

## **SECTION 01200 SODDING**

### **PART 1 - GENERAL**

#### **1.01 Scope**

It is the intent of these specifications to provide supplemental information to the content of the construction drawings on the quality of materials, execution, measurement, etc. These specifications are general in nature and may contain products and requirements which are not applicable to the project. Discrepancies between these specifications and the construction drawings, either imagined or real, shall be brought to the attention of the County for clarification.

#### **1.02 Description of Work**

Sodding includes, but is not limited to, ground preparation, fertilization, sodding, watering, mowing and maintenance as required to promote growth.

#### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing: An independent testing and inspection service will not be required for the work of this section.
- C. Inspection: Inspection shall be performed by the County or an independent inspector hired by the County
- D.

Inspection: Inspection shall be performed by the County or an independent inspector hired by the County.

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**PART 2 — MATERIALS**

**2.01 Sod**

Grass sod shall be Bermuda, Centipede or St. Augustine as shown on the plans or as selected by County, and shall be well matted with grass roots. The sod shall be harvested in rectangles, preferably 12 inch by 24 inch, shall be a minimum of two inches in thickness and shall be live, fresh and uninjured at the time of planting. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted. Dumping from vehicles will not be permitted. Damaged sod will be rejected. Replanting shall be done within 48 hours after time of harvesting or sod shall be kept damp until planted.

**2.02 Water**

The water used in the grassing operations may be obtained from any approved spring, pond, lake, stream, or metered municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalines or any substance which might be harmful to plant growth or obnoxious to traffic. Saltwater shall not be used.

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**PART 3 — EXECUTION**

**3.01 Construction**

- A. General: The limits of sod shall be as shown on the drawings, described herein or as directed by the County. Areas which are disturbed due to construction activities but which are not shown within the limits of sod shall be stabilized in accordance with this specification at no cost to the County. In these areas the County shall reserve the right to determine which method and materials shall be used for stabilization.
- B. Preparation of Ground: The area over which the sod is to be planted shall be scarified or loosened to a suitable depth and then raked smooth and free from rocks or stones. Where the soil is sufficiently loose, the County, at their discretion, may authorize the elimination of ground preparation. No subsequent operations shall be commenced until the County has approved the condition of the prepared areas. Water the soil before planting sod.
- C. Fertilization:
1. Fertilizer shall be spread at a rate per thousand square feet of area, in accordance with the following table:

5N-10P-5K: 30 LBS.	8N-8P-8K: 20 LBS.
6N-12P-2K: 25 LBS.	10N-6P-4K: 15 LBS.
7N- 7P-6K: 22 LBS.	10N-5P-5K: 15 LBS.
  2. Fertilizer shall be mixed in the soil to a depth of at least two inches by disking or harrowing.
- D. Sodding:
1. Soft spots and inequalities in grade shall be corrected before starting sod work.
  2. Lay sod without voids, tamp or roll. Broom screen topsoil over entire area. Sod shall be thoroughly watered. The surface shall be true to finished grade lines, even and firm at all points.
  3. Place sod with staggered joints closely butted, tamped or rolled to an even surface to the required finished grade. Avoid continuous seam along line of water flow in swales. Place sod in rows at right angles to slope.
  4. In areas with slopes steeper than 4:1, the Contractor shall use sod staples, wooden stakes or other means approved by the County, to prevent movement of the sod during rainfall events.
- E. Watering: The areas on which the sod is to be placed shall contain sufficient moisture, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the root zone for at least two weeks.

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Thereafter, the Contractor shall apply water as needed until the sod takes root and starts to grow. It is the Contractor's responsibility to furnish water for preparation, installation and maintenance of sod.

### **3.02 Maintenance**

- A. The Contractor shall at his expense maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include mowing, repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
- B. Replanting or repair necessary due to the Contractor's negligence, carelessness or failure to provide routine maintenance shall be at the Contractor's expense. Replanting necessary due to factors determined to be beyond the control of the Contractor shall be paid under the appropriate contract pay items.

### **3.03 Guarantee**

- A. The Contractor shall guarantee all sodding for the duration of the project and for a minimum period of 90 days should the sodding occur near the completion date. During the guarantee period, the Contractor shall replace at no cost to the County, any sod required under the Contract that is poor sod, dies or is not established 90 days after sodding if the causes for such defects are traced to negligence or poor workmanship by the Contractor.
- B. Any sod missing or defective due to the Contractor's negligence shall be furnished or replaced in a manner satisfactory to the County. In case of any doubt as to the condition and satisfactory establishment of the sod, the County may allow the sod to remain through another 60 day establishment after which time the sod in question, if found to be dead or in an unhealthy or badly impaired condition, shall be replaced by the Contractor at no cost to the County.

### **3.04 Testing And Inspection Requirements**

- A. Areas to receive sod will be subject to a visual inspection by the County upon completion of ground preparation and prior to placement of sod.

- B. Upon completion of sodding and prior to commencement of the guarantee period, the area will be subject to a visual inspection by the County.

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- C. At the end of the guarantee period, final inspection of the sod will be made by the County upon written notice requesting such inspection submitted by the Contractor at least three days before the anticipated inspection. All defects discovered shall be repaired or replaced by the Contractor before final acceptance..

END OF SECTION

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## **SECTION 01300 GRASS (BY SEEDING)**

### **PART 1 — GENERAL**

#### **1.01 Scope**

It is the intent of these specifications to provide supplemental information to the contents of the construction drawings on the quality of materials, execution, measurement, etc. These specifications are general in nature and may contain products and requirements which are not applicable to the project. Discrepancies between these specifications and the construction drawings, either imagined or real, shall be brought to the attention of the County for clarification.

#### **1.02 Description of Work**

Seeding includes, but is not limited to: Ground preparation, fertilization, seeding, erosion control, rolling, and watering as required to provide a healthy stand of grass.

#### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Inspection shall be performed by the County.
- C. It will be the responsibility of the Contractor to coordinate all inspections. The Contractor shall notify the County and applicable agency inspectors 48 hours in advance of inspections.

#### **1.04 Submittals**

- A. The following shall be submitted to the County for approval:
  - 1. Proposed seed mixes.

2. Manufacturer's data and installation procedures for erosion control blanket.

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**SECTION 01300  
GRASS (BY SEEDING)**

**PART 2 - MATERIALS**

**2.01 Seed**

A. General

1. All seed shall meet the requirements of State Department of Agriculture and Consumer Services and all applicable State laws and shall be approved by the County before being sown. The seed shall have been harvested from the previous year's crop.
2. When a low percentage of grass seed or native seed germination causes the quality of the seed to fall below the minimum pure live seed percentage as specified below, the Contractor may elect, subject to the approval of the County, to increase the rate of application sufficiently to obtain the minimum germination rate specified. No additional payment will be made for the added seed.

B. Grass Seed

1. Each of the species or varieties of seed shall be furnished and delivered in separate labeled bags. During handling and storage, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents and other causes.
2. All permanent and temporary grass seed shall have been tested within a period of six months of the date of planting.
3. All permanent and temporary grass seed shall have a minimum percent of purity and germination as follows:
  - a. Argentine Bahia Grass Seed shall have a minimum pure seed content of 95% with a minimum germination of 80% (use only when approved in writing).
  - b. Pensacola Bahia Grass Seed shall have a minimum pure seed content of 95% with a minimum active germination of 40% and a total germination of 80% including firm seed (use only when approved in writing).
  - c. Bermuda Grass Seed shall be of common variety with a minimum pure seed content of 95% with a minimum germination of 85%.
  - d. Annual Type Rye Grass Seed shall have a minimum germination of 90%.
  - e. Millet Seed shall be of the Brown Top variety with a minimum pure seed content of 90% with a minimum germination of 85% (use only when approved in writing).

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## **SECTION 01300 GRASS (BY SEEDING)**

### **2.02 Mixture**

Grass seed shall be a mixture of 15 parts of rye, depending on season, and 85 parts of Bermuda or other types of grass and mixes as selected by the County. The separate types of seed used shall be thoroughly dry mixed immediately before sowing. Seed which has become wet shall not be used. The Contractor shall submit for review and approval by the County mix designs prior to construction.

### **2.03 Mulch**

#### **A. Dry Mulch**

1. The mulch material used shall normally be dry mulch. Dry mulch shall be straw or hay, consisting of oat, rye or wheat straw, or of pangola, peanut, or coastal Bermuda grass hay.
2. Only un-deteriorated mulch which can be readily cut into the soil shall be used.

