be no fins, projection or unevenness between forms.

- 6) If after stripping the forms the Engineer determines that the finished concrete does not comply with any or all of the above requirements, the Contractor shall submit his proposal in writing to the Engineer as to his methods of correcting the work at no added cost to the Town, which shall include, but not limited to all grinding of fins, projections, unevenness between joints, form high spots and uneven spots.
- 7) In addition to all other requirements, concrete surfaces exposed to public view, irrespective of size, area or location shall be completely clean and free of: (1) Stains of any nature, (2) Parts of forms or other wood of any nature, (3) laitance, (4) "Run-downs" of leaked water from secondary pours, (5) Nails, (6) Strips, (7) Ties and (8) all other extraneous, deleterious materials and/or substances which may affect the finished appearance and condition of exposed concrete. Surfaces not meeting the above requirements are to be repaired and treated at no additional cost to the Town.

## 9. Slabs

- a. Unless otherwise noted on the Contract Drawings, place strips alternately at maximum 20 feet center-to-center and to align with column centerline. Do not place adjacent strips until elapse of twenty four hours after first strip is placed. Place slabs on grade by the "strip-cast" method. Method to be reviewed by the Engineer. Provide saw-cut joints at maximum 20 feet center-to-center and to align with column center lines within four hours of final finishing.
- b. Provide doweled construction joints where shown on the Contract Drawings.
- c. Provide a hard steel troweled finish, free from trowel marks and irregularities, to slabs and floors.
- d. Provide a light hair-broom finish to exterior slabs and floors exposed to public view. Leave hair-broom lines parallel to direction of the slab drainage.
- e. Provide a stiff bristle broom finish to slabs and floors with slopes greater than 10 percent. Leave broom lines parallel to slope drainage.
- f. Finish exposed edges of slabs, floors and tops of walls with a ¼-inch radius edge unless a chamfer is called for on the Contract Drawings.

## 10. Curing and Protection

- a. Comply with ACI 305 "Hot Weather Concreting", Chapter 4, with the supplements and modifications to ACI 301 listed herein.
- b. Only concrete water curing for not less than 7 days (24 hours/day continuously) will be accepted; Burlene mats shall be used in curing. Water cure by ponding or continuous sprinkling covering complete surface with minimum runoff. The application of water to wall may be interrupted for grout cleaning only over the areas being cleaned at the time, and the concrete surfaces shall not be permitted to become dry during such interruption.
- c. Begin all water curing as soon as concrete is set and concrete will not be damaged. Keep concrete and wall forms wet the first 24 hours. Remove forms as indicated in Formwork, Section 3.02-C.4, and continue with 7 day water curing. Recoat damaged surfaces subject to heavy or surfaces damaged by construction procedures within 3 hours of damage. Method of repair shall be approved by the Engineer.

## 11. Testing

- a. Testing laboratory will be selected and paid for by the Town. Send results of all tests to the Town and to the Contractor. The Contractor shall notify the Testing laboratory at least 24 hours before each concrete placing.
- b. Obtain and mold 3 specimens for each fifty (50) cu. yds., or fraction thereof, of each class of concrete placed each day or as directed by the Engineer.
- c. Cure specimens from each sample in accordance with ASTM C31. Record in test report any deviations from this Standard.
- d. Test specimens in accordance with ASTM C39. Test one specimen at twenty eight (28) days for acceptance and, one specimen at three (3) days and seven (7) days respectively, for information. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinders shall be considered the test result.
- e. Contractor's Superintendent shall color code on a set of structural drawings the extent of days work and date to conform to cylinders test.
- f. Perform slump test at discharge of mixer, one for each strength test in accordance with ASTM C143. In the event slump is excessive, testing laboratory will immediately notify the Contractor's superintendent and the Engineer's representative on site. The Contractor shall then reject all concrete with excessive slump and/or deposit time.
- g. Drying Shrinkage Test: A drying shrinkage test shall be conducted on the preliminary trial batch with the maximum water-cementitious materials ratio used to qualify each proposed concrete mix design using the concrete materials, including admixtures, that are proposed for the project. Three test specimens shall be prepared for each test. Drying shrinkage specimens shall be 4 x 4 x 11 inch prisms with an effective gauge length of

10 inches fabricated, cured, dried, and measured in accordance with ASTM C 157 except with the following modifications:

- 1) Specimens shall be removed from the molds at an age of 23 hours  $\pm$  1 hour after trial batching, shall be placed immediately in water at  $73^{\circ}$  F  $\pm$  3 $^{\circ}$ F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in lime-saturated water as specified in ASTM C157. Measurement to determine expansion expressed as a percentage of original length shall be taken at age 7 days. The length at 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity controlled room maintained at  $73^{\circ}$  F  $\pm$  3 $^{\circ}$ F and 50%  $\pm$  4% relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be reported separately for 7, 14, and 21 days  $\pm$ 4 hours of drying from "0" day after 7 days of moist curing.
- 2) Drying shrinkage deformation for each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. Results of the shrinkage test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age more than 0.004 percent, the results for that specimen shall be disregarded.
- 3) The average drying shrinkage of each set of test specimens cast in the laboratory from a trial batch as measured at the 21 days drying age shall not exceed 0.036 percent and 0.042 percent at the 28-day drying stage for all concrete.
  - a) The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.
  - b) If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions at no additional cost to the Owner, for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures, including Tetra Guard AS 20 or approved equal; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.
- 4) Alkali-aggregate reactivity potential shall be determined in accordance with Appendix XI of ASTM C 33. Aggregates shall be

tested in accordance with ASTM C 289 and C295 to determine potential reactivity. Aggregates which do not indicate a potential for alkali reactivity or reactive constituents may be used without further testing. Aggregates which indicate a potential for alkali reactivity shall be further tested in accordance with ASTM C227 or C1105, as appropriate, using cement containing less than 0.6 percent alkalis. At the discretion of the Engineer, testing in addition to that indicated in Appendix XI of ASTM C33 may be performed on potentially reactive aggregates. Nonreactive aggregates shall be imported if, in the opinion of the Engineer, local aggregates exhibit unacceptable potential reactivity.

12. Evaluation And Acceptance of Concrete.

- a. If tests are insufficient or inadequate, test and evaluate by core tests. Failure of any concrete cylinder to meet specified requirements shall be deemed as non-complying and costs of additional tests to determine the adequacy or inadequacy shall be borne by the Contractor. Concrete rejected for any reason is to be removed and replaced, including labor, forms and reinforcing, to meet specifications at no additional cost to the Town and no additional time extension.

13. Additional Requirements.

- a. Submit shop drawings as required per General Conditions and elsewhere in these specifications. Contractor shall check and approve all shop drawings prior to submission. Do not fabricate any item requiring shop drawings until approval of shop drawings has been granted by the Town. Partial shop drawings are not accepted, submit drawings for complete submittal.
- b. Provide precast or cast-in-place reinforced concrete lintels at all masonry openings and sills at all windows. Reinforce to suit loads and span. Provide minimum 8" bearing at each end and, pour integral with columns where opening abuts columns.

**END OF SECTION**

## **SECTION 03600 - GROUT**

### **PART 1. GENERAL**

#### 1.01 WORK INCLUDED

- A. The work included in this Section consists of grouting the various items listed hereinafter and indicated on the Drawings.

#### 1.02 RELATED WORK

- A. Section 03300 Cast-In-Place Concrete, Reinforcing, and Formwork

#### 1.03 SUBMITTALS

- A. Manufacturer's literature shall be submitted for review on the following items.
  - 1. Nonshrink grout data shall include grout properties, mixing, surface preparation and installation instructions.

#### 1.04 DELIVERY AND STORAGE

- A. Grouting materials shall be delivered and stored in unbroken containers with seals and labels intact as packaged by the manufacturer.

### **PART 2. PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. Nonshrink, Nonmetallic Grout: Five Star Special Grout 150, Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Euclid NS Grout, or equal pre-mixed type.
- B. Nonshrink Metallic Grout: Master Builders Embeco 636 Grout pre-mixed type, or equal.
- C. Epoxy Grout: Five Star epoxy grout by U.S. Grout Corp., or equal.

### **PART 3. PART 3 EXECUTION**

### 3.01 PREPARATION

- A. All bonding surfaces shall be clean and dust and oil free. Grout shall be mixed and applied in accordance with manufacturer's recommendations.
- B. Grout Mix proportions (for grout to fill cores in reinforced masonry walls)
  - 1. One part portland cement, Type I
  - 2. 2-1/4 parts damp, loose sand.
  - 3. Parts shot gravel (3/8" maximum).
  - 4. Mix to conform to ASTM C476-83 with a minimum compressive strength of 2500 psi at 28 days, have an 8" minimum and 10" maximum slump.

### 3.02 INSTALLATION

- A. Nonshrink Grout:
  - 1. Nonshrink, nonmetallic grout shall be used for grouting precast concrete wall panel connections, column base plates, anchor bolts, reinforcing bars, pipe sleeves, machinery supports and pump base plates.
  - 2. Grout shall be mixed as close to the work area as possible and transported quickly to its final position in a manner which will not permit segregation of materials.
  - 3. Nonshrink grout shall be cured with water saturated burlap for at least three days or with an application of Super Rez Seal cure and seal compound applied immediately after grout placement.
  - 4. Machinery set on grout pads shall not be operated until the grout has cured for at least 24 hours.

**END OF SECTION**

## SECTION 05120 - STRUCTURAL STEEL

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Structural steel members.

#### 1.02 RELATED SECTIONS

- A. Painting - Section 09900.

#### 1.03 SUBMITTALS

- A. Submit the following for review and approval:
  - 1. Shop drawings and erection drawings with indexes for structural steel.
  - 2. Shop paint manufacturer's data.
  - 3. Welder's qualifications.
  - 4. Torque wrench calibration equipment.
  - 5. Electrode data.
  - 6. Mill tests.
  - 7. Shop quality control program.
  - 8. Erection procedures.
  - 9. Connection design computations.

#### 1.04 STANDARDS

- A. Comply with the following standards and standard specifications unless indicated or specified otherwise.
  - 1. The "Florida Building Code", Dade County Edition, (FBC).
  - 2. The "Manual of Steel Construction", "American Institute of Steel Construction, Inc." (AISC) Latest Edition, including:
    - a. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
    - b. Code of Standard Practice for Steel Buildings and Bridges.
    - c. Structural Joints Using ASTM A325 or A490 bolts.
  - 3. "American Welding Society" (AWS) - Structural Welding Code, AWS D1.1.
  - 4. American Society for Testing and Materials (ASTM):
    - a. ASTM A36 - Standard Specification for Structural Steel.

- b. ASTM A325 - Standard Specification for High Strength Bolts for Structural Steel Joints, including Suitable Nuts and Plain Hardened Washers.
  - c. ASTM A490 - Standard Specification for Quenched and Tempered Alloy for Structural Steel Joints.
  - d. ASTM A307 - Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
  - e. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium - Vanadium Steels of Structural Quality.
  - f. Other ASTM Standard Specifications enumerated in the "Standards" of this paragraph; use Standard Specification in effect as of date of bid.
- B. Where the provisions of AWS are in conflict with AISC, the provisions of AISC will control.

#### 1.05 TOLERANCES

- A. The tolerances for framing tolerances in Section 7 of the "Code of Standard Practice" is modified as follows:

### **PART 2 PRODUCTS**

#### 2.01 ROLLED SHAPES

- A. Provide rolled shapes of all weights in accordance with ASTM A572 Grade 50, unless specifically indicated or specified otherwise.

#### 2.02 ANCHOR BOLTS

- A. ASTM A307 with regular series hexagonal head nuts, unless otherwise indicated.

#### 2.03 NUTS AND BOLTS EXCEPT ANCHOR BOLTS

- A. ASTM A325 except where specifically indicated to be ASTM A490. Washers as required. Bolts including washers and nuts connecting hot dipped galvanized shapes shall be galvanized where exposed.

#### 2.04 ELECTRODES

- A. According with requirements of E70 or F7 series, as appropriate.

#### 2.05 SHOP PAINT

- A. Oil paint, with rust inhibitive pigment, compatible with sprayed-on fireproofing

(07253) and finish coats (09900).

2.06 PIPE

- A. Pipe shall comply with ASTM A501,  $F_y = 36\text{KSI}$  or ASTM A53, Types E or S, Grade B,  $F_y = 35\text{KSI}$ .

2.07 STRUCTURAL TUBING

- A. Structural tubing to comply with ASTM A500, Grade B,  $F_y = 46\text{KSI}$ .

**PART 3 EXECUTION**

3.01 UNLESS SPECIFIED OTHERWISE HEREIN

- A. Comply with AISC specifications and the "Standards" of referred to herein for the fabrication and erection.

3.02 CONNECTIONS

- A. Shop connections shall be welded or bolted at the option of the Contractor, unless otherwise indicated.
- B. Field connections shall be bolted except where specifically indicated to be welded. Field moment connections may be welded.
- C. Bolts shall be ASTM A325, friction type, unless otherwise indicated.
- D. Connections shall be as generally indicated where the complete connection is shown.
- E. Connections not detailed will be designed by the Contractor for the controlling stresses indicated utilizing AISC requirements.
- F. Minimum connection is two 3/4 inch diameter ASTM A325 bolts or equivalent in weld, (15.5K).
- G. For framed connections in non-composite construction and for beams without concentrated loads, where reactions are not indicated, design the connection for one-half of the total uniform load capacity of the beam shown in "Tables for Allowable Loads on Beams," AISC.
- H. Where moment connection or continuous framing is indicated, design connections for the moment indicated, but not less than 50% of the moment capacity, however, where the design moment is not given, design the connection

for 100% of the moment capacity. All moment connections shall be Type I, rigid frame.

- I. Columns shall be detailed as indicated, bearing surfaces shall be finished (planed).
- J. Moment connections, shop or field, shall not have bolts thru the top flange plates (because of interference with the metal decking).
- K. Stiffened seats unless indicated are prohibited unless the Contractor verifies that architectural clearances are maintained and that interferences with any and all elements of the building will not occur.
- L. "Nelson" type studs for decking are provided in Section 05310.

### 3.03 SHOP CLEANING

- A. Clean all steel to the requirements of SSPC-SP2.

### 3.04 SHOP PAINTING

- A. Shop paint all steel except steel intended to be encased in concrete and steel to be hot dipped galvanized.

### 3.05 ERECTION MARKS

- A. Column marks shall be the column number assigned on the structural drawings supplemented by tier or level number.
- B. Beam marks shall be prefixed by floor or level number.

### 3.06 HOT DIP GALVANIZE AFTER FABRICATION

- A. Hot dip galvanize after fabrication according to ASTM A123, ASTM A385 and ASTM A386, all steel exposed to the weather. Erect those members with galvanized A325 bolts. Seal weld all members to be hot dipped galvanized.

### 3.07 CAMBER

- A. Shop or mill camber all beams indicated.

### 3.08 TESTING

- A. The Town may elect to inspect the Work in the shop or in the field or both by non-destructive means as specified herein. The Contractor will make no claim for extra work or delay using as a basis the inspection or non-inspection of the

Work by the Town.

B. Welding Inspection:

1. The Inspector designated by the Town will assume the duties and responsibilities of the "Inspector" specified in Chapter Six of AWS D1.1.
2. Acceptance Criteria:
  - a. Visual: AWS D1.1 Paragraph 3.7 and 8.15.
  - b. Radiographic, ultrasonic, magnetic particle and dye penetrant: AWS D1.1 paragraph 8.15.
  - c. Where more than one type of testing is used, acceptance criteria are passing all testing procedures used.
3. The Inspector will spot inspect by ultra sonic means one hundred percent (one spot per weld) of all tension groove welds and 50% of all compression groove welds shop and field. Where the metal thickness is less than 5/16", radiographic spot testing shall be used.
4. The Inspector will inspect by visual rules all welds.
5. The Inspector may use radiographic means where ultrasonic testing is not feasible.
6. The Inspector may supplement any of the above testing with dye penetrate, magnetic, radiographic or ultra sonic means.
7. The Contractor shall be responsible for all associated costs of the inspections including handling, surface preparation and repair of discontinuities.

C. The Contractor shall provide ladders or other means of access to the joints in the field.

D. Bolting Inspection: The Inspector will test the bolts in the shop and in the field by methods specified in Structural Joints Using ASTM A325 or A490 Bolts.

**END OF SECTION**

## SECTION 07920 - SEALANTS AND CAULKING

### PART 1. GENERAL

#### 1.01 SCOPE

- A. Work included: furnish all labor, materials, equipment, incidentals, transportation, application/installation and supervision necessary to complete all caulking, sealing and related work called for by the plans and/or specifications, or reasonably inferable from either or both, including, but not limited to the following:
1. At all locations indicated on plans or called for herein.
  2. Perimeters of all items piercing or set into exterior walls.
  3. All other interior and exterior locations (whether or not specifically called for on plans) where required to make work under this Contract complete, fully watertight and attractive in appearance.
  4. Including preparation of joints, priming (where required/directed), backing rods and bond breakers at all joints indicated on plans, as detailed/noted.

#### 1.02 QUALITY ASSURANCE

- A. Standards: comply with standards specified in this section.
- B. Qualifications of manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer of Record.
- C. Qualification of Installers:
1. Proper caulking and proper installation of sealants require that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.