#### **B. Green Mulch**

1. Green mulch shall consist of live coastal Bermuda, or other approved type of grass, and shall be free from weeds and obnoxious or undesirable grasses.
2. No green mulch which, in the County's opinion, has been allowed to become sufficiently dry as to lose its growth producing benefits will be allowed to be used.

- C. In the event that the subsequent stand of grass is found to be contaminated with weeds or other obnoxious or undesirable growth, and it can be determined that such growth was introduced with the green mulch, then the Contractor will be required to effectively eliminate such undesirable growth at his own expense.

### **2.04 Erosion Control Blanket**

Erosion control blanket shall be "Curlex" as manufactured by American Excelsior, Type SC150 as manufactured by Tensar/North American Green, or approved equal, unless noted otherwise on the plans.

### **2.05 Commercial Fertilizer**

- A. Commercial fertilizers shall comply with the state fertilizer laws.
- B. The numeral designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.

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GRASS (BY SEEDING)**

- C. Type I fertilizer (as hereinafter specified) shall be used unless Type II fertilizer or another designation is specifically called for on the Drawings or authorized by the County. Liquid fertilizer will not be permitted.
- D. Type I Fertilizer: The chemical designation of this fertilizer shall be 12-8-8 with at least 50% of the nitrogen from a non-water-soluble organic source. The nitrogen source may be a urea-formaldehyde source provided it is not derived from a waste product of the plastic industry.
- E. Type II Fertilizer: The chemical designation of this fertilizer shall be 12-12-8 with at least 50% of the nitrogen shall be from a urea-formaldehyde source and at least 50% of the phosphoric acid shall be from regular superphosphate.

**2.06 Water for Grassing**

The water used in the grassing operations may be obtained from any approved spring, pond, lake, and stream or metered municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalis or any substance which might be harmful to plant growth or obnoxious to traffic. Saltwater shall not be used.

**2.07 Equipment**

- A. Fertilizer Spreader: The device for spreading fertilizer shall be capable of uniformly distributing the material at the specified rate.
- B. Seed Spreader: The seed spreader shall be an approved mechanical hand spreader or other approved type of spreader.
- C. Equipment for Cutting Mulch into Soil: The mulching equipment shall be capable of cutting the specified materials uniformly into the soil and to the required controlled depth. Harrows will not be allowed.
- D. Rollers: A cultipacker, traffic roller or other suitable equipment will be required for rolling the grassed areas.

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**SECTION 01300  
GRASS (BY SEEDING)**

**PART 3 — EXECUTION**

**3.01 Construction**

- A. General: Fertilizing, seeding or mulching operations will not be permitted when wind velocities exceed 15 miles per hour. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is unduly wet or otherwise not in a tillable condition.
- B. Sequence of Operations: The several operations involved in the Work shall proceed in the following sequence: Fertilizing and preparation of the ground, seeding, erosion control and rolling. Erosion control shall consist of spreading and cutting in of mulch or application of erosion control blanket.
- C. Preparation of Area to be seeded: The ground to be seeded shall be prepared by disc harrowing and thoroughly pulverizing the soil reasonably smooth. It shall be reasonably free of large clods, roots and other material which will interfere with the Work and subsequent mowing and maintenance operations. No subsequent operations shall be commenced until the County has approved the condition of the prepared areas.
- D. Application of Fertilizer: The fertilizer shall be spread uniformly over the area to be seeded, at the rate of 500 to 600 pounds per acre. On steep slopes or other areas where machine spreading may not be practicable, the spreading may be done by hand. Immediately after the fertilizer is spread it shall be mixed with the soil to a depth of approximately four inches.
- E. Seeding
  - 1. While the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area at a rate of 80 pounds per acre.
  - 2. The seed shall be immediately mixed into the seed bed to a depth of one-half inch. The Contractor may mix the fertilizer and seed into the seed bed in one operation.
  - 3. When so directed by the County, seed of an approved quick growing species of grass, such as rye, Italian rye, millet or other cereal grass, shall be spread at a rate of 30 pounds per acre in conjunction with the permanent type seed mixture.
- F. Mulching: Approximately two inches, loose thickness, of the mulch material shall be applied uniformly over the seeded area, and the mulch material cut into the soil with the equipment specified so as to produce a loose mulched thickness of three inches to four inches. Care shall be exercised so the materials are not cut too deeply into the soil.

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## **SECTION 01300 GRASS (BY SEEDING)**

When green mulch is used it shall be incorporated into the soil not later than two days after being harvested and no artificial watering of the mulch shall be done before it is applied.

- G. Erosion Control Blanket: For slopes 4:1 or greater an erosion control blanket will be used in lieu of mulching unless noted otherwise on the plans or at the discretion of the County. Blankets shall be laid and stapled in accordance with the manufacturer's recommendations.
- H. Rolling: Immediately after completion of the seeding, the entire seeded and mulched area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required. For areas which will receive an erosion control blanket in lieu of mulch areas shall be rolled prior to installation of blanket.
- I. Watering: The seeded areas shall be watered so as to provide optimum growth conditions for the establishment of the grass. In no case, however, shall the period of maintaining such moisture be less than two weeks after the planting.

### **3.02 Maintenance**

- A. The Contractor shall at his expense maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include mowing, and the filling, leveling and repairing of any washed or eroded areas, as may be necessary. The County, at any time, may require replanting of areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
- B. If a planted area must be replanted due to the Contractor's negligence, carelessness or failure to provide routine maintenance of such area, such replacement shall be at the Contractor's expense. If replanting is necessary due to factors determined to be beyond the control of the Contractor, payment for replacement will be made under the appropriate contract pay item(s).

### **3.03 Guarantee**

- A. The Contractor shall guarantee all seeded areas for the duration of the project and for a minimum period of 90 days, should seeding occur near the completion date. During the guarantee period, the Contractor shall replace at no cost to the Owner, any grass required under the Contract that dies or is not established 90 days after seeding, if the causes for such defects are traced to negligence or poor workmanship by the Contractor.

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**SECTION 01300  
GRASS (BY SEEDING)**

- B. Any grass missing or defective due to the Contractor's negligence shall be furnished or replaced in a manner satisfactory to the County. In case of any doubt as to the condition and satisfactory establishment of the grass, the County may allow the seeded area to remain through another 60 day establishment period, after which time the grass in question, if found to be dead or in an unhealthy or badly impaired condition, shall be replaced by the Contractor at no cost to the County.

**3.04 Inspection Requirements**

- A. Areas to receive seed will be subject to a visual inspection by the County upon completion of ground preparation and prior to placement of seed and mulch or erosion control blanket.
- B. Upon completion of the grassing and prior to commencement of the guarantee period, the area will be subject to a visual inspection by the County.
- C. At the end of the guarantee period, final inspection of the grassed area will be made by the County upon written notice requesting such inspection submitted by the Contractor at least three days before the anticipated inspection. All defects discovered shall be repaired or replaced by the Contractor before final acceptance.

END OF SECTION

END OF SECTION 01300

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**SECTION 02110**  
**CLEARING AND GRUBBING**

**PART 1 - GENERAL**

**1.01 Scope**

A. Description of Work

1. Provide all labor, material and equipment to perform all clearing and grubbing as required to perform all the construction on the Drawings and as specified herein.
2. Clearing and grubbing includes, but is not limited to, removing from the project site, trees, stumps, roots, brush, structures, abandoned utilities, trash, debris and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures that prevent damage to existing features to remain are part of the work.
3. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

**1.02 Quality Assurance**

The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.

**1.03 Job Conditions**

Location of the Work: The area to be cleared and grubbed is shown schematically on the Drawings or specified below. It includes all areas designated for construction.

**1.04 Protection**

- A. Streets, roads, adjacent property and other works to remain shall be protected throughout the Work, as defined in the General Conditions.
- B. Existing trees, shrubs and bushes:
  1. Trees shall be protected by fencing, barricades, or wrapping as may be required.

2. Shrubs and bushes shall be protected by fences or barricades as may be required.

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**SECTION 02110  
CLEARING AND GRUBBING**

**PART 2 - PRODUCTS**

**2.01 Equipment**

The Contractor shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, tractors, trucks and loader.s.

**PART 3 - EXECUTION**

**3.01 General**

- A. It is the intent of these specifications that all desirable natural growth within the right-of-way and easement areas be preserved where practicable, and that all things which detract from the aesthetic value of the completed work, unnecessarily interfere with construction, or would unnecessarily interfere with future maintenance be removed. The Contractor shall be responsible for preserving all things designated to be salvaged or to remain. In areas where desirable natural growth is designated to remain, the Contractor shall thin or trim shrubbery and live trees to the extent consistent with the intent of these specifications. Use of methods or equipment which might mar or destroy vegetation designated for preservation will not be permitted.
- B. All clearing and grubbing necessary for setting construction stakes shall be completed a satisfactory distance ahead of grading operations.