#### 1.03 USE OF TERMS "CAULKING" AND "SEALANT"

- A. It is the intent of these specifications to differentiate between the terms "caulking" and "sealant."
1. Caulking materials specified are to be used only at interior locations where needed/detailed for appearance to conceal cracks/joints between surfaces, etc.
  2. Sealant materials are to be used at all exterior and interior locations where needed for water tightness and those interior locations where specifically

detailed/noted on drawings.

#### 1.04 PRODUCT HANDLING

- A. Delivery and storage: Deliver all materials of this section to the job site in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the job site any material which has exceeded the shelf life recommended by its manufacturer.
- B. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Engineer or Record.

### **PART 2. PRODUCTS**

#### 2.01 MATERIALS

- A. Caulking compounds, for interior non-moving joints use Externaflux Butyl Caulk, Pecorp-158, Sonneborn-Contech Products, Inc., Butakauk, or approved equal.
- B. Sealants: For sealing exterior expansion and control joints: Use Dow Corning Corp. 790 or approved equal.
- C. Colors:
  - 1. Colors for each sealant installation will be selected by the Engineer from standard colors normally available from the specified manufacturer.
  - 2. In concealed installations and in partially or, fully exposed installations where so approved by the engineer, standard gray or black sealant may be used.
- D. Primers: Use only those primers which are non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.
- E. Backup Materials: Use only those backup materials which are specifically recommended for this installation by the manufacturer of the sealant used and which are non-absorbent and non-staining.
- F. Bond-preventive Materials: Use only those materials best suited for the

application and as recommended by the manufacturer of the sealant used.

- G. Use only solvents which can be completely removed or which will not adversely affect the caulking or sealant to be applied.
- H. Other Materials: All other materials, not specifically described but required for complete and proper caulking and installation of sealants, shall be first quality of their respective kinds, new and as selected by the Contractor subject to the approval of the Engineer of Record.

### **PART 3. EXECUTION**

#### **3.01 INSPECTION**

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Concrete Surfaces:
  - 1. All surfaces in contact with caulking or sealant shall be dry, sound and well brushed and wiped free from dust.
  - 2. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
  - 3. Where surfaces have been treated, remove the surface treatment by use of sandblasting or wire brushing.
  - 4. Remove all laitance and mortar from the joint cavity.
  - 5. Where backstop is required, insert the approved backup material in the joint cavity to the depth required.

#### **3.03 INSTALLATION OF BACK-UP MATERIAL**

- A. Installation of back-up material, primers and bond-breaker, shall be in strict accordance with the respective manufacturer's recommendations.

#### **3.04 JOINT DIMENSIONS**

- A. Minimum joint 1/4" wide by 1/2" deep.
- B. Joints more than 1/2" deep shall be solidly filled to within 1/2" of the surface with specified filler.

#### **3.05 APPLICATION: (Coordinate work with other trades.)**

- A. Masking: thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.
- C. Apply generally with caulking gun of proper nozzle size to fit joint.
- D. Apply with sufficient pressure to fill joint from backing to surface.
- E. For joints in flat surfaces, neatly tool compound slightly concave with proper tools.
- F. Execute finishing of caulking around frames with coving tool.
- G. As work progresses, immediately remove compound that may accidentally flow onto adjoining surfaces using manufacturer's recommended solvent and cleaners. Remove excess material from joints immediately.

3.06 CLEANING

- A. Remove masking tape immediately after joints have been tooled.
- B. Clean adjacent surfaces free from caulking or sealant as the installation progresses. Use solvent or cleaning agent as recommended by the caulking or sealant manufacturer.
- C. At completion, carefully check all joints for damage and repair damaged joints.
- D. Remove all debris as a result of this operation.

**END OF SECTION**

## SECTION 09900 - PAINTING

### PART 1. GENERAL

#### 1.01 SCOPE 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.
- B. The Work under this Section shall include all material, labor, tools, ladders, scaffolding, etc. required to complete the painting for the entire Project. All painting material shall be brought on the job in the original unopened containers bearing the manufacturer's directions. Any painting material brought to the job in opened containers shall be rejected. The Contractor shall store his paint materials in a location directed by the Engineer and such storage space shall be kept clean and every precaution taken to prevent all danger of fire. Oily rags and papers shall not be left in the area overnight unless placed in covered metal cans.
- C. All painting shall be done by skilled workmen, in accordance with the best practice of the trade, who will be required to do a first class job in every respect. Wherever a "specialty paint" or other painter's material is mentioned herein by trade name or by manufacturer's name for specific location, material, surface, or service condition, it is mentioned as a standard of comparison only and it is not only intended that products by other manufacturers for like purposes may not be used if approved by the Engineer. Where any surface is acid etched, it shall be water-flushed and left until perfectly dry before any paint is applied.
- D. Work includes painting and finishing of interior and exterior exposed items, walls, below grade foundations, miscellaneous metal, 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.
- E. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats. The Contractor shall use the coating protective system as defined herein, as is applicable to the particular surface. Some of the surfaces defined herein may not be used for this project. Submit with shop drawings the Paint proposed in an explicit and clean form.

- F. The following items will not be painted or painted over:
1. Code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, and equipment identification, performance rating, name or nomenclature plates.
  2. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.
  3. Traffic stripes on paving.
  4. Stainless steel angles, tube, pipe, etc.
  5. Products with polished chrome, aluminum, nickel or stainless steel finish.
  6. Flexible couplings, lubricated bearing surfaces, insulation and metal and plastic pipe interiors.
  7. Plastic switch plates and receptacle plates.
  8. Signs and nameplates.
  9. Finish hardware.

#### 1.02 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. Use only thinners approved by the paint manufacturer, and use only within recommended limits.
- C. Undercoat and finish coat paints shall be compatible.
- D. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this project.
- E. All paint to be applied at the jobsite shall be applied with brush or roller; no spray application shall be allowed, unless otherwise specified herein or authorized by the Engineer. Regardless of any dry film thickness recommended by the manufacturer, all paint must completely cover the surface, to the satisfaction of the Engineer, in such form that the undersurface does not show through.

#### 1.03 REGULATIONS, REFERENCES AND STANDARDS

- A. All painting work shall conform to the following (latest edition):
  1. South Florida Building Code (SFBC).

2. Code of Federal Regulations (CFR):
  - a. 29 CFR Part 1910, Occupational Safety and Health Standards (OSHA).
  - b. 29 CFR Part 1926, Occupational Safety and Health Standards (OSHA), Construction Industry Standards.
3. National Association of Corrosion Engineers (NACE).
4. Painting and Decorating Contractors of America (PDCA).
5. Steel Structures Painting Council (SSPC).
6. National Sanitation Foundation (ANSI/NSF).

#### 1.04 SUBMITTALS

- A. The Contractor shall submit in triplicate to the Engineer for approval a schedule of paints he proposes to use for the various locations and purposes, at least 30 days before the anticipated date of use. This schedule shall indicate the type of paint, the manufacturer's name and the manufacturer's stock number and trade name of the product. No paint material shall be purchased until approval of such list has been made by the Engineer. The Contractor shall also submit in triplicate the manufacturer's recommended methods of application of the various types and kinds of paints and enamels.
- B. Submittals shall include manufacturer's data and samples as indicated below and shall be prepared and submitted in time to provide adequate review by the Engineer.
- C. Samples - Painting:
  1. Paint colors will be selected by the Engineer. Compliance with all other requirements is the exclusive responsibility of the Contractor.
  2. The Contractor shall tint each coat differently to assist the Engineer in checking work progress and to help in the elimination of "holidays".
  3. Samples of each finish and color shall be submitted to the Engineer for approval before any work is started.
  4. 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 - one showing the application of one coat only, one showing the application of two coats and one showing the application of all three coats.
  5. Such samples when approved in writing by the Engineer shall constitute a standard, as to color, and in compliance with paragraph 1.02.E, for acceptance or rejection of the finish painting work.
  6. For piping, valves, equipment and miscellaneous metal work, provide sample chips or color charts of all paint selected showing color, finish and general characteristics. Colors of piping shall be as directed by the Engineer.

7. Rejected samples shall be resubmitted until approved.

D. Product Data:

1. For each Coating Surface, furnish the following:

- a. Location.
- b. Surface Material.
- c. Coating Supplier.
- d. Representative.
- e. Surface preparation.
- f. Paint Material (Generic).
- g. Product Name/Number.
- h. Minimum Coats Coverage.

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.

1. Provide labels on each container with the following information:

- a. Name or title of material.
- b. Federal Specification number (if applicable).
- c. Manufacturer's name.
- d. Manufacturer's stock number and color.
- e. Generic type.
- f. Contents by volume, for major pigment and vehicle constituents.
- g. Application instructions.

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.

B. All containers shall be handled and stored in such a manner as to prevent damage or loss of labels or containers.

C. The Contractor with the approval of the Engineer shall designate areas for storage and mixing of all painting materials. Comply with the requirements of pertinent codes and fire regulations. Proper containers outside of the building shall be provided by the Contractor and used for painting wastes. No drains or plumbing fixtures shall be used for this purpose.

D. Used rags shall be removed from the buildings every night and every precaution taken against spontaneous combustion.

1.06 JOB CONDITIONS

A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
2. Do not paint in areas where dust is being generated.
3. Be responsible for the safety of Contractor's Employees, and provide adequate ventilation, safety masks, explosion proof equipment, and all other items necessary for this purpose.
4. All work shall be carefully protected while painting is going on, using suitable cover cloths where necessary. Any work defaced or damaged by the painters shall be made good by the Contractor as directed by the Engineer. The Contractor shall be responsible for cleaning all accidentally spilled materials such as paint, varnish, plaster, stucco and concrete from the structures and equipment, and shall leave the work in complete and perfect condition in every detail.
5. Assure that the surfaces are in proper condition to receive paint and shall guarantee paint against peeling and discoloration due to faulty application or workmanship, in accordance with the terms of the Contract Bond.

1.07 EXTRA STOCK

- A. Paint to be supplied to the Town. Upon completion of painting work, the Town shall be furnished at no additional cost one (1) gallon of each type and color of finish paint for touching-up. Paint container labels shall be complete with manufacturer's name, generic type, number, color and location where used.

**PART 2. PRODUCTS**

2.01 MATERIALS

- A. All paint shall be manufactured by one of the following and shall be their highest grade of paint; Subject to compliance with requirements, products that may be incorporated into the Work include:
1. Sherwin-Williams
  2. Somay/Valspar
  3. Carboline
  4. Tnemec
  5. Devoe
  6. Rustoleum
  7. Requests for approval of other paint manufacturers and materials other than specified shall be submitted to the Engineer for approval.

- 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. 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, price difference between specified name and generic paint proposed, 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 and should cover completely the previous color.
- D. Emulsion and alkyd paints shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements.
- E. Finish coats containing lead shall not be allowed. Oil shall be pure boiled linseed oil.
- F. Rags shall be clean painters' rags, completely sterilized.

2.02 COATING SYSTEMS

- A. The painting or coating systems where applicable shall be as listed below using the materials specified or approved equals.
- B. Painting for piping or pump station projects shall be as specified, and as listed below, using the materials specified, or approved equals:

AREA	NEUTRALIZE OR PASSIVATE	PRIME	FINISH
Exposed exterior concrete stucco and masonry. (Paint shall extend a minimum of 6 inches below finished grade where grass or natural ground abuts surface.)	None	None	2 coats, Kop-Coat 600, Exterior, Antique Ivory-378.
Exposed interior concrete ceiling, walls, equipment bases in dry pit.	10% solution of muriatic acid.	None	3 coats of Kop-Coat Ponkote 300 enamel

AREA	NEUTRALIZE OR PASSIVATE	PRIME	FINISH
Exposed interior metal work, other than gratings, ladders or not specifically mentioned below.	Kop-Coat Passivator No. 40	One coat Rustbond Penetrating Sealer SG by Carboline	2 coats of Kop-Coat Ponkote 300 enamel.
Steel and cast iron piping, valves, supports and appurtenances other than those specified above	Kop-Coat Passivator No. 40, if galvanized. Kop-Coat Inertol Tar Stop Primer, if tar coated. Sandblast if needed	2 coats Rustbond Penetrating Sealer SG by Carboline	Somay 237 Enamel or Sherwin Williams Industrial Enamel 354 Series
Exposed interior metal work, except aluminum, stainless steel, and other items specifically mentioned below	Kop-Coat Passivator No. 40, if galvanized. Kop-Coat Inertol Tar Stop Primer, if tar coated. Sandblast if needed	2 coats Rustbond Penetrating Sealer SG by Carboline	Somay 237 Enamel or Sherwin Williams Industrial Enamel 354 Series
Galvanized metal	Per paint manufacturer's recommendations	Rustbond by Carboline	Carbonthane 133 LH by Carboline

**PART 3. EXECUTION**

**3.01 SURFACE PREPARATION**

- A. In addition to the aforementioned preparations, the Contractor shall be required to remove all dirt, rust, scale, splinters, loose particles, disintegrated paint, grease, oil and other deleterious substances from all surfaces which are to be coated.
- B. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in contact with painted surfaces and not to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations.
- C. Before commencing work, the painter must make certain that surfaces to be

covered are in perfect condition. Should the painter find such surfaces impossible of acceptance, he shall report such fact to the Contractor who shall immediately correct the deficiencies. 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. Prepare cementitious surfaces of concrete, concrete block, cement plaster and cement-fiber board to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
- F. Clean ferrous substances, which are not galvanized or shopcoated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning. All welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting.
- G. Surface profile as obtained from sandblasting shall be as recommended by the coating manufacturer.

### 3.02 MATERIALS PREPARATION

- A. 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.
- B. 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.

### 3.03 APPLICATIONS

- A. Paint all exposed surfaces 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 or finish is not designated, the Engineer will

select these from standard colors available for the materials systems as specified.

- B. Sample panel size shall be 10 feet by 10 feet. No paint samples shall be placed over grout finish or concrete walls without the Engineer's written approval and must comply with Section 03300, "Cast-in-Place Concrete, Reinforcement and Form-work."
- C. Color Selection:
  - 1. Paint colors shall match those used in the existing facility. Color coding, banding, legends, etc., for exposed interior and exterior piping is as follows:

<u>Equipment And Materials</u>	<u>Paint Color</u>	<u>Color Numbr er Carbol ine</u>	<u>Color Number Sherwin Williams</u>
Natural Gas	White	1864	SW 4087
Potable Water	Blue	2383-0336	SW 4079
Potable Water (Hot)	Blue	2383-0508  or  0336-0314	SW 4079
Compressed Air	Doeskin	1217	SW 4038
Drains	Charcoal Gray	1734	ANSI 61 Gray

<u>Equipment And Materials</u>	<u>Paint Color</u>	<u>Color Numb er Carbol ine</u>	<u>Color Number Sherwin Williams</u>
Electrical Conduit	Black	0900	SW 4090
Electrical Conduit (above 220 volts)	Black with Red Bands	0900 S-525	SW 4090 SW 4081
Flushing Water	Light Brown	1217	SW 4003
Process Water	Light Brown	1217	SW 4003
Sewage Piping	Dark Brown	G-241	SW 4016
Pumps and Motors	Light Gray	O746	ANSI 70 Gray
Dangerous or Caution Areas	Medium Yellow	J-698	SW 4084
Steam	Patio Green	O304	SW 4085
Sludge (in Water)	Ivory "WSL"	6421	SW 4036

<u>Equipment And Materials</u>	<u>Paint Color</u>	<u>Color Numb er Carbol ine</u>	<u>Color Number Sherwin Williams</u>
Centrate	Medium Green	O304	SW 4085
Steel Misc. Items, Angles, Supports, etc.	Charcoal Gray	1734	ANSI 61 Gray
Water Plants and Stations (Structures)	Antique Ivory	3867	SW 4036
Water Plants and Stations (Steel and Trims)	Charcoal Gray or Antique Ivory	1734 3867	SW 4036 ANSI 61
Sewage Plants and Stations (Structures and Trims)	Antique Ivory	3867	SW 4036

Note: Carboline/Somay Colors from Master Color Chart 560M.

- D. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.
- E. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.
- F. Surface to be painted shall be dry and clean.

- G. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, if in the opinion of the Engineer the paint film is of a non-uniform finish, color and appearance. Additional coats shall be applied without additional cost to the Town.
- H. 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.
- I. Paint surfaces behind moveable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 1. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.
  - 2. Paint steel to be embedded in concrete or masonry.
- 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 Painting Surfaces:
  - 1. 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 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 STENCILS

- A. Stencils shall be of durable material which will not absorb paint, and which will present crisp clear finished text without underflow or overspray, on the item being stenciled.

- B. The height of stenciled text on piping shall be equal to  $\frac{1}{4}$  of the pipe diameter, unless otherwise approved by the Engineer, but shall not be less than  $\frac{1}{4}$ -inch nor more than 6-inches in height in any case unless specifically noted herein or shown on the Drawings.
- C. The height of stenciled text on structures or equipment shall vary from 1-inch to 6-inches depending on location, size and space availability on the structures and equipment, and on the importance of the text. The height of each stenciled text shall be as ordered by the Engineer.
- D. Lettering shall be upper case, normally spaced, and both letters and figures shall be bold enough to be legible at a distance of at least 10-feet for text heights of  $\frac{1}{2}$ -inch or less, and 30-feet for all other sizes.
- E. Letter style shall match existing stenciled text used by the Town on adjacent or connected structures, equipment and piping wherever possible.
- F. Stencil product name on each hazardous material storage tank.

### 3.05 NAMEPLATES

- A. All equipment and piping shall be provided with nameplates to reflect the nomenclature or purpose of the item.
- B. Nameplates shall be of brass, 16 gauge BSG minimum thickness (.0508-inch), or AISI Type 316 stainless steel, 18 gauge MSG minimum thickness (.0478-inch), with die stamped letters not less than  $\frac{1}{4}$ -inch high. Each unit of equipment shall have one nameplate, and piping systems shall be provided with a nameplate on each valve and at each point of starting, termination, entering or existing.
- C. Nameplates shall be directly attached to the equipment with stainless steel screws, bolts and nuts, or rivets where applicable. Where there is impractical due to equipment size or shape, the nameplate may be wired to the equipment with stainless steel wire. Nameplates shall be wired to valves and piping with stainless steel wire. The stainless steel wire shall be 18 gauge SWG minimum (.0475-inch).

### 3.06 APPLICATIONS RESTRICTIONS

- A. Application of materials shall be done only on properly prepared surfaces as herein specified, and all exterior painting shall be done only in dry weather. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Engineer.

### 3.07 MINIMUM COATING THICKNESS

- A. Coatings shall be applied in accordance with the manufacturer's recommendations.
- B. Apply a prime coat to material which is required to be painted or finished, and which has not been prime coated by others.
- C. 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.

### 3.08 FINISHES

- A. Pigmented (Opaque) Finishes:
  - 1. 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:
  - 1. Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specific requirements.

### 3.09 FIELD QUALITY CONTROL

- A. All completed surfaces will be checked by the Engineer, 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 Engineer.
- B. All gauges and equipment necessary to perform these tests will be supplied by the Contractor at no cost to the Town.

### 3.010 PROTECTION

- A. All other surfaces shall be protected while painting equipment, piping, etc.
- 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 areas where painting is being done to adequately protect flooring and other work from all damage.

3.011 CLEANING

- A. The Contractor shall perform the work under this Section while keeping the premises free from accumulation of debris and rubbish and shall remove all scaffolding, paint cloths, paint, and brushes from the building when completed.
- B. Cleaning:
  - 1. All paint brushed, splattered, spilled or splashed on any surface not specified to be painted shall be removed.

**END OF SECTION**

## SECTION 11210 - VERTICAL CLOSE COUPLED (DRY-PIT) SEWAGE PUMPS

### PART 1. GENERAL

#### 1.01 REQUIREMENTS

- A. The Contractor shall install, adjust, test, and start a vertical (dry-pit) close coupled solids handling sewage pump, to be provided by the Town.
- B. It is the intent of these Specifications to obtain complete and operable equipment. All items and accessories appearing in the manufacturer's literature as standard, and all items specified herein, shall be included. Also, since it is not possible to name every single component, all accessories necessary to accomplish the intent of these Specifications shall be included as if they were specifically mentioned herein.
- C. All equipment and accessories shall be of the highest quality available in the industry, and assembly and installation shall show the highest quality of workmanship available in the respective trades.
- D. All equipment furnished shall be new, unused, the products of manufacturers having a minimum of five (5) years of experience in manufacturing, marketing and servicing units similar to those offered.

#### 1.02 SUBMITTALS

- A. Furnish and submit shop drawings that shall include the following technical information:
  - 1. Pump dimension drawings.
  - 2. Pump performance curves, including other impeller sizes.
  - 3. Materials of construction.
  - 4. Extended shaft Specifications
  - 5. Motor dimensions
  - 6. Motor Specifications including efficiency
- B. Together with the assembly drawings, the Contractor shall furnish three (3) copies of a lateral critical speed analysis and torsional frequency analysis for the assembly. Also, calculations to support the bearings and shafts selection and deflection. The later per 1994 Hydraulic Institute. All calculations to be done for the proposed pump, when provided with the impeller necessary required to meet the future conditions listed in these specifications, and for the worst case in the performance curve.
- C. Instruction Manuals:

1. Furnish five (5) bound and indexed sets of Operations and Maintenance manuals, prepared by the pump manufacturer, properly organized for quick reference and shall include the following information:
2. Operating instructions
3. Maintenance instructions
4. Parts lists
5. Dimensional drawings
6. Assembly drawings
7. Installation instructions
8. Equipment performance and test data

## **PART 2. PRODUCTS**

### **2.01 GENERAL**

- A. The pumping unit provided shall consist of pump, suction elbow, coupling, base and electric motor.
- B. The pumping unit as described herein, shall include all parts and accessories listed below or as necessary for proper installation of complete units. These shall include:
  1. Pump with supports
  2. Coupling
  3. Electric Motor
  4. All parts necessary to connect all components of the pumping units together, except cables between motors.
  5. Spare parts
- C. To assure unity of responsibility, all components of the pumping unit shall be furnished by the pump manufacturer, who shall be responsible for the proper functioning of all parts manufactured by him or purchased from other manufacturers and included in his package.

### **2.02 PUMPS**

- A. The pumps shall be vertical, single stage, single bottom suction, close coupled, dry pit, non-clog, designed specifically for pumping raw sewage.
- B. The pumps shall be driven by electric motors. The units shall be automatically controlled according to level in the wet well. The pumps will start and stop against closed valves. These will not open until the pressure on the pump side exceeds the pressure on the force main and the pumps will not stop until the valves are fully seated.

- C. Pumping units shall be capable of operating continuously at any head within the above range without damage to any component and without vibration levels exceeding those specified herein below.
- D. Vibration shall not exceed 0.2 inch/second velocity as measured by the Standards of the Hydraulic Institute. Pump structure shall have a first natural frequency of at least twice the shaft rotative speed. Natural frequency or resonance shall not affect the operation of the pump at any point within the range specified.

## 2.03 PUMP COMPONENTS:

### A. Piping Connections:

- 1. Suction and discharge connections shall be ANSI Class 125 flat face flanges, diameters to be at least but not less than as shown in the installation drawings. Each suction and discharge flange shall be drilled and tapped for gauge connections. A ½ inch IPS tap shall be supplied in the suction and discharge nozzle. Gauge connections shall be ½ inch-14 NPT in the suction and discharge nozzles. Provide ¾ inch plugged connections for casing vent and drain. Provide a hand hole located as to permit access to the impeller to clear obstructions and to measure the clearance between wear rings. The interior surface of the hand hole shall follow the contour of the casing.

### B. Coupling and Protective Guard:

- 1. Protective coupling guards shall be furnished and installed to prevent personal injury.

### C. Bearing Lubrication:

- 1. Bearings shall be grease lubricated with provisions for the addition and relief of grease. Grease shall be lithium or aluminum complex base, as manufactured by Lubri-Plate, 1200-2 Series (Lithium Base) or 730-2 Series (Aluminum complex base), or approved equal..

### D. Vertical Pump Support:

- 1. Pump shall be supported by cast iron or fabricated steel pedestal base with openings large enough to permit access to the suction elbow and clean-out hand hole. Base shall be designed to support the assembled weight of the pump and shafting. It shall safely withstand all stresses imposed thereon by vibration, shock and all possible direct and eccentric loads. Supports shall be as shown in the drawings or of the pedestal type including the suction elbow. In any case, base shall have adequate

horizontal dimensions, foundation contact area, anchorage facilities and shall be of sufficient height so that the suction elbow will not touch the floor or foundation upon which the pump is mounted.

#### 2.04 MANUFACTURER:

- A. The pumps shall be Xylem/Flyght A-C Series NSWV Model 300.

#### 2.05 PUMP MOTORS

##### A. General:

1. Motors and auxiliaries shall comply with the latest applicable IEEE, ANSI and NEMA Standards, which are hereby made apart of these Specifications.
2. It is not the intent to specify details of design and construction. The motor shall be constructed and equipped with accessories in accordance with the manufacturer's standard practices where they do not conflict with this Specification.

#### 2.06 TOOLS AND SPARE PARTS:

##### A. Special Tools:

1. Furnish, together with the pumping units, one (1) set of any special tools, other than common plant mechanic's tools, necessary to install, adjust, maintain or repair the pumping units or any of the components.

##### B. Spare Parts:

1. Spare parts as listed below shall be furnished with the pumping unit. These shall be packaged for long term storage in suitable heavy cardboard or wooden boxes, clearly marked with the contents.
2. Three sets of spare casing wear plates, impeller wear rings shaft sleeves, bearings and impellers shall be provided. In addition each pump shall be provided with a spare impeller trimmed at the maximum diameter available.

### **PART 3. EXECUTION**

#### 3.01 TEST, GENERAL

- A. The tests of the pumping units are divided into four parts: Hydrostatic tests of pump component parts at the pump factory, tests of the motors at the motor factory, tests of the assembled pumps at the factory, and final acceptance tests

to be conducted after installation.

- B. Tests shall be scheduled, only after the factory has pre-tested the unit and submitted preliminary test data that has been deemed satisfactory by the Engineer of Record.

### 3.02 HYDROSTATIC TEST OF PUMP COMPONENTS

- A. Pump casings, suction covers and stuffing box covers assembled shall be pressure tested at 150 percent of the maximum shut-off pressure at the future conditions. The test pressure shall be held for a minimum of 15 minutes. Test reports certified by a manufacturing company official who is a Registered Professional Engineer in the State where the factory is located and who has personally witnessed the test shall be given to the Engineer of Record at the time of the witness testing of the pumping units.

### 3.03 MOTOR TEST

- A. Routine factory certified tests shall be given to each motor as required by NEMA and ANSI Standards. Tests shall be performed in accordance with IEEE Standard No. 112A "Test Procedures for Polyphase Induction Motors and Generators".
- B. In addition to the above, routine factory tests including no load, full load, locked rotor current and high potential tests shall be performed. Winding resistance, sound level, temperature rise and peak-to-peak amplitude of vibration shall be measured. Pull-in and pull-out torque shall be determined. Tests shall be made according to standard NEMA procedures and five (5) certified copies of reports and speed-torque curves shall be furnished to the Town before pump delivery.
- C. The motor shall be tested for vibration at no load and at rated voltage and frequency. The maximum allowable peak-to-peak amplitude of vibration on the bearing chambers shall be 2.0 mils.

### 3.04 PUMP TEST

- A. The pump shall be tested to develop the performance curves, for assurance of proper and vibration free operation.
- B. Data gathering shall be in accordance with Hydraulic Institute Standards. Curves shall be plotted using the data obtained at the tests. All curves shall extend from shut-off to actual runout points. Curves shall include: head vs. capacity, brake horse power, mechanical efficiency and wire to water efficiency. There should be a minimum of 10 test points spaced at approximately equal head. Test data and pump curves shall be certified and five (5) copies of each shall be sent to the Engineer of Record.

- C. Vibration shall be continuously monitored during all pump tests. After completing the performance test on the pump, the pump will be operated at variable speed from full speed to 50% of it and back to full speed and from shut-off to run out heads while monitoring the vibration.
- D. Included in the performance tests there shall be a period of 5 minutes of pump operation against a closed discharge valve. Pressure, power consumption, and vibration shall be monitored. Immediately after completing this test, the pump shall be disassembled for inspection to determine if there is evidence of excessive shaft bending and/or rubbing of wear rings. If the temperature inside the pump approaches the boiling point the test will be stopped at that moment for the particular unit.
- E. Field tests and assistance shall be provided by service technicians experienced in each kind of equipment installed, and for each specific function. The cost of these tests, services and trips shall be entirely bore by the Contractor.
- F. For equipment start-up and acceptance tests. The factory representative shall supervise the start-up and acceptance testing of each pumping unit, as described below. The pumping unit will be subjected to operational testing under a variety of conditions including low NPSHA and various discharge heads. Also included shall be vibration measurement tests as described in other paragraphs of this subsection of the Specifications. The factory service technicians shall perform all final adjustments necessary for the best possible operation.
- G. At the end of each start-up and acceptance tests, including vibration measurements, the Engineer and the factory representative shall, jointly, analyze the test data. If all evidences prove that the installation is correct, the factory representative shall issue a certification and upon acceptance by the Engineer of the statements in such certification, the unit will be considered accepted.

### 3.05 INSTALLATION

- A. All of the equipment specified under this section of the specifications shall be installed in strict accordance with these Specifications and the instructions received from the manufacturers. Workmanship and miscellaneous materials shall follow the best standards of quality recognized for the trades involved. Where there may be conflicts between the Specifications and manufacturer's instructions, this shall be brought to the attention of the Engineer, who shall issue orders resolving the conflict, and his opinion shall be final and binding for all involved parties.

**END OF SECTION**

## SECTION 11215 - SUMP PUMP

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. This section covers furnishing and installing the sump pump for the dry pit at Pump Station facility.
- B. Related Sections:
  - 1. Section 03300 - Cast-In-Place Concrete.
  - 2. Division 16 - Electrical.

#### 1.02 DEFINITIONS

- A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

#### 1.03 SUBMITTALS

- A. The Contractor shall demonstrate that the manufacturer is engaged in the installation of the equipment and shall include documentation including operation manuals and shop drawings.
- B. Shop Drawings:
  - 1. Make, model, weight, and horsepower of equipment assembly.
  - 2. Submit complete catalog cut information, descriptive literature, specifications, and identification of materials of construction edited to job requirements.
  - 3. Performance data curves showing head, capacity, NPSHR, power demand, pump efficiency and submergence over the entire operating range of the pump, from shutoff to maximum capacity.
  - 4. Pump maximum downthrust or upthrust in pounds.
  - 5. Detailed mechanical and electrical drawings showing the equipment dimensions, size, and locations of connections and weights of associated

- equipment.
- 6. Materials of construction for all parts.
- 7. Power and control wiring diagrams, including terminals and numbers.
- 8. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
- 9. Factory finish system.

C. Quality Control Submittals:

- 1. Manufacturer's printed installation instructions.
- 2. Operation and maintenance manual.

D. Lubrication Submittals:

- 1. The Contractor shall submit a list with a minimum of four (4) interchangeable supplier's standard lubricants for all equipment requiring lubrication as recommended by pump manufacturer.

E. Special Tools:

- 1. Furnish with equipment as a minimum, one (1) complete set of suitably marked special tools and appliances which may be needed to disassemble, adjust, operate, maintain, service, repair and test the equipment.
- 2. Complete list of the special tools and appliances to be furnished.

1.04 DELIVERY

- A. Special mechanisms shall be delivered with the equipment fully lubricated, to the extent possible. If any point cannot be so serviced, it shall be clearly marked to the effect that it is not lubricated and requires servicing prior to operation. An adequate supply of the proper lubricant with instructions for its application shall be supplied with the equipment for each point not lubricated prior to installation.

**PART 2 PRODUCTS**

2.01 SUMP PUMP TO PROVIDED BY TOWN OF MEDLEY

## 2.02 ACCESSORIES

- A. Equipment Identification Plate: Brass or 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number and listing the name of the manufacturer and all pertinent design data and serial numbers shall be attached to the equipment in a readily visible location. Stainless steel hardware shall be used in attaching the data plates.
- B. All control panel items shall be identified with engraved lucite data plates.
- C. Hardware: All machine bolts, nuts and capscrews shall be of the hex head type and shall be of 316 stainless steel. Hardware requiring special tools or wrenches shall not be used.

## 2.03 FACTORY FINISHING

- A. Manufacturer's finish shall be in accordance with Section 09900, PAINTING.

## **PART 3 EXECUTION**

### 3.01 GENERAL

- A. Prior to field testing or start-up of all items requiring lubrication, the Contractor shall ensure that all preservations, packing materials, etc. have been removed and that each item has been serviced properly.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Connect suction and discharge piping without imposing strain to pump flanges.

### 3.03 FIELD FINISHING

- A. Equipment shall be painted as specified in Section 09900, PAINTING.

### 3.04 FIELD QUALITY CONTROL

- A. Functional Tests: Conduct test on pumps and check for proper operation, start-up, shut-off, for correct connections, and quiet operation.
- B. After installation of all items furnished under this Contract, acceptance tests shall be performed by the Contractor and witnessed by the Engineer. These tests shall include complete operational testing.
- C. Upon completion of successful acceptance testing, the manufacturer shall submit a certification of the installation for inclusion in the Contractor's test report.

**END OF SECTION**

## SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

### PART 1. GENERAL

#### 1.01 WORK INCLUDED

- A. Drawings and Specifications: The Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the other shall be supplied and installed as though specifically called for by both. The Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Drawings and the Specifications, or between either of these and any regulations or ordinances governing mechanical work, the Contractor shall notify the Engineer in ample time to permit revisions.

#### 1.02 SITE INVESTIGATION

- A. It shall be the responsibility of the Contractor to visit the site of the work and become familiar with all available information regarding the location of existing facilities. Failure of the Contractor to fully inform himself of all existing conditions will not be cause for additional compensation.

#### 1.03 FEES, PERMITS, AND INSPECTIONS

- A. The Contractor shall obtain all permits for work under this contract and shall pay all expenses in conjunction therewith. He shall also procure and deliver to the Engineer all certificates issued by the authorities having jurisdiction.
- B. The work will be inspected by the Engineer during the course of construction. Provide for inspection by others having jurisdiction during the proper phases.

#### 1.04 NEW EQUIPMENT AND MATERIALS

- A. All equipment and materials used in this installation shall be new, of the best quality and, unless otherwise noted, shall be standard catalog items of the various manufacturers.

#### 1.05 STANDARDS

- A. The codes and standards covering mechanical work include, but are not limited to:
1. American National Standards Institute (ANSI).
  2. American Society for Testing Materials (ASTM).
  3. American Society of Mechanical Engineers (ASME).
  4. American Welding Society (AWS).
  5. National Fire Protection Association (NFPA).
  6. National Electrical Manufacturers Association (NEMA).
  7. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
  8. National Sanitation Foundation (NSF).
  9. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
  10. South Florida Building Code (SFBC).