**3.02 Scheduling of Clearing**

- A. The Contractor shall clear at each construction site only that length of the right-of-way, permanent or construction easement, which would be the equivalent of one month's pipe laying. This length shall be determined from the Contractor's Progress Schedule.
- B. The County may permit clearing for additional lengths of the pipe line provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

- C. A satisfactory stand of temporary grass shall have no bare spots larger than one square yard. Bare spots shall be scattered and the bare area shall not comprise more than one percent of any given area.

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### **3.03 Clearing and Grubbing**

- A. All excavation and embankment areas associated with new structures, slabs, roadway, and general grading areas which are disturbed shall be cleared and grubbed. Each side of a pipeline shall be cleared and grubbed as required.
- B. Surface objects, trees, stumps, roots, grass, weeds, deteriorated vegetation, brush, debris and other protruding or underground obstructions, not designated to remain, shall be cleared and grubbed. Undisturbed stumps and roots and non-perishable solid objects which will be a minimum of three feet below subgrade or slope of embankment may be left when authorized by the County.
- C. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.
- D. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.
- E. Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and thoroughly compacted.
- F. Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.
- G. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as rip rap.
- H. All operations shall be conducted in such a manner as to prevent damage to anything that is to remain on the right-of-way or to adjacent property. The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.
- I. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

- J. All fences adjoining any excavation or embankment that, in the Contractor's opinion, may be damaged or buried, shall be carefully removed, stored and replaced. Any fencing that, in the County's opinion, is significantly damaged shall be replaced with new fence material.
  
- K. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of the construction area but not directly within excavation and/or fill limits. The Contractor shall be held liable for any damage the Contractor's operations have inflicted on such property.

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**CLEARING AND GRUBBING**

3.03 Clearing and Grubbing

All excavation and embankment areas associated with new structures, slabs, roadway, and general grading areas which are disturbed shall be cleared and grubbed. Each side of a pipeline shall be cleared and grubbed as required.

Surface objects, trees, stumps, roots, grass, weeds, deteriorated vegetation, brush, debris and other protruding or underground obstructions, not designated to remain, shall be cleared and grubbed. Undisturbed stumps and roots and

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CLEARING AND GRUBBING**

non-perishable solid objects which will be a minimum of three feet below subgrade or slope of embankment may be left when authorized by the County.

Grubbing shall consist of completely removing roots, stumps, trash and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.

All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and thoroughly compacted.

Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

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## **SECTION 02110 CLEARING AND GRUBBING**

- L. Following the clearing and grubbing operations, the Contractor shall slope the existing ground surface and fill depressions and stump holes to encourage drainage utilizing existing material within the limits of clearing and grubbing and to the specified grades.
- L. After sloping the ground surface to ensure positive drainage over the entire site, the Contractor shall rake the entire area to remove surface roots and objects and to provide a final dressing for the project area.
- M. Low hanging and unsound or unsightly branches on trees or shrubs to remain, but extending over the clearing and grubbing limits shall be trimmed.

### **3.04 Stripping**

- A. Contractor shall remove topsoil prior to the placement of new fill material. The depth of topsoil to be removed shall be that depth required to expose suitable subgrade material.
- B. Contractor shall set aside a sufficient quantity of topsoil material to vegetate those areas requiring topsoil throughout the project. Said stockpile shall be located so as to not interfere with the work in progress. Any additional topsoil generated above and beyond the quantities needed for the project shall be hauled away at the Contractor's expense.

### **3.05 Disposal of Material**

- A. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. A copy of written consent shall be provided to the County for permanent records. In no case shall any material or debris be left on the Project Site, abutting private properties, or buried on the Project Site.
- B. No burning is allowed.
- C. The use of herbicides or blasting in clearing and grubbing is specifically prohibited.

END OF SECTION 02110

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## **PART 1 - GENERAL**

### **1.01 Intent**

The purpose and intent of this act is to provide for increased worker safety by requiring compliance with sufficient standards for trench safety.

### **1.02 Regulatory Requirements**

State Standard: The Occupational Safety and Health Administration's excavation safety standards 29 CFR. s. 1926.650 Subpart P are hereby incorporated as the state standard. The Department of Labor and Employment Security may, by rule, adopt updated or revised versions of those standards, providing that the updated or revised versions are consistent with the intent expressed in this act and Florida State Statute 533.72, and are not otherwise inconsistent with state law. Any rule adopted as provided in this section shall be complied with upon its effective date.

### **1.03 Submittals**

- A. The Contractor who will perform the excavation on the Project shall submit the following:
1. A reference to the trench safety standards that will be in effect during the period of construction of the project.
  2. Written assurance by the contractor performing the trench excavation that such contractor will comply with the applicable trench safety standards.
  3. A separate item identifying the cost of compliance with the applicable trench safety standards. The separate item identifying the cost of compliance with trench safety standards shall be based on the linear feet of trench to be excavated. The separate item for special shoring requirements, if any, shall be based on the square feet of shoring used. Every separate item shall indicate the specific method of compliance as well as the cost of that method.

### **1.04 Compliance**

- A. The Contractor performing trench excavation shall:
1. As a minimum, comply with the excavation safety standards which are applicable to a project.
  2. Adhere to any special shoring requirements, if any, of the State or other political subdivisions which may be applicable to such a project.
  3. If any geotechnical information is available from the County, the contractor, or otherwise, the contractor performing trench excavation shall consider this information in the contractor's design of the trench safety system which it will employ on the project. This paragraph shall not require the County to obtain geotechnical information.

END OF SECTION

## **PART 1 — GENERAL**

### **1.01 Scope**

- A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines and associated structures shown on the Drawings and as specified.
- B. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install pipe and appurtenances in conformance with the lines and grades shown on the Drawings and as specified.
- C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.
- D. The trench zones are divided into five specific areas:
  - 1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization and is required when the native trench bottom is unstable.
  - 2. Bedding: The bedding is directly underneath the pipe and brings the trench bottom to grade. The purpose of the bedding is to provide a firm, stable, and uniform support of the pipe.
  - 3. Haunching: The haunching area begins at the bottom of the pipe and ends at the spring line of the pipe for rigid (DI, RCP) and 6-inches above the top of the pipe for flexible pipe (PVC, HDPE, FRP). This area is important in terms of limiting pipe deflection.
  - 4. Initial Backfill: The area above the haunching material and below a plane 12 inches above the top of the barrel of the pipe.
  - 5. Final Backfill: The area above the initial backfill to a level below that required for the trench/roadway restoration.
- E. The choice of method, means, techniques and equipment rests with the Contractor, subject to the approval of the County. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, and the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way and prevailing practice in the area.

### **1.02 Description of Work**

Excavation, trenching, and backfilling for utility systems.

### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable codes and requirements of governing authorities having jurisdiction.
- B. Testing and Inspection
  1. Contractor must employ, at Contractor's expense, an independent testing laboratory approved by the Owner.
  2. Contractor will engage a geotechnical firm with a certified testing laboratory for quality control testing during earth work operations.
  3. It will be the responsibility of the Contractor to coordinate all testing and inspections. The Contractor shall notify the Owner's Engineer, testing service, and applicable agency inspectors 48 hours in advance of testing and inspections.
  4. The geotechnical firm will submit the following reports directly to Engineer: Test reports on borrow material; field density; optimum moisture-maximum density curves; graduation curves.
  5. Density: All references to "maximum dry density" shall mean the maximum dry density defined by the "Maximum Density-Optimum Moisture Test", ASTM D 698, except that for non-cohesive materials "maximum dry density" shall mean the maximum index density as determined by the "Maximum Index Density of Soils Using a Vibratory Table", ASTM D 4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet the requirements of ASTM D 1556, "Density and Unit of Soil in Place by the Sand Cone Method", ASTM D 2937, "Density of Soil in Place by the Drive-Cylinder Method" or ASTM D 6938, "In - Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (shallow depth)".
  6. All costs associated with compaction testing ordered by the County shall be paid for by the Contractor. The extent of testing required shall be reasonable, but shall also be dependent upon soil conditions, Contractor's means and methods of operation, and regulatory requirements. As a minimum, compaction tests shall be performed in alternating fill lifts at a single location per each 500 LF of pipeline or 750 square yards of excavation, but in no case less than 3 test locations.

### **1.04 Safety**

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226. The Contractor is responsible for safety.