11. Codes, Regulations, Ordinances, etc., of the State, County, and/or Municipality, in which the construction is located, and any political division having jurisdiction over this work.

B. These codes, society and association recommendations constitute minimum requirements and no reductions from design requirements will be permitted, even if allowed by the applicable codes, without expressed written permission of the Engineer. References are to the editions current at time of bidding.

#### 1.06 SPACE AND ACCESS

A. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

#### 1.07 CUTTING AND PATCHING

A. All cutting and patching necessary for the work shall be performed by the Contractor. Where interferences occur, and departures from indicated arrangements are required, the Contractor shall coordinate the mechanical work with the other trades involved and make a determination as to changed locations and elevations of the ductwork and/or piping and shall obtain approval from the Engineer for the proposed changes.

#### 1.08 SAFETY REQUIREMENTS

A. In addition to the components specified and shown on the Drawings and necessary for the specified performance, the Contractor shall incorporate in the design and show on the shop drawings all the safety features required by the current codes and regulations, including but not limited to those of the Occupational Safety and Health Act of 1970, and Amendments thereto.

#### 1.09 DRIVES AND BELT GUARDS

A. The Contractor shall provide for each rotating shaft a protective guard which shall be constructed around an angle iron frame, securely bolted to the floor or apparatus. The guard shall completely enclose drives and be constructed to comply with all safety requirements. Hinged access doors not less than 6-inches x 6-inches shall be provided for access to motor and fan shaft for test purposes. For double inlet fans, the belt guard shall be arranged so as not to restrict the air flow into the fan inlet. Guards shall not interfere with lubrication of equipment.

#### 1.10 BALANCING PUMPS AND MOTORS

A. All pump and motor units shall be statically and dynamically balanced. Unless otherwise specified, the vibration allowance in the units shall not exceed the upper limits as established by the Hydraulic Institute Standards.

#### 1.11 ELECTRICAL WORK

A. The Contractor shall furnish all electrical and control equipment associated with mechanical work including electrical controls, switches, contactors and starters for all equipment items requiring same. All work shall conform in all respects to the

requirements of the applicable articles of Division 16.

#### 1.12 METAL FASTENERS

- A. Unless otherwise indicated, metal fasteners and related parts shall be of aluminum or stainless steel and shall be of adequate strength for the purpose intended.

#### 1.13 PREVENTION OF ELECTROLYSIS

- A. Where the contact of dissimilar metals may cause electrolysis and where aluminum will contact concrete, mortar or plaster, the contact surface of the metals shall be separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface; or where deemed necessary by the Engineer, not less than one course of asphalt saturated cotton fabric cemented to both metals with flashing cement, shall be used. Finished works shall be cleaned and excess cement removed.

#### 1.14 SHOP DRAWINGS

- A. The Contractor shall submit for the approval of the Engineer, detailed and dimensioned shop drawings showing the construction of the proposed facility and installation of all equipment complete in every respect. Each drawing shall be indexed and/or referenced to the Contract Drawings and Specifications. No work upon the manufacture or fabrication of any equipment shall be performed until the Engineer's approval has been obtained. Certified pump curves shall indicate actual test performance of units furnished. The Contractor shall submit, with the certified pump shop drawings, layout drawings showing exact installation, piping and foundation details for the pumping units being submitted. The various Sections in the Specifications specify additional requirements for shop drawings with which the Contractor shall comply. Shop drawings shall be submitted in accordance with the provisions of Section 01340.

#### 1.15 FACTORY TESTS

- A. When equipment is required to be factory tested, the results of the tests shall be submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.

#### 1.16 RECORD DRAWINGS

- A. Before final acceptance, Record Drawings shall be submitted to the Engineer in performance with the provisions of Section 01720.

#### 1.17 CLEANING AND ADJUSTMENTS

- A. Upon completion of work, the Contractor shall clean, oil and grease fans, motors compressors, pumps, and other running equipment and apparatus and mechanisms which the installs and shall make certain such apparatus and mechanisms are in proper working order and ready for test.

#### 1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instructions on the operation and maintenance of the equipment furnished shall be

provided in accordance with the provisions of Section 01730.

1.19 **GUARANTEE AND WARRANTIES**

- A. The Contractor shall guarantee all work, materials, equipment, etc. against defects for a period of one year from the date of the final acceptance, that all the equipment has the capacity specified and that it will operate without excess noise or vibration caused by improper installation. In addition to the guarantee, the Contractor shall provide the performance warranties as specified for the equipment in the various sections.

1.20 **LUBRICANTS**

- A. The Contractor shall provide a one (1) year supply of all types of lubricants required for the various types of equipment furnished and installed under this Contract. Lubricants shall be in metal containers suitably labeled.

**PART 2. PRODUCTS**

Not Used

**PART 3. EXECUTION**

Not Used

**END OF SECTION**

## SECTION 15060 - PIPING AND FITTINGS

### PART 1. GENERAL

#### 1.01 SCOPE

- A. The work included in this section consist of furnishing all material, equipment, labor and performing all operations necessary for the supply of all piping, fittings and accessories within the limits of work, as shown on the drawings and specified herein.
- B. Where references are made to other standards or codes, unless specific date references are indicated the latest edition of said standard or code shall govern.

#### 1.02 WORK NOT INCLUDED UNDER THIS SECTION

- A. Piping installation for various types of piping systems is specified various other sections herein. Installations specified in this section are supplementary to those sections and in the case of conflict the more stringent condition shall prevail.

#### 1.03 RELATED SECTIONS

- A. Section 15010 - Basic Mechanical Requirements.
- B. Section 15065 - Miscellaneous Materials.
- C. All sections specifying various types of valves.

#### 1.04 PIPING LAYOUT

- A. Field verify dimensions prior to preparation of layout and shop drawings. Obtain shop drawing approval prior to fabrication of piping. All items not specifically mentioned in the Specifications or noted on the approved Plans, but which are obviously necessary to make a complete working installation shall be included.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. During shipping, delivery and installation of pipe and accessories, handle in a manner as to ensure a sound undamaged condition.
- B. Exercise particular care not to injure pipe coatings.

### PART 2. PRODUCTS

#### 2.01 PIPE AND FITTINGS: DUCTILE IRON AND CAST IRON

- A. General:
  - 1. As used herein, "ANSI" denotes the American National Standards Institute, "AWWA" denotes the American Water Works Association, and "ASTM" denotes the American Society for Testing and Materials.

2. All pipe and fittings to be furnished hereunder shall conform to the referenced ANSI and/or AWWA Standard as modified herein, as appearing in the following sections.
3. All markings required on pipe and fittings, shall be clearly legible and located such that they will not be hidden or destroyed when assembled into the intended system.

B. Pipe:

1. All pipe shall be ductile iron pipe conforming to ANSI/AWWA Standard C151/A21.51-02, "Ductile-Iron Pipe, Centrifugally Cast, for Water".
2. The pipe thickness and outside diameter of pipe for sanitary sewer and water usage shall conform to Table 2 (for mechanical joint pipe) of ANSI/AWWA Standard C151/A21.51-02 for the following sizes (The pressure class specified is the minimum permitted):

a. Size	Pressure Class.
b. 4-inch through 12-inch	350.
c. 14-inch through 20-inch	250.
d. 24-inch	200.
e. 30-inch through 54-inch	150.

- C. Each piece of pipe shall be marked as required in Subsection 4.6 of AWWA C151-02. Letters and numerals on pipe sizes 12-inch and smaller shall be not less than 3/8-inch.
- D. The Town absolutely reserves the right to require the use of "thickness" class pipe or higher pressure class pipe in applications where in the opinion of the Engineer such use is in the best interest of the Town. The Engineer's decision in this regard shall be final.
- E. A sufficient quantity of non-toxic vegetable soap lubricant shall be supplied with each shipment of pipe. The soap lubricant shall be suitable for use in subaqueous trench conditions.
- F. For flanged ductile-iron pipe with integrally cast flanges, the nominal wall thickness of the pipe barrel shall be as specified in Section 3.3, "Joints and Accessories" under "Flanged Joints", herein below.

G. Fittings:

1. Fittings Conforming with ANSI/AWWA C110/A21.11-98 (Water & Sewer Use)
  - a. Standard mechanical joint and flanged joint fittings shall be ductile iron for use with ductile-iron pipe as specified above. Cast ductile-iron fittings in the 3-inch through 24-inch size range shall be pressure rated at 350 psi, minimum; (except flange-joint fittings shall be rated at 250 psi, minimum). All fittings with mechanical joints, and flange joints shall conform to ANSI/AWWA Standard C110/A21.10-98, "Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids". In addition, fittings with mechanical joints shall conform to ANSI/AWWA Standard C111/A21.11-00, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".
  - b. The weight of fittings, shall be as given in ANSI/AWWA C110/A21.11-98 for ductile-iron fittings. The weight of mechanical joint fittings shall be as established in Tables 3 through 12. The weight of flanged joint fittings shall be as established in Tables 13 through 20.

2. Fittings Conforming with ANSI/AWWA C153/A21.53-00 (Water & Sewer Use)
  - a. All fittings shall be cast ductile-iron for use with ductile-iron pipe as specified above. Fittings in the 3-inch through 24-inch size range shall be pressure rated at 350 psi, minimum (except for those fittings such as plugs, caps, and sleeves which are normally rated at a higher pressure). No flanged fittings or mixtures of flanged with other end type fittings will be allowed in the range of 3-inch through 48-inch since they are not covered in the AWWA Standard. All fittings with mechanical joints and flange joints shall conform to ANSI/AWWA Standard C153/A21.53-00, "Ductile-Iron Compact Fittings for Water Service".
  - b. Since the C153 Standard provides only minimum dimensions, fully detailed drawings of all fittings proposed shall be supplied by the manufacturer with his bid. The tabulated nominal weight of each size and type of fitting shall also be supplied by the manufacturer for all items proposed. This weight shall be that of the bare casting prior to application of any lining or coating. The weight of a fitting supplied under the contract shall not be less than ninety-five (95) percent of the tabulated nominal weight supplied by the manufacturer's catalog literature for that fitting. Further, the weight of fittings supplied shall not be more than five (5) percent above the same tabulated nominal weight.

## 2.02 JOINTS AND ACCESSORIES

### A. Mechanical Joints

1. Mechanical joints for fittings shall conform to ANSI/AWWA Standard C111/A21.11-00, except that the gaskets for each fitting under Groups D and D1 shall be neoprene. Bolt holes for mechanical joints shall be equally spaced, and shall straddle the vertical centerline. Tee head bolts and hexagonal nuts for all mechanical joints in fittings shall be of high strength low-alloy steel with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.11-00. Glands shall be of ductile-iron construction for ductile iron fittings, and cast gray iron or ductile iron for cast gray-iron fittings.
2. The proper number of gaskets, glands, bolts and nuts, all conforming to ANSI/AWWA Standard C111/A21.11-00, plus one (1) extra gasket for every 10 (ten) joints or fraction thereof, shall be furnished with each order. The gaskets and joint accessories shall be shipped in suitable protective containers. Follower glands held in place with set screws will not be acceptable. Segmented glands will not be acceptable.

### B. Mechanical Joint Megalug-Type Restraining Systems

1. In any mechanical joint of 30-inch nominal diameter and below this type of restraint may be utilized as design or field conditions dictate. Use of this type of restraint is restricted and in general may not be used as a substitute for flanged joints. It is recognized that flange adapters of this type form a useful tool for adjusting lengths of flanged pipe runs where it is almost impossible to predict all lengths correctly. Therefore, a very restricted number of these joints will be allowed in instances where it can be clearly shown to the satisfaction of the Engineer that they are necessary. This application is restricted to 20-inch nominal diameter and below. Further, this use shall be designed in and shall not be made as a field substitution. In all instances flange adapters shall be rated for a minimum working pressure of 250 psi with a minimum safety factor of 2:1. In no case will these flange adapters be used as a general substitute for standard flanged joints.

2. The Town absolutely reserves the right to require other forms of restraint where in the opinion of the Engineer the use of this form of restraint is not in the best interest of the Town and his decision shall be final.
3. The Megalug restraint systems manufactured by EBAA Iron Sales, Eastland Texas, will be considered the standard of quality for comparison purposes and if the Town has any doubts as to the durability, quality or ability to restrain of a proffered substitute, the entity offering the substitute shall bear the entire burden of proving this equality to the complete satisfaction of the Engineer. Other manufacturers producing this type of restraint system shall submit data with their shop drawings showing that their restraint system has been in the marketplace for a minimum of three (3) years in this country.
4. Each thrust-resistant mechanical joint or push on joint made up with this type of restraint and the pipe and fitting of which it is a part, shall be designed to withstand an axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position in the pipeline nor for support from external thrust blocks.

#### C. Flanged Joints

1. Connecting pieces with one end flanged and the other end either plain-end or mechanical joint, shall conform to ANSI/AWWA Standard C110/A21.10-98. Joint material for both the flanged end and the mechanical joint accessories for connecting pieces with a mechanical joint end shall be furnished as specified.
2. Other types of flanged fittings, and flanged pipe, shall conform to the following requirements unless otherwise stated in the order:
3. Flanged fittings shall conform to ANSI/AWWA Standard C110/A21.10-98, as specified hereinabove.
4. Flanged ductile-iron pipe with integrally cast flanges shall be manufactured in accordance with ANSI/AWWA Standard C151/A21.51-02, and with provisions contained hereinabove for centrifugally cast ductile iron pipe, and shall be furnished with ANSI Standard Class 125 flanges, plain faced and drilled, conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", latest revision. Hollow back flanges are not acceptable.
5. Flanged ductile-iron pipe with threaded flanges shall be manufactured in accordance with ANSI/AWWA Standard C115/A21.15-99, "Flanged Ductile-Iron Pipe With Ductile-Iron or Grey-Iron Threaded Flanges", and shall be rated for a working pressure of 250 psi, minimum. The nominal thickness of flanged ductile-iron pipe, 6-inch and larger, shall not be less than those shown in Table 1 of ANSI/AWWA Standard C115/A21.15-99. The nominal thickness of 4-inch flanged ductile-iron pipe shall be Class 54 (min.) conforming to Tables 3 and 4 of ANSI/AWWA Standard C151/A21.51-02. The pipe shall be furnished with ANSI Standard Class 125 flanges, plain faced and drilled, conforming to ANSI Standard B16.1, latest revision. Hollow back flanges and grey-iron flanges shall not be acceptable for use as threaded flanges. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer, and shall not be interchangeable in the field. Pipe lengths shall be as ordered. Removal of flanges, cutting and re-threading the pipe, and re-installing the flanges will not be permitted in any case.
6. All flanges on ductile-iron pipe and fittings shall be of ductile iron. All joint materials for flanged pipe and fittings, shall be supplied with all pipe or fittings ordered. Bolts and nuts shall comply with all requirements of Appendix Section A.1 of ANSI/AWWA

Standard C115/A21.15-99 except that both shall be stainless steel. Unless ring gaskets are specifically called for in the order, gaskets shall be full-faced, and gaskets shall be of 1/8-inch thickness. Gaskets shall fully conform with the requirements of ANSI/AWWA Standard C115/A21.15-99 Appendix Section A.2 except that gaskets shall be SBR for water and neoprene for sewer usages.

## 2.03 LININGS AND COATINGS

### A. Coating:

1. All pipe and fittings shall be outside-coated with a 100% polyamine epoxy specifically designed for wastewater immersion and low permeation to H<sub>2</sub>S gas applied by means of the airless spray method. The exterior coating shall meet AWWA Specifications for this type of coating, shall be smooth without pinholes, thin, bare or overly thick areas. Smoothness shall be such that when hand rubbed, no "sand paper" feeling will be experienced and such that the spigot area will readily slide through the gasket without pulling, tearing, rolling or otherwise disturbing the sealing capabilities of the gasket. Spigot ends shall be beveled prior to painting and to an extent that will permit ready insertion of the spigot through the gasket area.

### B. Ceramic Epoxy Lining

1. Ductile Iron pipe and fittings shall be epoxy lined.
2. All ductile iron pipe and fittings shall be delivered to the application facility without lining on the interior surface or the first 6 inches on the spigot end of the pipe exterior.
3. The only ceramic epoxy material approved by the Town at this time is Protecto 401 or approved equal.

### C. Material must meet the following criteria and be accompanied by certification of the following test results:

1. A permeability rating of 0.00 when tested according to Method A of ASTM E96-00 "Test Method for Water Vapor Transmission of Materials", Procedure A with a test duration of 30 days.
2. The following test must be run on coupons from factory lined ductile iron pipe:
  - a. ASTM B117 Salt Spray (scribed panel) - Results to equal no more than 0.5mm undercutting after one year.
  - b. ASTM G95 Cathodic Disbondment 1.5 volts @ 77 degrees F. Results to equal no more than 0.5mm undercutting after 30 days.
  - c. Immersion Testing rating using ASTM D714-87 (1994).
  - d. 20% Sulfuric Acid - No effect after one year.
  - e. 25% Sodium Hydroxide - No effect after one year.
  - f. 160 degree F. Distilled Water - No effect after one year.
  - g. 120 degree F. Tap Water (scribed panel) - 0.0 undercutting after one year with no effect.