### **1.05 Job Conditions**

#### **A. Site Information**

1. Any data provided regarding subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn by Contractor from data provided by the County.
2. Any data provided is made available for convenience of Contractor.
3. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

#### **B. Underground Utilities**

The plans show certain features of topography and certain underground utilities, but they do not purport to show in complete detail all such lines or obstructions. Such topography and notes on the plans were inserted from records available are for the Contractor's convenience only, and shall not be used as a basis for claims of extra compensation. Whenever necessary to determine the location of existing pipes, valves, or other underground structures, the Contractor shall examine all available records and shall make all explorations and excavations for such purpose. Any damage to existing facilities resulting from the Contractor's operations shall be immediately repaired by the Contractor at no cost to the Owner.

#### **C. Existing Utilities**

1. The Contractor shall be responsible to locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate fully with Owner and utility companies in keeping respective services and facilities in operation.

3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others during occupied hours, except when

permitted in writing by Engineer, and then only after acceptable temporary utility services have been provided. Provide minimum of 48 hours' notice to Engineer and receive written notice to proceed before interrupting a utility.

4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

D. Protection of Persons and Property

1. Open excavations occurring as part of this work shall be barricaded and posted with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
3. Perform excavation by hand within drip line of large trees to remain and protect the root system from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap.

## **PART 2 — MATERIALS**

### 2.01 Soil Materials

#### A. Definitions:

1. Satisfactory soil materials are defined as those complying with AASHTO soil classification groups A-1, A-2-4, A-2-5, A-3.
2. Unsatisfactory soil materials are defined as those complying with AASHTO soil classification groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7.
3. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials, and stones larger than two inches.
4. Unyielding material shall consist of rock and gravelly soils with stones greater than three inches.
5. Unstable material shall consist of material too wet to properly support the utility pipe, conduit, or appurtenance structure.

B. Bedding, Haunching, and Initial Backfill Material: Satisfactory soil materials free of clay, rock, or gravel larger than one inch in any dimension, debris, waste, vegetable, and other deleterious matter and less than 15% passing No. 200 sieve.

C. Final Backfill Material: In areas not subject to vehicular or pedestrian traffic, the final backfill material shall be general excavated earth materials, and shall not contain cinders, stumps, limbs, man-made wastes, other materials and shall not contain more than 33% broken rock, of which no stone or boulder shall weight more than 50 pounds. If materials excavated from the trench are not suitable for use as final backfill material, as determined by the County, provide select material conforming to the requirements of this Section. In areas where the backfill is beneath a roadway or sidewalk and subject to vehicular or pedestrian traffic, the backfill shall meet the requirements for select backfill.

D. Trench Foundation Material: Crushed stone shall be utilized for trench foundation (trench stabilization) and shall conform to the Florida Department of Transportation Specification 900 with the exception that slag or crushed slag shall not be used. Stone sizes shall be No. 57 sieve.

E. Select Backfill Material: Select backfill shall be materials which meet the requirements as specified for bedding, haunching and initial backfill, including compaction requirements.

F. Select Granular Material: Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag

composed of hard, tough, and durable particles and shall contain no more than 10% by weight of material passing a No. 200 mesh sieve and not less than 95% by weight passing the one inch sieve. The maximum allowable aggregate size shall be one inch or the maximum size recommended by the pipe manufacturer, whichever is smaller.

- G. Concrete: Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of no less than 3,000 psi, with no less than 5.5 bags of cement per cubic yard and a slump between 3 and 4 inches. Ready mixed-concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A-615, Grade 60.

## **PART 3 — EXECUTION**

### **3.01 Excavation**

- A. Excavation includes excavation to the required subgrade elevations and includes excavation of pavements and other obstructions visible on ground surface, underground structures, utilities, and other items indicated to be demolished and removed, together with earth and other materials encountered.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.
- C. Unsuitable Materials: Where muck, rock, clay or other material within the limits of the roadway or other utility work is unsuitable (unsatisfactory soils and materials) in its original position, the Contractor shall excavate each material to the cross sections indicated on the plans or as directed by the Engineer. The unsuitable material shall be disposed off-site in accordance with applicable codes and regulations and the excavated area backfilled with suitable material to the lines, grades, and elevations indicated on the plans or as directed by the Engineer.
- D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or instability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- E. Dewatering:
  - 1. Excavation shall be free from water, at Contractor's expense, before bedding, pipe, or structures are installed. To insure that bottom of trench can be adequately compacted, maintain groundwater level two feet below bottom of trench.
  - 2. Provide all necessary pumps, under drains, well point systems, and other means for removing water from trenches and other parts of the work. Continue de-watering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench and so that it is above the natural water table.
  - 3. Water from the trenches and excavations shall be disposed in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of same by the public.

4. The Contractor is responsible for obtaining any FDEP permits required for dewatering.

F. Trench Excavation:

1. Top Soil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the non-paved, finished grading areas.
2. Trenches shall be excavated to the lines and grades shown on the Drawings with the centerlines of the trenches on the centerlines of the pipes.

G. Trench Width for Pipelines:

1. The sides of all trenches shall be as vertical as is practical from the bottom of the trench to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.
2. Excavate the top portion of the trench to any width within the construction easement or right-of-way, at Contractor's expense, which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.
3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 6 inches clearance between the rock and any part of the pipe or appurtenance.

H. Depth:

1. The trenches shall be excavated to the required depth or elevation which allows for the placement of the pipe and bedding to the proposed grade or to provide minimum cover.
2. For sanitary sewer force mains, re-use water mains and potable water mains excavate trenches to provide a minimum cover of 36-inches. Within the right-of-way of highways, streets or roadways; also excavate to place the top of the pipe a minimum of 36-inches below the nearest pavement edge or drainage ditch.
3. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.
4. Where rock is encountered in trenches for pipelines, excavate to the minimum depth which will provide clearance below the pipe barrel of 8-inches for pipe 21-inches in diameter and smaller and 12-inches for larger pipe, valves and manholes. Remove boulders and stones to provide a minimum of 12-inches clearance between the rock and any part of the pipe, manhole or accessory.

- I. Bottom Preparation: Trench bottom shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of two inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing on the pipe.
- J. Excavated Materials:
1. Excavated materials shall be placed adjacent to the work to be used for backfilling as suitable. Top soil shall be carefully separated and lastly placed in its original location.
  2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.
- K. Removal of Unyielding Material (Rock): Where unyielding material is encountered in the bottom of the trench, such material shall be removed 12-inches below the required grade and replaced with haunch materials
- L. Removal of Unstable Material: Where unstable material is encountered in the bottom of the trench, such material shall be removed to the proper grade as hereinbefore described. When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.
- M. Excavation for Appurtenances: Excavation for manholes, catch-basins, inlets, or similar structures shall be at least 12-inches clear between the outer structure surfaces and the face of the excavation, or support members shall be of sufficient size to permit placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### **3.02 Sheeting, Bracing and Shoring**

- A. Sheeting, bracing and shoring shall be performed in the following instances:
1. Where sloping of the trench walls do not adequately protect persons within the trench from slides or cave-ins.
  2. In wet, saturated, flowing or otherwise unstable materials.

3. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.
  4. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.
- B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.
- C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.
- D. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Design shall be prepared by a Florida Registered Professional Engineer and submitted to the County for review.
- E. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe or utility.
- F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the County it cannot be safely removed or is within three feet of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet below the surface.
- G. Sheet piling within three feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the County.

### 3.03 Rock Excavation

- A. Definition of Rock: Any material which cannot be excavated with conventional excavating equipment, and is removed by drilling and blasting, or mechanically fracturing by means other than a trench excavator, and occupies an original volume of at least one-half cubic yard.
- B. Blasting: Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the County may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.
- C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.
- D. The Contractor shall notify the County prior to any blasting. Additionally, the Contractor shall notify the County and local fire department before any charge is set.
- E. The Contractor shall conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

### 3.04 Backfilling

- A. General: Control soil compaction during backfilling operations providing minimum percentage of density specified for each area classification indicated below.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the required percentages of maximum density determined in accordance with AASHTO T180/ ASTM D 1556 (modified).
- C. Replacement of Unyielding Material: Unyielding material removed from the bottom of the trench shall be replaced with satisfactory material placed in layers not exceeding 6-inches loose thickness.
- D. Replacement of Unstable Material: Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6-inches loose thickness.