3. A statement from the manufacturer attesting to the fact that at least 20% of the volume of the lining contains ceramic quartz pigment.
  4. A statement concerning recoatability and repair to the lining.
- D. Application
1. The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings.
  2. Surface Preparation
    - a. Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil, grease or any substance which can be removed by solvent is present shall be solvent cleaned using the guidelines outlined in SSPC-1 Solvent Cleaning. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before coating must be reblasted to remove all rust.
  3. Lining:
    - a. After the surface preparation and within eight (8) hours of surface preparation, the interior of pipe and fittings shall receive a minimum forty (40) mils dry film thickness of the protective lining. No lining shall take place when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flange ends are included in the Project, the linings must not be used on the face of the flange; however, full face gaskets must be used to protect the ends of the pipe. The 40-mil system shall not be applied in the gasket grooves.
  4. Coating of Gasket and Spigot Ends:
    - a. Due to the tolerances involved, the gasket area and exterior of the spigot end for 6 inches back from the end of the spigot must be coated with six (6) mils minimum, ten (10) mils maximum of Protecto Joint Compound. This coating shall be applied by brush to ensure coverage. Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. All material for the gasket groove and spigot end shall be applied after the application of the lining as specified in the preceding paragraph.
  5. Number of Coats:
    - a. The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The time between coats shall never exceed that time

recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoatable with itself without roughening the surface.

6. Touch-Up and Repair:

- a. Protecto Joint Compound shall be used for touch-up or repair. Procedures shall be in accordance with manufacturer's recommendations.

E. Inspection and Certification

1. Inspection

- a. All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PC-2 Film Thickness Rating.
- b. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500 volt test.
- c. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on the date.

2. Certification: The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified, and that the material was applied as required by the specification.

3. Procedures for Sealing Cut Ends and Repairing Field Damaged Areas:

- a. Remove burrs caused by field cutting of ends or handling damage and smooth out the edge of the lining if rough.
- b. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
- c. Areas of loose or damaged lining associated with field cutting the pipe shall be repaired, if approved by the Engineer, as recommended by the pipe manufacturer. The damaged area shall be stripped back by chiseling or scraping about 1 to 2 inches into the well-adhered lining before patching.
- d. The exposed metal and the 1 to 2-inch lining overlap shall be roughened with a coarse grade of emery cloth (#40 grit), rasp or small chisel. Avoid wire brushing or similar buffing since these tend to make the surface too smooth for good adhesion.
- e. With the area to be sealed or repaired absolutely, clean and suitably roughened, apply a coat of Protecto Joint Compound by brush in accordance with the manufacturer's recommendations.

2.04 QUALITY ASSURANCE

- A. All pipe, fittings and other materials supplied under this contract shall be subject to inspection while still on the delivery truck. It is the sole responsibility of the vendor and supplier to make prior contact with the Storekeeper or the Construction Management and provide a minimum of 48-hours prior notice of delivery. When so notified, the Town will make arrangements for inspection of the material upon arrival or within a reasonable time thereafter. Material will not be unloaded without inspections taking place either prior to or, if necessary for examination, during the unloading procedure. The Town will not be responsible for any delays or additional costs created by non-compliance with the

requirement for prior notification or the requirement for thorough inspection.

- B. Materials shall be delivered in complete compliance with the AWWA Standards as modified herein, without damage, and shall match or exceed the quality of any samples supplied. The Town absolutely reserves the right to require samples of any material supplied and to perform whatever tests considered by the Engineer, whose decision shall be final, to be in the Town's best interest on said samples. Where such tests are of a destructive nature, the sample, if it passes the test will be paid for (at cost as shown by invoice) by the Town. Samples failing will be immediately replaced with suitable material at the supplier's/contractor's expense. Samples required prior to order as a condition for purchase or as a materials submittal for approval will be at the supplier's/contractor's expense but, if approved and not used for destructive tests, may be used in the work with permission from the Engineer.
- C. Materials found to be defective, not in strict compliance with the quality standards of samples supplied or these specifications shall be immediately returned to the vendor at his expense. If defects are discovered at a later time, the vendor shall be required to remove said items and shall bare all costs for so doing together with any replacement costs. Rejection of items may subject the vendor to liquidated and/or actual damages as specified elsewhere herein.
- D. Foundries supplying materials shall maintain their metallurgical records for a minimum period of two (2) years after fabrication and firms not doing so may be found in default.
- E. Flaws which provide cause for rejection include but are not limited to; incorrect metallurgy or metallurgy which cannot be verified to the complete satisfaction of the Engineer; foundry identification/location, size, pressure and material identification information lost, removed, non-existent, or not visible when assembled; not in complete compliance with all applicable AWWA Standards as modified herein and/or these specifications; not in compliance with NSF; not in compliance with approved shop drawings; out of roundness in excess of AWWA requirements; dimensional differences in excess of AWWA requirements; rough exterior coating; chipped, cracked, scratched or otherwise damaged interior or exterior coatings or linings; interior or exterior coatings which are too thin; coatings too thick to allow proper assembly; coatings too thick to allow proper grip by restraining gaskets or other restraining elements; pin holes or honey combing of pipe; weld spatter or excess metal in gasket grooves or the whole of the bell area; bell areas which are distorted or otherwise improperly cast; spigots which are out of round, not of proper dimension, or not beveled to an extent that will allow easy assembly of the pipe joint; gaskets which are defective or of the wrong material; lack of joint materials; improper or defective joint materials; bolting of the wrong material or size; electro galvanizing or other exterior plating when hot-dip galvanizing is required; incorrect, flawed or damaged interior coating or lining; lack or non-submittal of all required certifications; non-timely submission of certifications; incorrect/incomplete certifications or certifications lacking the signature, date and seal of a professional engineer when so required; flanges which are too thin, not a right angles to the pipe centerline, or otherwise distorted; together with all other flaws or defects which in the opinion of the Engineer, whose decision shall be final, adversely affect the assembly and/or function of the piping system as intended.

### **PART 3. EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall provide all barricades and/or flashing warning lights necessary to warn of the construction throughout the Project.
- B. Pipe and fittings shall at all times be handled with great care to avoid damage. In loading and unloading, they shall be lifted with cranes or hoists or slid or rolled on skidways in such manner as to avoid shock. Under no circumstances shall this material be dropped or allowed to roll or slide against obstructions.
- C. All work shall be performed by skilled workmen experienced in similar installations. All pipe and fittings shall be adequately supported by clamps, brackets, straps, concrete supports, rollers or other devices as shown and/or specified. Supports or hangers shall be spaced so that maximum deflection between supports or hangers shall not exceed 0.050 inch for pipe filled with liquid, but shall not be further than 6 feet apart, whichever is closer, unless otherwise shown. All pipe supports shall be secured to structures by approved inserts or expansion shields and bolts.
- D. All pipes shall be thoroughly cleaned internally before being installed. All pipes, except oxygen service, air and gas, shall be flushed with water and swabbed to assure removal of all foreign matter before installation. Air and gas piping shall be tapped with a hammer to loosen scale or other foreign matter that might be within the pipe, then thoroughly blown with a high pressure air hose. Air shall be from the Contractor's air compressor.
- E. At all horizontal or vertical pipe deviation, the Contractor shall install both restrained pipe and thrust blocks. Joints may only be opened to adjust alignment by half of the AWWA or manufacturer's recommended opening (which is smaller).
- F. Tie Rods: Unless otherwise indicated on the Drawings, the size and number of tie rods for a joint or installation shall be as recommended by the manufacturer's design chart for a working pressure of 150 psi. Tie rods shall be installed as recommended by the manufacturer.

### 3.02 INSTALLATION OF PIPE, FITTINGS AND VALVES

- A. General:
  - 1. The design Drawings are in some cases diagrammatic. They may not show every bend, off-set, elbow or other fitting which may be required in the piping for installation in the space allotted. Careful coordination of the work of this Section with that of Division 2 and 16 is necessary to avoid conflicts. Install gravity lines at uniform grade to low point after field verification of low point invert.
  - 2. The centerline of the pipe shall not vary by more than 2 inches from the location shown on the Plans and the top of the pipe shall not vary by more than 2 inches from the established grade, except at points where this tolerance must be changed to clear obstructions, or make connections. Deviation from this location will be permitted only upon written instructions from the Engineer.
  - 3. Sandbags may be used to support the pipe but no pipe shall be laid on blocks, except by the written permission of the Engineer of Record.
- B. Installation of Ductile Iron Pipe
  - 1. Bolts, nuts and rubber gaskets for use in flanged and mechanical joints shall be stored under cover. Gaskets shall not be exposed to heat, light or any petroleum products, shall be kept clean and shall not be handled with greasy or dirty hands.

2. Before making up flanged joints in cast iron pipe and fittings, the back of each flange under the bolt heads, and the face of each flange shall have all lumps, blisters and excess coating removed and shall be wire brushed and wiped clean and dry.
  3. Before laying the ductile iron pipe, all lumps, blisters and excess coal-tar coating shall be removed from the bell and spigot ends of each pipe and the outside of the spigot and the inside of the bell wire brushed and wiped clean and dry. The entire gasket groove area shall be free of bumps or any foreign matter which might displace the gasket. Vegetable soap lubricant shall be applied in accordance with the pipe manufacturer's recommendations, to aid in making the joint. The workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Deflections shall be made only after the joint has been assembled.
  4. Cutting of ductile iron pipe for inserting valves, fittings, etc., shall be done by the Contractor with a mechanical pipe saw in a neat and workmanlike manner without damage to the pipe, the lining, or the coating.
  5. Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing in the direction of laying; and for lines on an appreciable slope, the bells shall, at the discretion of the Engineer, face upgrade.
  6. Mechanical joints in ductile iron pipe and fittings shall be made in accordance with the manufacturer's standards except as otherwise specified herein. Joints between mechanical joint pipe and/or fittings shall be made in accordance with AWWA Standard Specifications, "Installation of Ductile Iron Water Mains and Appurtenances," C600-87, except that deflection at joints shall not exceed one-half of the manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in AWWA C600-87, whichever is the lesser amount.
  7. Flanged joints shall be used only where indicated on the Plans. Before making up flanged joints in the piping system, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to insure that bolt stresses are evenly distributed.
  8. Bolts and nuts in flanged and mechanical joints shall be tightened in accordance with the recommendations of the pipe manufacturer for a leak-free joint. The workmen shall exercise caution to prevent overstress. Torque wrenches shall be used until, in the opinion of the Engineer, the workmen have become accustomed to the proper amount of pressure to apply on standard wrenches.
- C. Cleaning and Testing: All of the piping installed under this project shall be tested as follows and as directed by the Engineer.
1. With exceptions as noted below, all ductile iron piping installed under this Contract shall be cleaned and tested according to Paragraph I herein below in this Section:
    - a. Only potable water piping shall be disinfected.
    - b. No leakage shall be permitted for flanged piping.
    - c. No leakage shall be permitted for any type of above ground piping.
- D. Installation of Aboveground and Exposed Piping

1. Aboveground and exposed pipe fittings, valves and accessories shall be installed as shown or indicated on the Drawings.
2. Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings rather than bushings. Pipe connections shall be made in accordance with the details shown and manufacturer's recommendations. Open ends of pipe lines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated and as required to insure adequate support of the piping.
3. Welded connections shall be made in conformity with the requirements of AWWA Standard C 206 and shall be done only by qualified welders. The Engineer may, at his option, require certificates that welders employed on the work are qualified in conformity with the requirements of this standard and/or sample welds to verify the qualifications of the welders. Before testing, field welded joints shall be coated with the same material as used for coating its pipe in accordance with the requirements of AWWA.
4. Flanged joints shall be made up by installing the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with a suitable lubricant immediately before installation.
5. Joints using Dresser couplings shall be made up as recommended by the manufacturer.
6. Use of perforated band iron (plumber's strap), wire or chain as pipe hangers will not be acceptable. Supports for pipe less than 1-1/2 inches nominal size shall not be more than 8-feet on centers and pipe 2-inches nominal size and larger shall be supported at not more than 10-feet on centers, unless otherwise indicated. Any noticeable sagging shall be corrected by the addition of extra supports at the Contractor's expense.

### 3.03 FIELD QUALITY CONTROL

- A. All water mains shall be flushed to remove all sand, debris, rock and other foreign matter. Dispose of the flushing water without causing a nuisance or property damage.
- B. Pressure and Leakage Testing: All pumps, piping and gauges shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation shall be approved by the Engineer. Pump shall be of a non-pulsating type suitable for this application and gauge accuracy certification may be required at the Engineer of Record's discretion. All pressure and leakage testing shall be done in the presence of a representative of the Town as a condition precedent to the approval and acceptance of the system.

**END OF SECTION**

## SECTION 15065 - MISCELLANEOUS MATERIALS

### PART 1. GENERAL

#### A. SCOPE

1. Miscellaneous materials necessary for a complete installation, not specified herein, shall be equal in quality to the specified materials suitable for the intended use, and shall conform to the details and notes shown on the Plans. All minor items implied, usually included or required for the construction of a complete operating system, shall be installed whether specified or shown on the Plans, or not.
2. The Contractor shall furnish and install where shown on the Plans or stated herein, the following materials or equals:

### PART 2. PRODUCTS

#### A. MATERIALS

Anchors, chemical adhesive	Stainless Steel HVA type by Hilti Co, or approved equal.
Anchor bolts, eyebolts, nuts	ASTM A325-88a, hot-dip galvanized washers-steel, including anchor bolts and tie-rods carbon steel.
Anchor bolts, nuts, washers and screws-stainless steel	AISI Type 316 stainless steel
Anchor straps	1-1/2-inch by 1/8-inch hot dip galvanized each with two 1/2-inch by 3-inch anchor bolts and nuts (galvanized).
Backflow preventer	Pressure reducing 2-inch Series 909, manufactured by Watts Regulator, Co. (or other Town approved model for size and application).
Backflow preventer (hose)	3/4", bronze hose bibbs Watts No. 8.
Banding straps for pipe skids	Hot-dip galvanized steel or stainless steel, 1/32-inch thick by 1-1/4 inch wide, minimum, with banding clamps of same material.

Blind flanges, cast iron	AISI Standard B16.1, Class 125, plain-faced and drilled. "Hollow Back" flanges not acceptable.
Bolt, nuts and washers, Aluminum (where required on the Plans)	Aluminum bolts shall conform with AA 2024-T4 Alloy designation, anodized.
Bolts and nuts for flanged pipe joints	Hot-dip galvanized steel, sized pipe joints per ANSI specifications. If in contact with aluminum or stainless steel, AISI Type 316 stainless steel, sized per ANSI specifications.
Bonding Agent for concrete	High polymer resin dispersed in water "Daraweld-C" by W. R. Grace Co.
Brackets and Pipe Supports Clamps	ASTM A36M-89, hot dip galvanized after fabrication.
Caulking Compound	Hornflex-L (two component compound based on Thiokol polysulfide liquid polymers), W.R. Grace & Co. Apply per manufacturer's recommendation.
Chain Rail	Chain shall be straight-link machine chain, Type 316L Stainless Steel with approx. 15 links per foot. Each chain section shall be fitted with Type 316L Stainless Steel snap fittings and eye bolt at both ends. Eye bolts shall be affixed to end posts.
Check valves in meter hook-ups	1-1/2 inch to 2-inch brass with neoprene poppet by Stataflo Products, Inc., or approval equal.
Concrete pipe support saddle liner	Neoprene rubber sheet, 1/4 inch thick w/ 4-ply fabric reinforcement durometer grade 70, cut  width 1/2 inch less than saddle with.
Concrete protecting coating (interior slab and interior walls from bottom slab up to 3-1/2 feet).	Base: Strongcote WB-114, 1/32-inch by Strongwall Systems Inc. or approved equal.  Top: Strongcote SC-112, by 1/32-inch thick

	Strongway Systems, Inc. or approved equal.
Coupling Adapters	Flanged, cast Iron, Type 912 by Rockwell International, or approved equal.
Coupling, Flexible (Groove type)	Cast iron Victaulic Style 31 or approved equal, complying with AWWA C606-87. Compatible with pipe material, dimensions and service, and furnished with neoprene gaskets and stainless steel bolts and nuts.
Coupling, Flexible	Vibration and noise insulating expansion joint, design pressure 150 psi, acceptable for drinking water shall be Style 110-A by Unaflex Rubber Corp., distributed by H.S. White Co., Inc., Ft. Lauderdale, or approved equal.
Dowel Bars	Continuous threaded, w/ splicer, Type DBT by Richmond Screw Anchor Co.
Duct caps (Grab Sample Ports)	6" Bronze Andrew industrial Type "DC", Kamlock or equal with 6-inch NPT bronze Adaptor Andrews Industrial Type "A", KamLock, or approved equal.
Epoxy for polylining repairs	Two-part coal tar epoxy Madewell 1104 by Madewell Products Corp.
Epoxy grout, non-shrinking (for setting equipment)	See Specifications Section 03600.
Epoxy grout, non-shrinking (for setting handrails).	"Wall-Nu" (Trowel Mix), by Steelcote Mfg. available locally at Florida Wire and Rigging Works, Inc "Five Star" by U.S. Grout Corp., or equal, available from Coastal Construction Products.
Exhaust fan (for dry wells)	See Specification Section 15860.
Expansion anchors and shields	Redhead by ITT Phillips Drill Division, Redhead by ITW, Simpson Strong Tie or approved equal.