E. Bedding and Haunching

1. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.
2. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tampering the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.
3. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
4. After the pipe section is properly placed, add the haunching material to the spring line of the pipe for rigid (DI, RCP) and 6-inches above the top of the pipe for flexible pipe (PVC, HDPE, FRP). The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.
5. The types of trench bedding are identified as follows:
  - a. Class "A" (Bedding Factor — 2.8): Excavate the bottom of the trench flat at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. Lay pipe to line and grade on concrete blocks. Place concrete to the full width of the trench and to a height of one-fourth of the outside diameter of the pipe above the invert.
  - b. Class "B" (Bedding Factor — 1.9): Excavate the bottom of the trench at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. The bottom of the trench shall be rounded such that at least the bottom quadrant of the pipe rest firmly on the bedding. The bedding shall be undisturbed soil if suitable or placed material. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe for rigid (DI, RCP) and 6-inches above the top of the pipe for flexible pipe (PVC, HDPE, FRP)..
  - c. Class "C" (Bedding Factor — 1.5): Excavate the bottom of the trench at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. The bottom of the trench shall be rounded such that at least the bottom quadrant of the pipe rest firmly on the bedding. The bedding shall be undisturbed soil if suitable or placed material. Haunching material

shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-fourth the outside diameter of the pipe above the bottom of the pipe barrel.

6. PVC, HDPE and FRP pipe shall be installed with Class "B" bedding, unless shown otherwise herein or on the drawings. The bedding and haunching shall be hand tamped to achieve a compaction of approximately 95% maximum density.
7. Ductile Iron and other non-plastic pipes shall be installed with Class "C" bedding, unless shown otherwise herein or on the drawings. The bedding and haunching shall be hand tamped to achieve a compaction of approximately 90% maximum density.
8. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed gravel stone bedding material to the required grade before constructing the manhole.

F. Initial Backfill:

1. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.
2. Initial backfill material shall be placed in layers of a maximum of 6-inches loose thickness and compacted with approved tampers to 95% maximum density and to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of pipe for the full length of the pipe. Backfill material in this portion of the trench shall consist of satisfactory material at a moisture content that will facilitate compaction, free from stones larger than two inches in any dimension, except where the pipe is coated or wrapped for protection against corrosion, the backfill material shall be free of stones larger than one inch in any dimension.
3. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this section.

G. Concrete Encasement for Pipelines:

Where concrete encasement is shown on the Drawings for pipelines, excavate the trench to provide a minimum of 6-inches clearance from the bell of the pipe. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 6 inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

H. Final Backfill:

1. Backfill carefully to restore the ground surface to its original condition. For earth or vegetated areas, replace the top 6-inches of the trench with top soil that was stock piled during excavation.

2. Excavated material which is unsuitable for backfilling, excess material and rock shall be disposed of, at no additional cost to the County, in a manner approved by the County.
  3. If materials excavated from the trench are not suitable for use as backfill materials, provide select material conforming to the requirements of this Section.
  4. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
    - a. In 6-inch layers, if using light power tamping equipment, such as "jumping jack"
    - b. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.
    - c. In 24-inch layers, if using a hydra-hammer
- I. Final backfill shall be compacted as follows:
1. Under proposed or existing pavement, dirt roads, sidewalks, or within four feet of pavement edge, compact to a minimum of 95% of the maximum density. Type of material and compaction effort may vary within the top 12-inches under areas designated for pavement replacement as reflected on the Drawings.
  2. Around structures (manholes, inlets) compaction shall be 100% of the maximum density.
  3. Seeded areas, or non-traffic areas, compact to a minimum of 90% of the maximum density.
- J. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.

### **3.05 Additional Material**

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide suitable fill material.

### **3.06 Testing and Inspection Requirements**

- A. Quality Control Testing During Construction
1. Contractor shall engage geotechnical firm to inspect and approve subgrades and fill layers before further construction work is performed.
  2. In alternating compacted fill lifts, make one field density test for every 500 linear feet horizontally or 750 square yards, but in no case less than three tests. The County has the right to select the location of compaction test.

3. If, in the opinion of the Engineer, geotechnical firm reports indicate inspection, subgrade, or fill which have been placed are below specified density, the Contractor shall provide additional compaction and testing at no additional expense to the Owner.
4. The Contractor shall provide excavation as necessary for geotechnical personnel to conduct test.

### **3.07 Disposal of Excess and Waste Materials**

Off-Site Disposal: Remove all waste materials, including unacceptable excavated material, trash, and debris, and properly dispose at a location selected by the Contractor in accordance with local, state and federal criteria. Such disposal shall not be at a location on County Property.

### **3.08 Measurement and Payment**

- A. General: No separate payment will be made for the work covered by this section, with the exception of replacement of unsuitable materials, and all costs in connection therewith shall be included in the contract price for the related item(s) of work.
- B. Replacement of unsuitable materials (as determined by the Engineer) shall be paid under unit price bid for sand or select granular backfill. No separate payment will be made for removal and disposal of unsuitable material.

END OF SECTION

## **PART 1 — GENERAL**

### **1.01 Scope**

- A. This Section describes products to be incorporated into the water distribution system and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. It is the intent of these specifications to provide information supplemental to the contents of the construction drawings on the quality of materials, execution, measurement, etc. These specifications are general in nature and may contain products and requirements which are not applicable to the project. Discrepancies between these specifications and the construction drawings, either imagined or real, shall be brought to the attention of the County for clarification.

### **1.02 Description of Work**

- A. Extent of work is shown on the drawings.
- B. Domestic water system work includes but is not limited to: Water mains, fire hydrants, valves, service connections and appurtenances.
- C. Comply with the requirements of applicable sections for excavation and backfilling required in connection with water distribution system work.
- D. Comply with requirements of Paragraph 2.13 of this section for concrete work required in connection with water distribution system work.
- E. Contractor is advised that existing water mains may be of various pipe materials, including asbestos cement. The Contractor shall be responsible for protection of existing water mains during construction and shall be responsible for repairing any pipes damaged during construction. Repair sections shall be PVC or ductile iron. The Contractor shall comply with all work site, air emission, solid waste and personal safety and protection regulations as related to the excavation, exposure, cutting, handling, containment and disposal of existing water main pipe material.
- F. The removal, encapsulation or enclosure, storage and disposal of pipe materials containing asbestos shall be in accordance with Sections 455.301 through 455.309 of the Florida State Statutes; American Water Works Association Manual of Water Supply Practices No. M16 'Work Practices for Asbestos — Cement Pipe'; 29 CFR 1910.19; 29 CFR 1926.1101, Appendix F; Asbestos

NESHAP (40 CFR 61, Subpart M); 40 CFR 763, Appendix E; and all other industry and regulatory requirements.

### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction and the applicable standards of the American Water Works Association (AWWA).
- B. Testing and Inspection Service
  - 1. Employ, at Contractor's expense, testing laboratory to perform bacteriological testing of water mains.
  - 2. It will be the responsibility of the Contractor to coordinate all testing, flushing, and inspections. The Contractor shall notify the County, testing service, and applicable agency inspectors 48 hours in advance of testing, flushing, and inspections.
  - 3. Hydrostatic test shall be completed by the Contractor in the presence of the County or County's representative.
- C. The manufacturer shall provide written certification to the County that all products furnished comply with all applicable requirements of these Specifications.

### **1.04 Submittals**

- A. Prior to construction commencing, the Contractor shall submit for approval by the County manufacturer's certifications and cut sheets for the following items:
  - 1. Fire hydrant assemblies
  - 2. Valves
  - 3. Water main pipe
  - 4. Fittings
  - 5. Water services
  - 6. Water meters
  - 7. Tapping sleeves
  - 8. Air release valves
  - 9. Other appurtenances
- B. Qualifications: If requested by the County, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.
- C. Test Reports: Submit Bacteriological Test Reports directly to the County from the testing services with copy to Contractor.

### **1.05 Existing Utilities and Obstructions**

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the County. The Contractor shall call the Sunshine State One Call of Florida, Inc. (1-888-761-3042), as required by Florida Law and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Conflict with Existing Utilities
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tie-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts, if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements, and after a written request to, and subsequent approval by the County. If, in the opinion of the County, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
  2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the County. If, in the opinion of the County, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
- C. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- D. Water Main Separation Requirements (See Utilities Standard Detail G-14)
1. Water mains constructed in Bay County Rights-of Way shall be laid to provide a minimum horizontal distance of at least three feet between the outside of the water main and the outside of any existing or proposed vacuum-type sanitary sewer, storm sewer, storm water force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the water main and the outside of any existing or proposed gravity-type sanitary sewer, pressure-type sanitary

sewer, wastewater force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the water main and all parts of any existing or proposed "on-site sewage treatment and disposal system". If ten feet cannot be maintained, refer to Florida Administrative Code 62-555.314, which states that a minimum of six feet is acceptable.