Fill Cap (emergency pump out 4-inch connection to force main)	4", lock-type, OPW 634-TT with 4 x 4-inch adaptor, OPW 633-T, by Dover Corp., or equal.
Flange coupling adapters	Smith-Blair, Dresser.
Flange joint material	ANSI sized and approved, full faced 1/8 inch thick neoprene (for sewer) SBR (for water) gaskets and hot-dip galvanized bolts and nuts (except as otherwise specified for a particular service). Properties of gaskets to conform with ANSI/AWWA C111/A221.11. Bolts and nuts hot dip galvanized steel properly sized for ANSI Standard Class 125 flanged joints.
Flexible couplings (Compression type, if required during installation).	Compression type sleeve Dresser Style 38, Baker, or equal, compatible with pipe dimensions and service, and furnished complete with grade 27 gaskets and 316 stainless steel bolts and nuts.
Flexible connections, (stainless steel)	Stainless steel bellows type with flanged connections as manufactured by Ram-Tech Sales, Inc., Shreveport, LA, or approved equal.
Gasket lubricant	Vegetable soap lubricant as recommended by the pipe, valve or gasket manufacturer for installation of pipe in subaqueous trench.
Gauges – pump discharge	0-60 psi range, Kunkle, Style G1110, case type N or equivalent by John C. Ernst, or Ashcroft with diaphragm seal.
Gauges – pump suction	0-15 psi range, Kunkle, Style G1130, case type N with diaphragm seal, 4-1/2 inch dial size. Gauges shall be furnished by the manufacturer supplying the diaphragm seals assembled as a unit.
Gauge cock	Bronze gauge cock Crane No. 744 equivalent by Stockam.

Gravel for venturi, valve or other pit (where required on Plans or herein)	Gravel shall be locally obtained from a fresh water source, free of deleterious matter and graded from 3/4 to 2-1/2 inches in size.
Non-shrink, hydraulic cement grout wall Grout for boring and jacking	<p>“Waterplug” by Thoro System Products.</p> <p>Portland cement-sand mixture. Type I (for water) Type II (for sewer) Portland cement and sand fineness that 100 percent will pass a standard 40-mesh sieve. Grout shall not contain greater than one part sand to one part cement.</p>
Hose Clamps	All stainless steel, worm-gear type, Nos. 30032, 300188, by Breeze Corp, Inc. Hex head Type 316 Stainless Steel Series “68” Hy-Gear by Ideal.
Hose, sump pump	<p>2-inch I.D. Buna-N, “Plant Master” No. 119B by Gates.</p> <p>Grinnel, Fig. 164, or approved equal. 20-inch adjustable roller stand with base plate shall be TT Grinnell, Fig. 274, or approved equal.</p>
Restrained Joints	Provide individually actuated wedges (370 BHN) and joint resistant ring made of grade 60-42-10 ductile iron, ASTM A536-84, with torque limiting twist-off nuts. Gland shall be capable of being used with the standard mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53, and coated with the same asphalt coating specified for pipe and fittings. It shall have a working pressure of at least 250 psi and a minimum safety factor of 2:1 and be Listed by Underwriters Laboratories. The restraint shall be MEGALUG Series 1100 by EBAA Iron, Inc., or approved equal.

Megalugs shall be used only where shown on the plans or where approved by the Engineer.

Meter Couplings	1-1/2 inch & 2-inch brass "Loc-Pak" by Ford Meter Box Co.
Neoprene pad (60 Durometer)	Neoprene Bearing Pad "Servicized" by W.R. Grace Co. Code No. 3340.
Neoprene (compressible pad)	Acmeaseal by Acme Highway Products, Corp., Amherst, N.J.
Oils and Lubricants	Type, quality and quantity as recommended by manufacturer of machinery or equipment.
Paint – Zinc rich for galvanized item with minor damage	Dry galve by Force Chemical Division, America Soldering and Flux Co.
Paint, bituminous	Bitumastic No. 300M and Bitumastic No. 50, Kop-Coat Co.
Pea Rock	Local washed rock, 100% passing 1-inch mesh and retained on 1/4 –inch mesh.
Pipe clamps	Hot-dipped galvanized steel.
Pipe straps (2-inch by 3/8-inch)	AISI Type 316 stainless steel with 3/8-inch diameter stainless steel bolts.

Pipe straps for Vent Pipe	Galvanized 2-inch No. 3039T19 by McMaster-Carr.
Pipe supports (where required)	Aluminum Strut Channel 1 5/8-inch X 1 5/8-inch unistrut.
Pipe support (other types)	Fabricated as shown on the Plans, ASTM A36/A36M-90 steel, hot dip galvanized after fabrication.
Pipe Hanger, Clevis Type (where required)	Adjustable clevis, carbon steel, galvanized, ITT Grinnell Fig. 260.
Pipe Support, Rod Attachment (where required)	Forged Steel Clevis Type with pins. ITT Grinnell Fig. 299.
Polysulfide Rubber Sealant	
Riprap	Sand-cement in burlap sacks, well mixed, in the proportion of 5:1. The sacks shall absorb moisture to set-up in the position placed.
Sand for casing	Such fineness that 100% will pass a standard 4-mesh sieve.
Sealant for concrete joints	Dow Corning 888 Silicon Joint Sealant with 3/8-inch Dia. expanded closed-cell polyethylene foam backer rod or approved equal.
Service terminal fittings - single	One-inch lock wing style valve, drilled for wire sealing, Cat. No. KV23-444W Ford Meter Box Company, or Cat. No. H-14255, Mueller Company.
Service terminal fittings – dual	One-inch branch valve assembly, with standard 7-1/2 inch spacing between outlet centers, drilled for wire sealing, Cat. No. UV23-42W Ford Meter Box Company or one inch branch connection with standard 7-1/2 inch spacing between outlet centers Cat. No. H-15362, fitted with angle stops for 5/8-inch meters, drilled for wire sealing, Cat. No. H-14265, (3/4" inlet) Mueller Company.

Strainer	3/4 –inch with screwed connections and 20 mesh 18-8 stainless steel straining element. Type SY-70, as manufactured by Cash Acme or approved equal.
Stainless steel screws for ladders	AISI Standard Type 316.
Stainless steel cable	AISI Type 316 wire rope.
Stainless steel repair clamps, with Stainless steel bolts, PSM SDR –35 PVC sewer pipe to ductile-iron or AWWA C900 CI-PVC pressure pipe	Wide range, single or multiple panel, Style 3121 or 3122, Clow Corporation. Coat with bituminous paint after installation.
Street elbow (90 Degrees)	150 psi, galvanized, malleable iron, screwed,  ANSI Standard B2.1 threaded (NPT).
Suction Bend	Cast iron, flange and flare, long radius, 90-degree bend, U.S. Pipe and Foundry Co.
Tread Plate	1/4-inch galvanized steel (raised checkered design).
Threaded rods	1/2inch, 5/8-inch and 3/4-inch hot-dip galvanized steel.
Tie rods	Threaded each end, hot-dip galvanized steel, galvanized nuts, washers and eye bolts.
Eye Bolts	The eyebolts shall be Star National Products, Figure No. 7.
Timber skids and block	Wolmanized pressure-treated Southern Pine at 2.5 pounds per cubic foot retention. Skids and blocking shall be size so that the top of the bells or restrained joints of the carrier main will be two inches or less below the inside top of the casing pipe.
Turnbuckles	Grinnell Fig. 230, hot-dip galvanized.
U-bolts (galvanized)	Hot-dip galvanized steel.

U-bolts (stainless)	AISI Type 316 stainless steel.
Vent Cap	2-inch, OPW-63, by Dover Corp.
Valve (Foot)	1-inch, double poppet, bronze, OPW 92 by Dover Corp.
Wall pipes (cast iron)	Clow F-1400 series, American Cast Iron or equal, flange and flange or flange and plain end, or bolted mechanical joint, as required or as shown on the plans. Length to fit wall thickness.
Wall Sleeves for Pipe 4" and Smaller	Schedule 40, hot-dip galvanized steel pipe, cut flush with face of wall or floor and reamed.
Wall Sleeves for Pipe Larger than 4-inches	Cast iron, sized as shown on the Plans, conforming to AWWA Standards, Class "D" pattern, with intermediate flange.
Water proofing system (where required by the Plans)	"Penecrete" cementitious water proofing system at joint and 2-inches of "Penetron" all around joint area, mixed and applied as required by the product manufacturer, International Coating Systems, Inc. - Danko Sales, Inc. (404)922-3351 or approved equal.

**PART 3. EXECUTION - NOT USED**

**END OF SECTION**

## SECTION 15100 - VALVES, GENERAL

### PART 1. GENERAL

#### 1.01 SCOPE

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Piping, General.
- B. Painting.
- C. Equipment General Provisions.
- D. Electrical.

#### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Codes:
  - 1. All codes, as referenced herein, are specified in Section entitled "Reference Standards." As used herein, "ANSI" denotes the American National Standards Institute; "AWWA", the American Water Works Association; and "ASTM", the American Society for Testing and Materials.
- B. Commercial Standards:
  - ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
  - ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
  - ANSI/ASME B1.20.1 General Purpose Pipe Threads (Inch).
  - ANSI/ASME B31.1 Power Piping.
  - ASTM A 36 Specification for Structural Steel.
  - ASTM A 48 Specification for Gray Iron Castings.
  - ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - ASTM A 536 Specification for Ductile Iron Castings.
  - ASTM B 61 Specification for Steam or Valve Bronze Castings.
  - ASTM B 62 Specification for Composition Bronze or Ounce Metal Castings.
  - ASTM B 148 Specification for Aluminum-Bronze Castings.
  - ASTM B 584 Specification for Copper Alloy Sand Castings for General Applications.

ANSI/AWWA C500 Gate Valves for Water and Sewerage Systems.  
ANSI/AWWA C504 Rubber-Seated Butterfly Valves.  
AWWA C508 Swing-Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS.  
ANSI/AWWA C509 Resilient-Seated Gate Valves, 3 Through 12 NPS, for Water and Sewerage Systems.  
AWWA C550 Protective Interior Coatings for Valves and Hydrants.

1.04 MANUFACTURER

- A. All valves shall be the product of domestic manufacturing firms which have been engaged in the production of valves for not less than five (5) years. Test all AWWA valves specified herein at the factory in accord with the AWWA Standard Leakage And Hydrostatic Test and furnish a Certified Test Report and Affidavit of Compliance for each valve.

1.05 QUALITY ASSURANCE

- A. Valve Testing: Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.
- C. Provide valves that have the manufacturer's name and valve rating cast in body.

1.06 CONTRACTOR SUBMITTALS

- A. Shop Drawing: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished.
- B. Valve Labeling: The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.
- C. Affidavit of Compliance: Submit for all AWWA valves an affidavit of compliance certifying that the valves and the materials used in their construction conform to the applicable requirements of AWWA Specifications as revised and cited below, and that all tests specified have been performed and that all test requirements have been met. Payment will not be made until after receipt of the affidavit.
- D. Contract Drawings: The Engineer's drawings, which constitute an integral part of this Contract, indicate the general layout of the complete system. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions. The Contractor shall also review architectural, structural, and mechanical plans and shall adjust his work to conform to all conditions indicated thereon. Discrepancies shown on different plans, or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Engineer, for a decision. These drawings may be superseded by later revised, or detailed drawings or specification addenda prepared by the Engineer and the Contractor. All reasonable changes shall be performed without extra cost to the Town. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation shall be included.

All AWWA valves shall be furnished with Certified Test Reports (for testing) and Affidavit of Compliance.

## **PART 2. PRODUCTS**

### **2.01 VALVES**

- A. General: The Contractor shall furnish all valves, gates, valve operating units, stem extensions, operators and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. All valves shall have a minimum design pressure rating of 150 psi and capable of a test pressures in excess of the service application working pressure.
- B. Cast iron parts of valves shall meet the requirements of ASTM A126, "Standard Specifications for Grey Iron Castings for Valves, Flanges and Pipe Fittings, Class 'B'." Flanged ends shall be flat-faced and have bolt circle and bolt patterns conforming to ANSI B16.1 Class 125 unless otherwise specified hereinafter.
- C. All castings shall be clean and sound, without defects of any kind and no plugging, welding or repairing of defects will be permitted. All bolt heads and nuts shall be hexagonal conforming to ANSI B18.2. Gaskets shall be full-face and made of natural or synthetic elastomers in conformance with ANSI B16.21 suitable for the service characteristics, especially chemical compatibility and temperature. Non-ferrous alloys of various types shall be used for parts of valves as specified. Where no definite specification is given, the material shall be the recognized acceptable standard for that particular application.
- D. Valve Flanges: The flanges of valves shall be in accordance with Section 15060, "Piping and Fittings."
- E. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged valves, shall receive a fusion-bonded epoxy coating in accordance with AWWA C550. Flange faces of valves shall not be epoxy coated. The CONTRACTOR, through the valve manufacturer, shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.
- F. Valve Labeling: A label shall be provided on all shut-off valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve or as indicated by the ENGINEER.

### **2.02 VALVE OPERATORS**

- A. General
  - 1. Valves and gates shall be furnished with operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. All valve operators, regardless of type, shall be installed, adjusted,

and tested by the valve manufacturer at the manufacturing plant. Operator orientation shall be verified with the ENGINEER prior to installation. If this requirement is not met, changes to orientation shall be made at no additional cost.

2. All operators, unless otherwise specified, shall turn counter- clockwise to open. Operators shall have the open direction clearly and permanently marked. All valve operators, manual, motor and pneumatic, shall be provided with the valve by the valve manufacturer. The CONTRACTOR, through the valve manufacturer, shall be solely responsible for the selection of the proper operator to meet the operating conditions specified herein. Field calibration and testing of the operators and valves to ensure a proper installation and an operating system shall be the responsibility of the CONTRACTOR.

B. Manual Operators

1. All manual operators shall have handwheels, unless otherwise shown. Unless otherwise shown or specified, valves of sizes 4-inch and larger shall have gear-assisted operators.
2. Operation of valves and gates shall be designed so that the effort required to operate the handwheel shall not exceed 40 pounds applied at the extremity of the wheel or lever. The handwheels on valves 14 inches and smaller shall not be less than 8 inches in diameter, and on valves larger than 14 inches the handwheel shall not be less than 12 inches in diameter.
3. Chainwheel operator shall be fabricated of malleable iron and pocketed type chainwheels with chain guards and guides. Chainwheel operators shall be marked with an arrow and the word "open" indicating direction to open. The operators shall have galvanized smooth welded link type chain. Chain that is crimped or has links with exposed ends shall not be acceptable.

### **PART 3. EXECUTION**

#### **3.01 INSTALLATION**

- A. General: All work shall be performed by skilled workmen experienced in similar installations. All valves shall be adequately supported by clamps, brackets, straps, concrete supports, rollers, adjoining pipes or other devices as shown and specified. All supports shall be secured to structures by approved inserts or expansion shields and bolts.
- B. All valves shall be thoroughly cleaned internally before being installed. Installation of valves shall be done in accordance with construction methods specified in "Pipes and Fittings" Section of these Specifications.
- C. Install valves as recommended by manufacturer.
- D. Install valves so that they are easily accessible for operation, visual inspection and preventive maintenance.
- E. Location of valves and chain operators: Install valves so as to be accessible for operation and free from interferences when operated. Position so that leakage will not contact any electrical equipment that may be located below.

- F. All valves and piping specialties shall have a rated working pressure of not less than 1.5 times of the system pressure which it serves.
- G. Upon completion of the Project, but prior to final acceptance, the Contractor in the presence of the Engineer, shall fully open each valve installed by him, except at connections to existing Town mains. Valves at connections to existing Town mains shall only be operated by the Town.

**END OF SECTION**

## SECTION 15115 - CHECK VALVES

### **PART 1 – GENERAL**

#### 1.01 SCOPE OF WORK

The Contractor shall furnish and install check valves complete and operable, including all appurtenances and accessories.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

Section 15100 - Valves, General

### **PART 2 - PRODUCTS**

#### 2.01 CHECK VALVE

##### A. General

1. The swing-check valves shall be standard (plain) types, for normal horizontal installations, conforming to all of the applicable requirements of the most current ANSI/AWWA Standard C508, "Swing-Check Valves for Waterworks Service, 2-in. Through 24 In. NPS", except as otherwise specified herein. The valves shall be iron body, bronze mounted.
2. Outside arm swing-check valves will not be permitted. Contractor to provide the proposed check valves for approval by the Engineer.
3. Valve bonnet opening shall be large enough to allow ample clearance for direct removal of disc by hand.

##### B. External Ferrous Items

All external ferrous items, except cast iron, shall be hot-dipped galvanized in accordance with the most current ANSI/ASTM Standard A123, "Zinc (Hot-Galvanized) Coatings on Iron and Steel Products", or ANSI/ASTM Standard A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware", or stainless steel.

##### C. Flanged Valves

Flanged valves shall have ends plain-faced and drilled conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", Class 125. Bolt holes in the flanges shall be equally spaced and shall straddle the vertical and horizontal centerline. All joint materials for flanged valves will be furnished with the valves; neoprene for sewer and SBR for water applications.

##### D. Clapper

1. The clapper shall swing clear of the waterway when the valve opens, permitting a full flow through the valve equal to the nominal diameter of the pipe.
2. The body and clapper seating surface shall be metal to metal, and shall be bronze.

3. The clapper disc and the clapper hinge arm, including the clapper disc cap screw, shall be bronze or cast iron. Clapper to hinge arm connection shall be such that the unit cannot be unscrewed by fluid flow.

E. Clapper Hinge Pin

1. The clapper hinge pin (shaft) shall be stainless steel conforming to AISI Type 316.
2. The clapper hinge pins shall rest in bronze bushings provided with a compression packing or double nitrile o-ring seal. An opening shall be provided in each of two bosses on the body for easy access to either end of the hinge pin. The openings shall be tapped and provided with plugs.