2. Water mains constructed in Bay County Right-of way, that will cross any existing or proposed gravity-type sanitary sewer, vacuum-type sanitary sewer, or storm sewer, will be laid so the outside of the water main is at least 6-inches above the other pipeline or at least 12-inches below the other pipeline. Water mains that will cross any existing or proposed pressure-type sanitary sewer, wastewater or storm water force main, or pipeline conveying reclaimed water will be laid so the outside of the water main is at least 12-inches above or below the other pipeline.
3. At the utility crossings described above, one full length of water main pipe will be centered above or below the other pipeline so the water main joints will be as far as possible from the other pipeline or the pipes will be arranged so that all water main joints are at least three feet from all joints in vacuum-type sanitary sewers, storm sewers, or storm water force mains, and at least six feet from all joints in gravity or pressure-type sanitary sewers, wastewater force mains, or pipelines conveying reclaimed water.

## **PART 2 - PRODUCTS**

### **2.01 General**

All materials shall be new and unused. They shall be of standard, first grade quality and intended for the use for which they are offered. Materials or equipment which, in the opinion of the County, are inferior or of a lower grade than indicated, specified, or required will not be accepted.

### **2.02 Water Mains**

#### **A. Ductile Iron Pipe (DIP)**

1. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipes, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipes shall be Pressure Class 250 and have corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings.
2. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with an asphaltic outside coating per AWWA C151.
3. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.
4. Joints: Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111. Restrained joints shall be American "FLEX-RING" or "LOK-RING", or U.S. Pipe "TR FLEX" or "HP LOK". No field welding of restrained joint pipe will be permitted. Restraining gasket joints shall be assembled with American Fast-Grip gaskets or US Pipe FIELD LOK gasket.
5. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets may be ring type or full face type. The gasket for a standard push-on or mechanical joint, shall be of BUNA-5, vulcanized styrene rubber (SBR) and in accordance with AWWA C111.
6. Bolts and Nuts
  - a. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.
  - b. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.
  - c. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.

7. Mechanical joint glands shall be ductile iron.
  8. Thrust collars and mid-span restraints shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.
  9. Ductile iron pipe shall be encased in V-Bio polyethylene film where shown on the Drawings. V-Bio polyethylene film shall have a minimum thickness of 8 mils and shall meet the requirements of AWWA C105.
  10. Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
  11. Ductile iron pipe exterior shall have continuous blue stripe if applied during manufacturing, the stripe is parallel that runs parallel to the axis of the pipe, that is located at no greater than 90 degree intervals around the circumference of the pipe, and that will remain intact during and after pipe installation. If tape or paint is used to stripe pipe during installation of the pipe, the tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and that is located along the top of the pipe.
- B. Polyvinyl Chloride (PVC) Pipe
1. Smaller than 4-inch Pipe: All PVC pipe and fittings less than 4-inches in diameter shall be manufactured in accordance with ASTM D2241, with a standard dimension ratio (DR) of 21, rated pressure 200 psi, and bear the National Sanitation Foundation Seal for potable water pipe.
  2. 4-inch through 12-inch Pipe: PVC pipe shall be manufactured in accordance with AWWA C900, latest edition. Pipe shall be pressure class 235 and must meet dimension requirements of dimension ratio (DR) 18 and shall bear the National Sanitation Foundation seal for potable water pipe.
  3. 14-inch and Larger Pipe: PVC pipe shall be manufactured in accordance with AWWA, C905, and latest edition. Pipe shall be pressure class 235 and must meet dimension requirements of dimension ratio (DR) 18 and shall bear the National Sanitation Foundation seal for potable water.
  4. Joints: Joints shall be "push-on" and shall meet all requirements of ASTM D3139. Each bell shall be an integral wall section joint assembly using elastomeric gasket seals. All gaskets shall meet all requirements for performance as specified by ASTM F477.
  5. Pipe Marking: All pipe shall be marked as prescribed in ASTM D2241 (e.g., nominal pipe size, type of plastic pipe material, pipe dimension ratio, pressure rating, ASTM specification designation number, manufacturer's name and code), and the National Sanitation Foundation Seal for potable water.
  6. PVC Pipe for waterlines shall be blue.
  7. Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards, including the National Sanitation Foundation. Additionally, each piece of pipe shall be stamped "NSF Approved".

8. Fusible PVC 4-inch through 24-inch shall be DIPS DRIB C900-C905.
- C. High Density Polyethylene Pipe (HDPE): All water main pipe sizes 4-inch through 24-inch shall be DIPS DR11 (200 psi).

### **2.03 Fittings (3-inch and Larger)**

- A. General: Fittings 3-inches and larger shall be ductile iron manufactured in accordance with ANSI/ AWWA C110/A21.10 or C153/A21.53. The minimum pressure rating for fittings shall be 250 psi.
- B. Coating: All fittings furnished with bituminous outside coating and shall be cement mortar lined and coated in accordance with AWWA C104.
- C. Anchoring Devices
  1. All anchoring devices shall be suitable for use with mechanical joint fittings meeting AWWA C110 and/or AWWA C111.
  2. All anchoring devices shall be constructed of ductile iron (at least ASTM A536 Grade 70-50-05) and manufactured in accordance with AWWA C110 and/or C111.
  3. All anchoring devices shall have a sufficient number of set screws so as to properly restrain various fittings or pipes at the rated pressure without the need for additional thrust restraint.
- D. Retainer Glands
  1. Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Glands shall be manufactured of ductile iron conforming to ASTM A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/AWWA C153/A21.53, latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices.
  2. Retainer glands for ductile iron pipe shall be MegaLug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or Star Pipe Products Star-Grip Series 3000.
  3. Retainer glands for polyvinyl chloride pipe shall be MegaLug Series 2000 PV, as manufactured by EBAA Iron, Inc. or Star Pipe Products Stargrip Series 4000.
- E. Push-on Restraints
  1. Push-on joint restraints shall be Fast-Grip Gasket by American Ductile Iron Pipe Co., or equal.
  2. Bell harness restraints shall be MegaLug Series 2500 by EBBA Iron or equal.

## 2.04 Gate and Tapping Valves

Resilient seat gate valves shall be located no more than 500 feet apart in commercial, industrial and high-density residential areas and no more than 1000 feet in all other areas. Valves shall be spaced to isolate a maximum of 40 single-family residential lots. A minimum of two valves per tee, and three valves per 4-way cross, shall be required to isolate and maintain adequate service. Valves shall be placed at branch lines and located at the end of all water main extensions except at looped cul-de-sacs.

- A. Smaller than 2-inches in Diameter: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded type. Valves shall have a minimum 200 psi working pressure for water (125 psi working pressure for steam). Valves shall be made in the USA. Gate valves shall be full port Crane No. 428 (threaded), Apollo Brass ball valve full port (threaded), or approved equal.
- B. 2-inches through 36-inches in Diameter: Gate valves shall be resilient seat wedge encapsulated with EPDM rubber type conforming to the requirements of AWWA C509 or AWWA C515 rated for 200 psi working pressure.
  - 1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
  - 2. The valve gate shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
  - 3. All internal and exterior ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550.
  - 4. Stem nuts shall be independent of wedge and shall be of solid bronze conforming to ASTM B62.
  - 5. All valves shall open by turning a two-inch square operating nut counterclockwise.
  - 6. Gate Valve: Joints shall be mechanical joints and shall conform to AWWA C111, and all bolts and nuts for mechanical joints shall be high-strength, low-alloy steel in accordance with AWWA C111. All gaskets shall be for a standard mechanical joint of BUNA-S (SBR Buna) in accordance with ANSI/AWWA C111/A21.4. All mechanical joint accessories shall be furnished with the valves.

7. All tapping valves shall have flange-by-mechanical joint ends.
8. All valves shall be furnished with operating nuts.
9. One operating wrench will be provided for each five valves furnished; at least one wrench shall be supplied.
10. A11 tapping valves shall be interchangeable with other makes of tapping sleeves.
11. For horizontal installation, all tapping valves 16-inch and larger must have bevel gearing and pipe plug on bottom of valve bottom side to install nipple and ball valve for flushing.
12. Approved models are:
  - a. American Flow Control Series 2500 Resilient Wedge Valve.
  - b. M & H C515
  - c. Mueller Company A-2362-78 Resilient Wedge Gate Valve with Aqua Grip.
  - d. AVK Resilient Seated Gate Valve Series 65, J & S Valves C515, or approved equal.
  - e. All tapping valves 16-inch and larger will be determined by the County on a case by case basis for meeting operational requirements.

## **2.05 Butterfly Valves (3-Inch and Larger)**

- A. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.
- B. Valve bodies shall be ductile iron conforming to ASTM A-536, Grade 65-45-12 or ASTM A-126, Grade B cast iron. Shafts shall be ASTM A-276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A-536, Grade 65-45-12 or ASTM A-126, Grade B cast iron. The valve shall have an EPDM seat.
- C. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
- D. Actuators
  1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.
  2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
  3. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

- E. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.
- F. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 150.
- G. Butterfly valves shall be manufactured by Mueller, M & H Valve, DeZurik, Val-Matic, or Pratt.

### **2.06 Tapping Sleeves**

- A. General: Tapping sleeves shall be full circle, constructed of stainless steel and in two halves. Tapping sleeve flange can be stainless steel or carbon steel.
- B. Tapping Sleeves 3-inch or larger shall have a  $\frac{1}{2}$ -inch threaded test port with a plug for pressure testing on the tapping sleeves & tap valves. All tapping sleeves 3-inch through 24-inch shall be Romac STS420 or JMC452, or approved equal. Any tapping sleeve 30-inch or larger will be reviewed on a case by case basis and requires approval from the County
- C. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve.

### **2.07 Tapping Saddles**

General: Tapping saddles shall be constructed of heavy gray cast iron or ductile iron, with the attachment straps, nuts, and washers constructed of corrosion-resistant, alloy steel in accordance with AWWA C111. All tapping saddles shall be Smith Blair #317, JCM406, TPS T-3, or approved equal. Tapping saddles 3-inch and larger shall have a  $\frac{1}{2}$ -inch threaded test port with plug for pressure testing on the tapping saddle and the tap valve.

### **2.08 Fire Hydrant**

- A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than  $5 \frac{1}{4}$  -inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.

- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2%-inch hose connections and one 4%-inch pumper connection, all with National Standard threads and each equipped with cap and non-kinking chain.
- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.
- J. Minimum depth of bury shall be 3.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.
- K. All outside surfaces of the barrel above grade shall be painted with enamel equal to Koppers Glamortex 501 in color orange
- L. Hydrants shall be traffic model and shall be East Jordan 5CD250, American Flow Control B-84-B, M & H Valve 129, or approved equal.
- M. Placements of fire hydrants:
  - Residential area: Spacing shall be every 500 feet
  - Rural area: Spacing shall be every 1,000 feet, or determined on a case by case Basis

## **2.09 Valve Boxes and Extension Stems**

- A. Valve boxes shall be provided for all buried valves. Valve boxes shall be one complete assembled unit composed of the valve box and extension stem. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable trench depths.
- B. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
- C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1000 ft-lb without failure. Valve box shall be equal to American's trench adapter.
- D. Valve box collars shall be poured in place concrete (see detail G-19).

## **2.10 Valve Markers**

The Contractor shall provide a Carsonite Utility Markers or approved equivalent with U.V. resistant decal for each valve installed. Valve decal shall be stamped "CAUTION WATER VALVE".

## **2.11 Hydrant Tees**

Hydrant tees shall be equal to ACIPCO A10180, SIP Industries, U.S. Pipe U-592, or approved equal.

## **2.12 Anchor Couplings**

Lengths and sizes shall be as shown on the Drawings. Anchor couplings shall be equal to ACIPCO A-10895, SIP Industries, U.S. Pipe U-591, or approved equal.

## **2.13 Concrete**

Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. For job mixed concrete, submit the concrete mix design for approval by the County. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A-615, Grade 60. The thrust box shall not be poured over bolts or in such a way as to prevent bolt removal.

### **2.14 Detection Tape and Trace Wire**

Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution: Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2-inches when buried less than 10-inches below the surface. Tape width shall be minimum 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be Pro-Line Safety Products Detectable Tape 2-inch No: 103111253 3-inch No: 103121253, or approved equal. In addition, the Contractor shall furnish and install 10 gauge coated copper tracing wire shall be Pro-Line HF-CCS-PE30 or Copperhead Superflex 1030, or approved equal.

### **2.15 Flushing Devices and Equipment**

- A. Flushing Post Hydrants shall be M & H Style 33, Eclipse No. 2 Post Hydrant, or approved equal.
- B. Bacteriological Sampling Stations shall be Eclipse 88-SS, Gil Industry Sample Station, or approved equal.
- C. Automatic Auto Flushers shall be Kupferle Eclipse No. 9400, Mueller Hydro-Guard HG-1, or approved equal.

### **2.16 Water Services**

- A. It is the intent of these Specifications that the water service connections shall duplicate those presently provided by the County in order to be compatible with their service maintenance procedures. All materials shall be NSF 61 "Approved".
- B. All materials installed under this Section shall have the approval of the NSF for water services.
- C. Residential Service:
  - 1. Contractor will install water service lines between the water main and existing right-of-way, terminating at the right-of-way with a curb stop. The service line curb stop and tracing wire must be stubbed out of the ground 3 feet and attached to a stake that will remain until water meters are installed. Water service separations between storm sewer and sanitary sewer shall be the same as for water mains.
  - 2. Tubing: Water service tubing shall be polyethylene Class 200, SDR9 manufactured in accordance with AWWA C902. All service tubing shall be 1-inch or larger.
  - 3. Curb Stop shall be B43-342W-G-NL ball valve as manufactured by Ford Meter Box Company, Inc. or approved equal. Curb stop shall have wings for locking the valve in the closed position.

4. Corporation Stop shall be Ford F1000-G-NL, or approved equal.
5. Gate Valve: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for water (125 psi working pressure for steam). Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).
6. Fittings shall be manufactured of brass, cast with full port of full open valve and machined in accordance with AWWA C800.
7. Service Saddle shall be Smith Blair 317, JCM 406, or approved equal.
8. Meter Box:
  - a. Meter boxes shall be plastic or polymer concrete. Material shall meet or exceed the following:
    - i. Tensile Strength: 3,400 psi (ASTM D 638).
    - ii. Flexural Modulus: 191,000 psi (ASTM D 790).
    - iii. Impact Strength, Izod: 0.6 feet 16/inch (ASTM D 256).
    - iv. Deflection Temperatures: 200 degrees F (ASTM D 648).
  - b. Plastic meter boxes shall be equal to Ametek, Plymouth Products Division or Brooks Products, Inc.
  - c. Traffic rated polymer concrete meter boxes for driveways, roads and sidewalks shall be equal to Glasmaster Tuff Box Series.
  - d. Meter box shall be fitted with a plastic solid cover.
  - e. Minimum dimensions shall be 10-3/4 x 16-inches top and 18-1/2 x 13-1/4-inches at bottom and 18-inches deep.
9. Water meters are not to be furnished; however, the water meter connection must be compatible with the water meters currently used by the County.
10. Backflow Preventers: Shall be furnished and installed by Contractor/Developer and be owned and maintained by Customer. Backflow preventer shall be Reduced Pressure Zone Type (RPZ).
  - a. Backflow preventers shall be rated for operation with inlet water pressures up to 175 psig and water temperatures up to 140-1/2 degrees F. Backflow preventers shall be tested and certified in accordance with ASSE 1013 and AWWA C506 and C511.
  - b. Provide with bronze body construction, rubber check valve and relief valve assemblies, and Clecon check seats.
    - c. Provide bronze ball body valve test cocks.
    - d. Provide bronze body strainer on the inlet of each backflow preventer.
    - e. Acceptable Manufacturers: Watts Series 909, Wilkins, Hersey.
    - d. Residential dual check valve backflow preventers shall be Apollo dual check valve 4ALF-355-48 or approved equal. .
    - f. Refer to Bay County Cross Connection Control Program for more information on back flow prevention.
11. Trace wire shall be Number 10, coated Pro-Line HF-CCS-PE30, Copperhead Superflex 1030, or approved equal. Wire connectors shall be TL-LUG-SS, or approved equal.

D. Commercial Service:

1. A commercial service shall be constructed similar to a water main or residential service base on the size requirement. Regardless of size, a commercial service shall include a backflow preventer.
2. Provide isolation valves on the inlet and outlet of each backflow preventer for maintenance. These valves shall be quarter turn, full port, and resilient seated, bronze ball valves.