F. See Part 2 of Section 15100, "Valves, General", for other components.

2.02 TESTING

All check valves shall be tested at the factory in accordance with Section 5.2 of the most current ANSI/AWWA Standard C508 and a Certified Test Report shall be furnished with each valve.

**PART 3 - EXECUTION**

3.01 GENERAL

All valves shall be installed in accordance with provisions of Section 15100, "Valves, General." Care shall be taken that all valves are well supported.

**END OF SECTION**

## SECTION 15125 - PLUG VALVES

### PART 1 -- GENERAL

#### 1.1 THE REQUIREMENT

- A. The Contractor shall provide plug valves and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 15100 - Valves, General apply to this Section.
- C. Plug valves shall have undergone a proof-of-design test to demonstrate that the valve components operate at the service flow, pressure, temperature, and fluid conditions, free from binding, excessive noise, and premature failures. Proof-of-design test results shall be available to the Engineer on request. The proof-of-design test shall be conducted in accordance with the applicable provisions of AWWA C504.

#### 1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with **Section 15100 – Valves, General** and **Section 01340 Shop Drawings, Product Data, and Samples**.

### PART 2 -- PRODUCTS

#### 2.1 ECCENTRIC PLUG VALVES (1/2-inch to 72-inches)

- A. Construction: Eccentric plug valves shall be of the non-lubricated, eccentric plug design with cast iron bodies conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with ANSI 125 lb. flanged ends for valves 3-inches and larger, and screwed or flanged ends for smaller sizes. The plugs and shafts shall be of cast iron or ductile iron conforming to ASTM A 536 - Ductile Iron Castings, and the plugs shall be lined with a resilient coating, best suited for the specific service. All exposed nuts, bolts, springs, washers, and similar component items shall be AISI Type 316 stainless steel. Resilient plug facing shall be of neoprene. The body shall be lined with a suitable elastomer, where required for a special service, or it shall be epoxy-lined in accordance with Section 15060 - Piping and Fittings. The seats shall be of nickel or stainless steel welded to the body. Top and bottom shaft bearings shall be of permanently lubricated stainless steel or Teflon coated stainless steel. Grit seals of Teflon, Nylatron, or similar suitable material shall be at the top and bottom plug journals. Valves up to and including 20 inches in size shall have an unobstructed port area of not less than 80 percent of full pipe area. Plug valves shall be full opening with 100% port area. Plug valves larger than 8-inch shall be designed for operation in a horizontal pipeline, with the valve shaft in a horizontal position and the operating shaft in a vertical position. Eccentric plug valves shall have a pressure rating of not less than 150 psi WOG, for bubble-tight shut-off in the standard flow direction, and 25 psi WOG in the reverse flow direction. When equipped with worm gear actuator, the pressure rating shall be 150 psi WOG in both directions. The stem seal shall consist of field adjustable packing, replaceable without removal of the actuator, bonnet, or of self-adjusting U-cup packing. Plug valves shall be the standard product of a manufacturer which has produced and sold such equipment for a period of at least five (5) years. Valves shall be suitable for buried, submerged service.
- B. Flanged valves: shall have ends plain-faced and drilled conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", Class 125. Bolt holes in the flanges shall be

equally spaced and shall straddle the vertical and horizontal centerlines. All joint materials for flanged valves will be furnished by others.

- C. Plug valves shall be furnished with a corrosion-resistant seat consisting of a welded-in overlay of high nickel content on all surfaces contacting the plug face.
- D. Plug valve shaft seals shall be designed for replaceable, manually adjustable, multiple ring "V" or "U" type packing of Buna-N or neoprene. The valves shall be of the bolted-bonnet type.
- E. Plug valves shall have stops at the fully-opened and fully-closed positions.
- F. Plug valves shall be designed for drip-tight shut-off in wet service applications at pressure differentials up to the full rating of the valve with pressure in either direction. Plug valves shall be provided with a manual operator sized to suit the maximum differential pressure across the valves.
- G. Manufacturer shall supply operators producing larger output torque values if so required by their valves, but in no case shall operator output torque be less than that shown for the particular valve size and pressure.
- H. In addition, the operator shall be capable of withstanding an input torque of 300 ft-lbs. on the operating nuts or a pull of 200 pounds on the handwheel without damage to operator components between the input and the stops.
- I. All external ferrous items, except cast iron, shall be hot-dipped galvanized in accordance with ASTM Standard A123, "Zinc (Hot-Galvanized) Coatings on Iron and Steel Products", or ASTM Standard A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware", or stainless steel.
- J. Manual operators shall be hand wheel actuated unless otherwise specified elsewhere herein.
- K. Manual operators shall be provided with completely enclosed mounting brackets or adapters. The operators shall be equipped with adjustable stops to prevent over travel in both the open and closed position with standard handwheel. All plug valves shall open by turning the handwheel counterclockwise. Orient operators with horizontal plug shafts such that the plug rotates upward upon opening.
- L. All operator components between the operating nut and the adjustable stops shall be designed to withstand, without damage, an input torque of 300 ft. lbs.
- M. The exterior valve surfaces shall be shop painted with two coats of asphalt varnish conforming to Federal Specifications TT-C-434A.
- N. Testing: Plug valves shall be tested in accordance with ANSI/AWWA C504, "AWWA Standard for Rubber-Seated Butterfly Valves", Section 5. The performance test and hydrostatic test shall be performed as stated, however the leakage test shall be performed bi-directionally; first on one side of the valve, and then on the other. The manufacturer shall furnish a certified test report with every valve stating that the valve has met the requirements of the tests.

- O. Actuators: Unless otherwise indicated, eccentric plug valves 3 inches and smaller shall have operating levers; larger valves shall have worm-gear actuators.
- P. Manufacturers or Approved Equal:
  - 1. **DeZurik Corporation**
  - 2. **GA Industries**
  - 3. **Pratt Valve**

## **PART 3 -- EXECUTION**

### **3.1 INSTALLATION**

- A. Plug valves shall be installed in strict accordance with the manufacturer's published recommendations and the applicable provisions of Section 15100.
- B. Eccentric Plug Valves: Unless otherwise directed, the following rules shall be observed for the installation of eccentric plug valves on sewage, sludge, or other liquid systems containing solids, silt, or fine sand:
  - 1. The valves shall be positioned with the stem in the horizontal direction.
  - 2. In horizontal pipelines, the plug shall swing upwards when opening, to permit flushing out of solids.
  - 3. The orientation of the valve shall prevent the valve body from filling up with solids when closed; however, where the pressure differential through the valve exceeds 25 psi, the higher pressure for valves without worm gear, electric, or air operators shall be through the valve to force the plug against the seat.
  - 4. Valves which may be closed for extended periods (stand-by, bypass, or drain lines) and valves with reversed flow (higher pressure on downstream side, forcing the plug away from its seat), shall be equipped with worm gear operators for the full range of sizes.
  - 5. For special applications or when in doubt, consult with the manufacturer prior to installation.

**- END OF SECTION -**

## SECTION 15860 - AIR MOVING EQUIPMENT

### **PART 1 - GENERAL**

#### 1.01 SECTION INCLUDES

- A. Ventilator Blower
- B. Exhauster
- C. Accessories
- D. Generator Building Supply Fan

#### 1.02 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. AMCA 99 - Standards Handbook.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
- E. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
- F. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data.
- G. NEMA MG1 - Motors and Generators.
- H. NFPA 70 - National Electrical Code.

#### 1.03 SUBMITTALS

- A. Shop Drawings: Indicate assembly of ventilator blower, exhauster, generator building supply fan and accessories including certified fan performance curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- B. Product Data: Provide data on ventilator blower, exhauster, generator building supply fan and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements. Provide the Town Product Control Notice of Acceptance.
- C. Manufacturer's Installation Instructions.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.

- B. Protect motors, shafts, and bearings from weather and construction dust.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
- B. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- C. Ventilation requirements for entry conditions shall meet OSHA standards.

### 2.02 EXHAUST FAN

- A. Dry wells shall be ventilated with an exhaust fan. The fan should be equipped with an intake duct from the floor. Exhaust fans shall be interlocked to operate when the light is engaged and sized to circulate a minimum of 20 changes of air per hour in the dry well.
- B. The dry well exhauster shall be a direct-connected centrifugal fan rated to produce a minimum of 340 cfm, at min. 3/8-inch water static pressure. The exhauster shall have cast iron housing with heat slinger (to reduce heat conduction to the motor bearings) or cast aluminum housing, inlet screen, aluminum or steel fan wheel, with clockwise rotation and supporting stands of an approved design. The motor shall be explosion proof, 1750 rpm nominal, for single phase, 60 cycle, 120 volt service and of sufficient nameplate horsepower to meet the exhauster requirements at any condition on its performance curve. The exhauster shall be a "Baby Vent Set", manufactured by Howden Buffalo, Inc., Model LM Volume Blower, by Cincinnati Fan and Ventilator Co., or an approved equal.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in accordance with the Florida Building Codes.
- B. Install fans as indicated, with resilient mountings and flexible electrical leads.
- C. Provide safety screen where inlet or outlet is exposed.

**END OF SECTION**

## SECTION 17010 - PUMP STATION WET WELL CLEANING

### **PART 1 GENERAL**

#### 1.01 DESCRIPTION

- A. This Section specifies the cleaning and inspection of the pump station wet well.

#### 1.02 QUALITY ASSURANCE

- A. Conduct cleaning and disposal operations in accordance with local, county, state and federal ordinances and anti-pollution laws. Rubbish, volatile wastes, and other construction wastes shall be neither burned nor buried on the work site, and shall not be disposed of into storm drains, sanitary drains, streams or other waterways.
- B. Final cleaning shall be accomplished either by workmen experienced in cleaning operations or by professional cleaners.

### **PART 2 PRODUCTS**

#### 2.01 ON-SITE WASTE CONTAINERS

- A. Provide on-site waste containers for collection of waste materials, debris and rubbish. See Section 01016, Subsection 1.06 regarding Safety Requirements for environmentally hazardous materials.

#### 2.02 CLEANING MATERIALS

- A. Cleaning materials shall be as recommended by the manufacturer of the surface to be cleaned.

### **PART 3 EXECUTION**

#### 3.01 SCOPE

- A. It is the intent of Town of Medley ("Town") to have its pump station wet well cleaned and inspected. Any items of labor, equipment and materials which may reasonably be assumed as necessary to accomplish this end shall be supplied by the Contractor, whether or not they are specifically stated herein.
- B. The term "clean" in these Specifications shall mean the adequate removal of all debris, sludge, mud, sand, dirt, rocks, sediment, grit, roots, grease and other solid and semi-solid materials from the pump station wet well. The Engineer will determine if the wet well has been cleaned adequately and his decision shall be final.
- C. The Contractor shall furnish all labor, equipment, materials, and incidentals required to thoroughly clean the interior surface walls and floor of the pump station wet well in order for visual inspection. Care shall be exercised in the use of the water and provisions shall be made to protect the water supply from contamination and indiscriminate use by

unauthorized persons. The contractor shall use only potable water unless otherwise specifically called out elsewhere herein. Under no circumstances shall the Contractor utilize a water source, including existing piping, until such source or piping has been approved for use by the Engineer.

### 3.02 EQUIPMENT

- A. Selection of cleaning equipment shall be based on the conditions of the pump station wet well at the time the work commences. The equipment selected for cleaning shall be capable of removing all debris, sludge, mud, sand, dirt, rocks, sediment, grit, roots, grease and other solid and semi-solid materials from the wet well. The pump station wet well shall be cleaned using mechanically powered or high velocity sewer cleaning equipment, as specified below.
1. High Velocity Hydro-Cleaning Equipment – All high velocity cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more velocity nozzles and shall also include a high velocity gun for washing and scouring pump station wet well walls and floors.
  2. Mechanical Cleaning Equipment – Acceptance of proposed alternative cleaning equipment or methods by the Engineer does not relieve the Contractor of his responsibility to adequately clean the pump station wet well to allow for performance of inspection work, nor does it relieve the Contractor of his liability for damages to the pump station as a result of inappropriate cleaning methods.
  3. Alternative cleaning equipment and methods shall be approved by the Engineer prior to use. Acceptance of proposed alternative cleaning equipment or methods by the Engineer does not relieve the Contractor of his responsibility to adequately clean the wet well to allow for performance of inspection work, nor does it relieve the Contractor of his liability for damages to the wet well as a result of inappropriate cleaning methods. The use of alternative cleaning equipment does not change the Unit Prices in the Quotation.

### 3.03 PERFORMANCE

- A. During all cleaning operations all necessary precautions shall be taken to ensure that no damage is caused to public or private property adjacent to or served by the wet well. The Contractor shall take precautions to avoid any damage or flooding to public or private property being served by the wet well being cleaned; the Contractor is responsible for all damage and shall correct damage at no additional cost. No residue shall be left on the ground or street surface.
- B. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. The Contractor shall provide for the pumping down of any surcharged manhole section and provide all bypass pumping, as required, during the cleaning operation. Bypass equipment shall be automatic and rated "Hospital Quiet".

### 3.04 MATERIALS REMOVAL/DISPOSAL

- A. All material resulting from cleaning operations shall be removed from the site at the end of each workday. Under no circumstances will the accumulation of debris, residue, etc. be allowed on site beyond the time stated, unless prior written authorization from the

Engineer is given for storage in totally enclosed, secured and leak proof containers.

- B. The Contractor shall be responsible for all blockages caused in either the sanitary sewer gravity lines and/or pump station as a result of the cleaning operation. Damage to pump station equipment is the responsibility of the Contractor and bypass pumping is required until the completion of pump station repairs are completed.

### 3.05 WET WELL CLEANING

- A. Cleaning work shall be performed at a low flow time when the pump station can be deactivated.
  - 1. All waste material removed from the pump station wet well shall be transported to the approved disposal site in vehicles having the following general requirements: (1) They must be type(s) approved for this application by the political jurisdictions involved, (2) Vehicles shall have watertight bodies and be properly fitted with seals and covers to prohibit material spillage or drainage, (3) They shall be cleaned as often as necessary to prevent deposit of material on roadways; (4) Vehicles must be loaded within all legal weight limits and operated safely within all traffic and speed regulations.
  - 2. The routes used by the Contractor for the conveyance of this material on a regular basis shall be subject to approval by the governing authority having jurisdiction over such routes.
  - 3. All waste and debris resulting from these operations shall be sufficiently dewatered (at least 20 percent solids and no visible moisture) and conveyed directly to the County's Class I sanitary landfill, the South Dade Solid Waste Disposal Facility, 24000 SW 97<sup>th</sup> Avenue, Miami-Dade County, Florida. The Contractor shall include in the prices bid all tipping fees and other costs for disposal of this material and no additional compensation will be allowed. Decanted water removed from the waste and debris may be returned to the sanitary sewer gravity line downstream of the section being cleaned.
  - 4. The Contractor is advised that he shall not dispose of this material by legal or illegal dumping on private or public property, by sale to others, or any means other than those given above.
  - 5. Any load of material, or any portion thereof, disposed of in a non-permitted fashion will result in a charge to the Contractor in the amount of \$1,000.00 per load, or any portion thereof, which sum will be deducted by the Town from any monies due the Contractor. This charge is in addition to clean-up of the material and properly disposing of it, plus any other damages imposed on the Contractor or the Town.
  - 6. The Contractor shall keep his haul route and work area(s) neat and clean and reasonably free of odor, and shall bear all responsibility for the immediate clean-up of any spill which occurs during the transport of waste materials. If the Contractor fails to clean-up such spill or waste immediately, the Town shall have the right to clean-up or arrange for its clean-up and may charge to the Contractor any costs, including administrative costs and overhead, incurred by the Town in connection of such clean-up. The Town may also charge the Contractor any costs or penalties imposed on the Town as a result of any spill, dump or discard. Under no

circumstances is this material to be discharged into waterways or any place other than where authorized to do so as specified above. The term "Contractor", as used in this section, shall include the Contractor's subcontractors and suppliers.

7. Acceptance of pump station wet well cleaning shall be made upon inspection of the structure to insure cleaning has been performed to the satisfaction of the Engineer. If the inspections show the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the pump station wet well until the cleaning is shown to be satisfactory to the Engineer.

**END OF SECTION**

## **SECTION UC-600 - PUMP STATION ELECTRICAL MATERIALS**

### **PART 1 - GENERAL**

#### 1.01 SCOPE OF WORK

The Contractor shall furnish and install all electrical materials specified herein and required for a complete installation.

#### 1.02 RELATED SECTIONS

- A. Section 01031 - Grades, Lines and Levels
- B. Section 01720 - Project Record Documents

#### 1.03 QUALITY ASSURANCE

- A. All electrical materials and equipment shall be new, of recent domestic manufacture, and approved by the Underwriters' Laboratories, Inc. Material or equipment damaged in the course of installation or test shall be replaced or repaired to the satisfaction and the approval of the Engineer of Record.
- B. All electrical materials and installation shall comply with the following codes and standards:
  - 1. National Electrical Code (NEC)
  - 2. Florida Building Code (FBC)
  - 3. National Fire Protection Association (NFPA)
  - 4. Insulated Power Cable Engineers Association (IPCEA)
  - 5. National Electrical Manufacturers Association (NEMA)
  - 6. Institute of Electrical and Electronic Engineers (IEEE)
  - 7. American Society for Testing and Materials (ASTM)
  - 8. American National Standards Institute (ANSI)
  - 9. Underwriters Laboratories (UL)

#### 1.04 SUBMITTALS

- A. Before any material or equipment is purchased, the Contractor shall submit complete shop drawings to the Town for approval, including a complete list in quintuplicate of electrical materials, fixtures and equipment to be incorporated in the work. The list shall include catalog number, diagrams, drawings, and such other descriptive data as may be required by the Engineer of Record. Approval of material will be based on the manufacturer's compliance with the Specifications, published ratings, or on test results, where specified.
- B. In addition, the Contractor shall furnish to the Town, in booklet form, four copies of; complete installation drawings, instruction books, operating and maintenance manuals, parts lists for each major item of electrical equipment, and similar data on minor items of equipment, together with; dimensional drawings, wiring diagrams and schematics for each major piece of electrical equipment.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. All equipment shall be new, complete and in operating condition unless otherwise specified.

- B. All components shall, whenever possible, be standard stock articles of well-known domestic manufacturers, who have been regularly engaged in the manufacture of such material and equipment for at least five (5) years.
- C. Fusible equipment shall be equipped with fuses, and 100 percent of spare fuses of each type shall be supplied.

## 2.02 MOUNTING CHANNELS

All wall-mounted electrical equipment, wiring troughs, junction boxes and groups of two (2) or more conduits, shall be mounted on a system of extruded aluminum channels 1 5/8 inches wide, which shall be attached to the wall with stainless steel machine bolts and expansion shields. The channels shall be 12-gauge aluminum, P-1000 series with compatible hardware and fittings, as manufactured by Unistrut Mfg. Co., Van Huffer Tube Corp., or approved equal. Conduit clamps shall be stainless steel "Uniclips".

## 2.03 SURGE PROTECTION

Line-to-line and line-to-ground protection shall exceed the requirements of ANSI/IEEE Standard C62.1 Sections 8.6.1 and 8.7.3 by a factor of at least 300%. Voltage clamping time shall be less than five (5) nanoseconds with a maximum surge current of 30,000 RMS at a clamping voltage under 600 VAC. One arrester, complete with circuit breaker disconnect is to be supplied on the incoming line to the control system. Arresters shall be Ingram Products, Joslyn or approved equal.

## 2.04 PHASE MONITOR

Phase Monitor shall be a three-phase monitor and supplied on the incoming line. The phase monitor shall prevent motors starting on the following conditions: overvoltage, undervoltage, phase reversal, phase imbalance and loss of phase. The phase monitor shall have integral fault light and dry contact for alarm indication. Phase monitor shall be Timemark, Potter-Brunfield, ATC Diversified Electronics or approved equal, fused on line side and disconnect only for 3 phase equipment.

## 2.05 GROUND RODS

Ground Rods shall be copper clad steel rods, 5/8-inch diameter by 10 feet long, approved for that use.

## 2.06 CABLE AND WIRE

- A. Cable and Wire shall be plainly marked with the manufacturer's name, year of manufacture, and type of cable. All conductors shall be copper unless otherwise specified.
- B. All cable shall be manufactured in strict accordance with the specifications and the applicable IPCEA, NEMA, IEEE, UL, and ANSI standards, by a manufacturer with at least 5 years of experience in cables of this type.
- C. All cable and wire shall be suitable for wet locations.
- D. 600 volt class cable shall be Class B, heat and moisture resistant thermoplastic type THW rated 75° C, maximum conductor temperature in wet or dry locations, with copper conductors. No. 10 and smaller may be single strand, No. 8 through No. 2 shall be 7 strand and No. 1 through 4/0 shall be 19 strand and 250 MCM through 500 MCM shall be 37 Strand.

## 2.07 LUGS

All power cables of any voltage class shall be terminated with tinned copper indentation-type lugs. The lugs shall be Bundy type YA, T & B, or equal, long barreled, with double indentations in the larger sizes. Two hole lugs shall be used where possible. The Contractor shall be responsible for compatibility between hole size and spacing on the lugs and on the equipment furnished.

## 2.08 PULLING COMPOUND

Pulling Compound, if used, shall conform to the recommendations of the wire manufacturer.

## 2.09 CONDUIT, FITTINGS AND WIREWAY

- A. General: Conduits, fittings and wireway shall be sized in accordance with the National Electrical Code, where sizes are not shown on the Plans. Conduit smaller than 3/4-inch shall not be used. If protected from mechanical damage, PVC conduits with factory made elbows can be installed exposed inside the dry well
- B. Metallic conduits shall be heavy walled, threaded and rigid. Galvanized steel conduit shall be used where it is embedded in concrete and/underground runs, and aluminum conduit shall be used for exposed runs.
  - 1. Galvanized Steel Conduit shall be hot-dip galvanized, inside and outside, after threading, and shall conform to Federal Specification WW-C581. Buried conduit shall be coated with two coats of Carbolite Bitumastic 50, or equal.
  - 2. Aluminum Conduit shall contain less than 0.1 percent copper, and shall conform to Federal Specification WW-C-540C. It shall be as manufactured by Kaiser Aluminum and Chemical Corporation, Triangle, or approved equal. Alcoa thread lubricant shall be used on all aluminum threads.
- C. Flexible Conduit shall be "Sealtite" flexible, liquid tight conduit, as manufactured by the American Brass Company, Bridgeport, Connecticut, the equivalent by O-Z/Gedney, or equal.

- D. PVC Conduit shall be Type 40, heavy-walled rigid, rated for 90 degree C cables as manufactured by Carlon or approved equal.
- E. Conduit Fittings and Device Boxes embedded in concrete shall be galvanized cast "Feraloy" FD series, by Crouse-Hinds. Device boxes, condulets, clamps, and other fittings in aluminum conduit runs shall be copper-free, cast aluminum. Condulets shall be oversize, and device boxes shall be FD series cast aluminum with die cast aluminum covers, by Crouse Hinds, Appleton, or equal.
- F. Wall Sleeves for Conduit shall be O.Z., positive, watertight through wall entrance fittings, FSK Series, Crouse-Hinds, or equal.
- G. Entrance Seals shall be O.Z. type CSBG, Crouse-Hinds, or equal.
- H. Rigid Conduit Straps and Clamp Backs of cast aluminum such as EFCOR 233 AL, Appleton, or equal, shall be used in attaching conduit to concrete surfaces where channels and clamps are not used.
- I. Conduit Bushings shall be insulated metallic bushings by T & B, O.Z., or approved equal, except where grounding bushings are required.
- J. Conduit Sealing Fittings shall be Crouse-Hinds, type GUAB, with sealing covers, or approved equal.
- K. Wireways shall be of the size required plus no less than 50% of spare capacity, made of 12 gauge aluminum with hinged spring-latched covers, and painted to protect against corrosion. The Contractor shall furnish all necessary bends, couplings and connectors. Interior parts shall be smooth, free of sharp edges and burrs. Use grounding type locknut and copper bond wire to make wireway and attached conduits electrically continuous. Slip-fasteners are not acceptable for this purpose. Wireways shall be type HW as manufactured by General Metals, Inc., Square D, or approved equal.

## 2.10 SWITCHES AND COVERS

- A. Light Switches shall be rated 20 amp, 120/277 volt AC, for tungsten or inductive load, Hubbell 1221 and 1223, Leviton, or approved equal.
- B. Weather proof Switch Covers shall be Crouse-Hinds DS185-SA, Appleton, or approved equal, copper-free aluminum.
- C. Explosion-Proof Switches shall be rated 20 amp, 125 volts AC with front operating handle, Appleton Cat. No. EFS175-FL, Crouse-Hinds, or approved equal.
- D. Safe-Run Switches shall be 2 position, double pole, single throw, maintained contact, selector switch in NEMA-4 enclosure, General Electric AJ201C or approved equal.
- E. Safety Disconnect Switches shall be heavy duty Type A, quick-make, quick-break,

horsepower rated, with external operating handle interlocked to prevent opening of the cover unless it is in the "off" and "open door" position. Switch shall be manufactured by Square D, Westinghouse, or approved equal.

- F. Mercury Float Switch shall have molybdenum contacts sealed in a doublewalled float of plastic material resistant to inorganic salt solutions, alkalis, and mineral acids. The electrical cable shall be two conductors with neoprene jacket and shall run unspliced to the Control Cabinet. Switch shall be Enpo-Cornell Pump Co. or equal.
- G. Limit Switch shall be heavy duty Square D Class 9007 or approved equal with 2 N.O. and 2 N.C. contacts.

## 2.11 RECEPTACLES AND COVERS

- A. Outlets shall be 125 volt, 20 amp, grounding type, duplex receptacle specification grade, Hubbell 5362, Leviton, or approved equal.
- B. Weatherproof Switch Covers shall be Crouse-Hinds DS185-SA, equivalent by Appleton, or approved equal, copper-free aluminum, gasketed cover.
- C. Receptacle for Emergency Power shall be 4 wire, 4 pole with angle adapter and screw cover, Russell Stoll, Catalog numbers as indicated below for the different services, or approved equal:
  - JRSA 2034 DR45 for 240 volts
  - JRSA 2034 HR45 for 480 volts
- D. Ground Fault Protected Receptacles shall be Class A, 120 Volt, duplex 20/20A NEMA 5-20R, Square D Catalog GDFR-120BC or approved equal.

## 2.12 LIGHTING FIXTURES

The Contractor shall provide lighting fixtures equipped with lamps and where size is not specified, use the largest lamp for which the fixture is rated. The Contractor shall supply a minimum of 100 percent extra bulbs for the entire Project.

- A. High Pressure Sodium Fixtures shall be wall mounted with cast aluminum housing, Lexan refractors, and reactor type ballasts. The Contractor shall provide each fixture with a photoelectric control, by General Electric, Type C583N510, or approved equal.
- B. Fluorescent Fixtures shall be vapor and dust-tight, fiberglass-reinforced polyester housing with prismatic acrylic lens, and stainless steel latches and exterior hardware. They shall be fitted with two F32T8 lamps and electronic ballast, shall be 120 volt rapid start. The fixtures shall be Crouse-Hinds Catalog No. NFL-4232/120, or approved equal.

## 2.13 PANELBOARD

The Contractor shall provide panel board with the voltage, phases and amperage required, with main and branch breakers ambient-compensated. It shall provide for a minimum of 20% spare

space. Panels shall have neutral and equipment grounding bus and shall be Square D, Westinghouse or approved equal.

#### 2.14 TRANSFORMER

Transformer shall be 480 volt to 120/240 volt, single phase, 60 hertz, 3KVA for submersible stations and 7-1/2 KVA, minimum, for dry well/wet well stations. It shall be high efficiency Square "D" Model 9070E01D1, or approved equal, with two 5% taps below normal, weatherproof for indoor or outdoor service.

#### 2.15 PULL BOX

Pull box shall be welded aluminum, 12 gauge, with hinged cover, minimum dimensions of 12 inch x 12 inch x 6 inch, without knockouts, anodized and painted, as manufactured by General Metals, Inc., Hoffman, or approved equal.

#### 2.16 LIGHTNING ARRESTER

Lightning arrester shall be 3-pole, 650 volt, thyrite secondary arrester, General Electric type 9L15BCC008, Westinghouse 634A217AO1, or approved equal.

#### 2.17 SURGE CAPACITOR

Surge capacitor shall be a 3-pole, 650 volt, 1.0 mfd. capacitor. It shall be a General Electric Type 9L18ABB301, equivalent by Westinghouse, or equal.

### **PART 3 - EXECUTION**

#### 3.01 GENERAL

- A. All electrical work shall comply with the applicable rules of the National Electrical Code, the National Fire Protection Association, and the Florida Building Code, and shall be in accordance with the requirements of OSHA, and the best commercial and industrial practice. Conduit and cable shall be sized as specified in the National Electrical Code, where sizes are not shown on the Plans.
- B. All electrical wiring, regardless of voltage classes, shall be installed in rigid conduit, except where shown otherwise on the Plans. No conduit installed shall be smaller than 3/4 inch IPS and no wire smaller than AWG #12, except as otherwise shown on the Plans, specified herein, or authorized by the Engineer of Record with the Town's approval.
- C. In some cases, the exact requirements must be determined from the shop drawings of the equipment furnished by the Contractor. Changes required by the Contractor for furnished equipment shall be the Contractor's responsibility. Materials or equipment damaged in the course of installation or test shall be replaced or repaired to the satisfaction of the Town.

#### 3.02 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Electrical service shall be built to Florida Power & Light Standards.

### 3.03 INSTALLATION

- A. The Contractor shall upgrade sump pump electrical feed with uninterrupted line from dry pit sump pump to 6P junction box mounted in the dry pit, and uninterrupted line from 6P junction box to new, contractor installed, GFI breaker in control panel.
- B. Two (2) centrifugal pumps shall be installed in the dry pit and hard-wired to the control cabinet to replace two (2) existing centrifugal pumps.
- C. One (1) exhaust blower shall be installed in the dry pit and hard-wired to the control cabinet to replace existing exhaust blower.
- D. One (1) pressure transducer shall be installed in the dry pit and hard-wired to the control cabinet to replace existing transducer.

### 3.04 CONDUIT INSTALLATION

- A. The Plans are generally indicative of the work to be installed, but do not show all bends, fittings, boxes, and specialties which may be required or the exact location of all conduits. The Contractor shall carefully investigate the site and conditions affecting all of his work and arrange his work accordingly. Any changes from locations shown on the Plans must be approved by the Town.
- B. Conduits shall be installed in such a manner that wires may be removed and replaced at a later date and to insure against collection of condensation or rainwater. Where bends are made, they shall be made with an approved conduit bending machine. Crushed or deformed conduit shall not be used.
- C. All conduit ends shall be square cut and reamed to remove burrs. Running threads will NOT be permitted. Approved couplings shall be used. All conduit joints shall be made up wrench tight, using strap wrenches, and shall be made waterproof in such a manner as not to interrupt the electrical bonds.
- D. As soon as installed, all open conduit ends, including those terminating in boxes, shall be plugged or capped and so maintained during construction to prevent the entrance of moisture and dirt. All conduit shall be carefully cleaned and dried inside before the installation of wire.

### 3.05 GROUNDING

- A. All grounding shall comply with the requirements of the National Electrical Code and all local Codes having jurisdiction.
- B. The ground system shall be composed of at least two 5/8" diameter x 10 feet long copper clad ground rods, spaced a minimum of six (6) feet apart. Ground rods shall also be connected to rebar in slab. Make all connections with #6 bare copper wire.
- C. Maximum ground resistance shall not exceed 25 ohms under normal dry conditions. Additional ground rods shall be driven if required to maintain this level.

- D. All electrical equipment, structural steel, guard rails, and other metallic objects shall be connected to the above-mentioned ground system
- E. Provide a warning ribbon installed at 12" depth in the ground above the ground loop conductor.

### 3.06 NEUTRALS

Each circuit which requires a neutral conductor shall have its own individual neutral conductor, contained in the same enclosure.

### 3.07 TESTING

All circuits and motors shall be megged, and the voltage and current load on each circuit shall be checked. Two copies of the results shall be furnished to the Town before acceptance of the work.

### 3.08 AS-BUILT/RECORD DRAWINGS

As the construction of the Project progresses, at no longer than monthly intervals, or shorter times if so ordered by the Engineer; the Contractor shall submit As-Built/Record drawings showing all work performed in the preceding time interval. The drawings shall be submitted for approval of the Town, and if not timely submitted and thereafter approved, the work of said time period will not be accepted. Drawings shall conform with the requirements of Sections 01031, "Grades, Lines and Levels" and 01720 "Project Record Documents". All electrical, control and communication equipment and underground electrical conduits and ducts shall be accurately located, sized, with cover or elevation shown, and identified.

END OF SECTION

## **SECTION UC-630 - PUMP STATION TESTING**

### **PART 1 - GENERAL**

#### 1.01 SCOPE

The Contractor shall test sewage pump station, to the complete satisfaction of the Engineer prior to final acceptance by the Town.

### **PART 2 - PRODUCTS**

(Not Used)

### **PART 3 - EXECUTION**

#### 3.01 GENERAL

- A. The Town's authorized representative together with the Engineer of Record and the Contractor shall jointly be present to witness tests for determination of conformance with approved plans and specifications.
- B. The Contractor shall notify the Town a minimum of forty-eight (48) hours in advance of the test.

#### 3.02 PROCEDURE FOR TESTING SEWAGE PUMP STATION

The Contractor shall be responsible for testing the pump station in the manner described below:

- A. Place the operating mode selector switch in the manual position.
- B. Fill wet well with water.
- C. Start and stop each pump sequentially and then both pumps together. While doing this, add water to the wet well as necessary.
- D. With water level lower than pump's "shut-off" point, place selector switch to automatic position.
- E. Fill wet well slowly. Observe lead pump run.
- F. Increase water flow into wet well for lag pump to run.
- G. Stop pouring into wet well and observe as both pumps shut off at the pre-selected levels.

- H. Disconnect power to pumps and fill wet well to alarm level and make sure it operates.
- I. Disconnect level controller and check that the lead pump is turned "on" and "off" at the proper levels by the float switches.
- J. If the station is equipped with a stationary generator and fuel tank, test.
- K. If the above parts of the test show that any component is not operating as intended, make necessary adjustments and/or repairs and repeat steps A through J, until the entire system operates trouble free.
- L. Fill the wet well with water to the invert of the influent pipe. Leave it full of water for at least two (2) hours. If the water level goes down, locate and repair the leak to the satisfaction of the Town. Repeat test to insure absence of leaks.

**END OF SECTION**