**2.17 Check Valve Vaults, Meter Vaults 3-inch and Larger, and Air Release Vaults**

- A. All vault walls shall be made of precast concrete sections. The top and bottom sections shall also be precast unless shown otherwise or approved by the Engineer.
- B. All coarse aggregate shall be made from 100 percent calcareous rocks. The contractor shall furnish manufacturer's certificate stating the type of aggregate used in the manufacture of the valve vault.
- C. The materials shall conform to the following standards:
  1. Concrete shall be 4000 psi using ASTM C150 Type 2 cement.
  2. Wire mesh shall conform to ASTM A185.
  3. Reinforcing rods shall be ASTM A615 grade 60.
- D. The top slab shall be cast with a locking access hatch in place. Access hatch shall be as specified on the drawings.
- E. Check valve and air release vaults can have one locking access hatch. Meter vaults 3-inch and larger must have a two piece locking access hatch. (Refer to W-9)

## **PART 3 — EXECUTION**

### **3.01 Handling Pipe**

- A. General: All material, unless otherwise directed, shall be unloaded at the job site and distributed at the site of the project by the Contractor. Materials shall be handled with care to avoid damage. In loading and unloading, pipe shall be lifted by hoists or slid or rolled on skids in such a manner as to avoid shock. Under no circumstances shall pipe be dropped. Pipe handled on skids must not be allowed to roll against pipe already on the ground. The Contractor shall be responsible for the safe handling of all materials. Damaged materials will be rejected by the County.
- B. Pipe shall be handled so as to avoid damage to the coating and lining. If, however, any part of the coating or lining is damaged by the Contractor, the repair shall be made by the Contractor at his expense in a manner satisfactory to the County before installation.
- C. Pipe shall be distributed on the site of the work parallel with and opposite or near the place it is to be laid in the trench, and with bell ends facing the directions in which the installation will proceed unless otherwise directed.
- D. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- E. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- F. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- G. No distributed pipe shall be placed inside drainage ditches.
- H. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

**3.02 Installation of Pipe**

- A. General: Upon satisfactory installation of the pipe bedding, as specified in the "Earthwork for Utilities" section of these specifications, a continuous trough for the pipe barrel and recesses for the pipe joints shall be excavated by hand digging so that, when the pipe is laid in the trench true to line and grade, the pipe barrel will receive continuous, uniform support, and the joint will receive no pressure from the trench bottom.
- B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods.
- C. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench, piece by piece, by means of hoisting apparatus, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to pipe, pipe coating, and pipe lining. Under no circumstances shall pipe or accessories be dropped, dumped or rolled into the trench from finished ground level.
- D. The gasket material for each joint shall be properly positioned before the pipe is lowered into the trench. The joining of the pipe shall proceed in accordance with the manufacturer's requirements.
- E. Watertight plugs shall be installed in the open ends of the pipe at all times when pipe laying is not in progress. At no time shall trench water be permitted to enter pipe.
- F. Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Wherever it is necessary to cut gray or ductile cast iron pipe which is equipped with a push-on joint type bell end, the cut end of the pipe shall be adequately beveled so as to prevent the edge of the cut pipe from cutting or tearing the gasket as the plain end is inserted into the bell of the adjoining pipe or fitting. All field-cut pipe shall be beveled by the Contractor, and the pipe "short" shall be used as part of the pipeline construction.
- G. Whenever necessary to deflect pipe after proper homing from a straight line, either in the vertical or horizontal plane to avoid obstructions, the maximum allowable deflection shall be in accordance with the following:

<u>Push-on Joint Pipe</u>	<u>Maximum Deflection</u>
Size	
4-inch thru 12-inch	3/8 -inch per foot
16-inch thru 36-inch	1/2 -inch per foot

Only after the pipe has been properly homed will it be allowed to deflect.

- H. No pipe shall be laid in water or when the trench conditions or the weather is unsuitable for such work.
- I. All water lines and services shall be located a minimum of 36-inches below grade unless noted otherwise on the drawings.
- J. Any pipe which is disturbed or found to be defective after laying shall be removed and re-laid or replaced.
- K. Prior to connecting new work to existing lines or appurtenances, the Contractor shall verify location and elevation of existing connection point and notify County of any conflicts or discrepancies.
- L. Joints:
  - 1. Before laying the pipe, all lumps, blisters, and excess asphaltic coating shall be removed from the bell and plain ends of each length of pipe. The pipe ends shall then be wire brushed and wiped until clean and dry. Where mechanical joints or push-on joints are specified, oil and grease also shall be removed. Pipe ends shall be kept clean until joints are made. The plain end of pipe for mechanical joints shall be lubricated with an approved pipe lubricant before installing the gaskets.
  - 2. In making up the push-on type joint, the gasket shall be placed in the socket per manufacturer's recommendation. A thin film of lubricant (approved by the pipe manufacturer) shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe. The plain end of the pipe to be entered shall be thoroughly cleaned and placed in alignment with the bell of the pipe to which it is to be joined. The joint shall be made by exerting sufficient force on the entering pipe so that the plain end is moved past the gasket until it seats as per manufacturer's recommendation.
    - a. Pipe lubricant shall be JTM Ease-on Pipe Joint Lubricant and meet NSF/ANSI standard 61, or equal.
    - b. Shall be brushed over the gasket and the plain end of the pipe for push on joints and mechanical joints, where needed.
  - 3. Backhoe buckets or excavation equipment are not to be applied directly to the pipe.
  - 4. Mechanical joints shall be assembled in accordance with AWWA Standards. Mechanical joints shall be centered in the bells. An approved pipe lubricant shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, the bolts inserted, and the nuts tightened by hand.
  - 5. The bolts shall be tightened on opposite sides of the pipes by means of a torque wrench in such a manner that the gland shall be brought up evenly into the joint. The following range of bolt torques shall be applied:

<u>Bolt Size (Inches)</u>	<u>Range of Torque</u>
½ -inch Diameter	85 to 95 ft.-lbs.
1-inch Diameter	95 to 100 ft.-lbs.

6. If effective seal is not obtained at a maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.
  7. If a joint is defective, it shall be cut out and entirely replaced or, if permission is given by the County, it may be repaired by a suitable clamp.
- M. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave un-joined pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the County.
- N. V-Bio Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the County. Installation shall be at locations shown on the Drawings.
- O. Conflict with Existing Utilities
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the County. If, in the opinion of the County, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order. Separation of potable water, reclaimed water, storm and sewer systems shall comply with FDEP regulations and Standard Drawings.
  2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the County. If, in the opinion of the County, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs

of such relocation being paid for as part of a change order. Separation of potable water, reclaimed water, storm and sewer systems shall comply with FDEP regulations and STANDARD DRAWINGS.

P. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water Main Separation Requirements (See Utilities Standard Detail G-14)

1. Water mains constructed in Bay County Rights-of-way shall be laid to provide a minimum horizontal distance of at least three feet between the outside of the water main and the outside of any existing or proposed vacuum-type sanitary sewer, storm sewer, storm water force main, or pipeline conveying reclaimed water. A horizontal distance of at least 10 feet shall be provided between the outside of the water main and the outside of any existing or proposed gravity-type sanitary sewer, pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the water main and all parts of any existing or proposed "on-site sewage treatment and disposal system."
2. Water mains constructed in Bay county Right-of way, that will cross any existing or proposed gravity- or vacuum-type sanitary sewer or storm sewer will be laid so the outside of the water main is at least six inches above the other pipeline or at least 12-inches below the other pipeline. Water mains that will cross any existing or proposed pressure-type sanitary sewer, wastewater or storm water force main, or pipeline conveying reclaimed water will be laid so the outside of the water main is at least 12-inches above or below the other pipeline.
3. At the utility crossings described above, one full length of water main pipe will be centered above or below the other pipeline so the water main joints will be as far as possible from the other pipeline or the pipes will be arranged so that all water main joints are at least three feet from all joints in vacuum-type sanitary sewers, storm sewers, or storm water force mains, and at least six feet from all joints in gravity or pressure-type sanitary sewers, wastewater force mains, or pipelines conveying reclaimed water.

### **3.03 Installation of Fittings, Valves and Taps**

A. Fittings shall be handled with care to avoid damage. All fittings shall be loaded and unloaded by lifting, and under no circumstances shall fittings be dropped, skidded, or rolled. Under no circumstances shall fittings be placed against pipe or other fittings in such a manner that damage could result. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to

exterior surface or interior lining of fittings. If any part of the fittings' coating or lining is damaged by the Contractor, the repair or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the County before installing. Fittings shall also be stored at all times in a safe manner to prevent damage and kept free of dirt, mud, or other foreign matter. All fitting gaskets shall be stored and placed in a cool location out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis.

- B. Fittings shall be set and joined to the pipe in a manner specified previously for joint assembly. When conditions warrant, fittings should be provided with special support trussing and blocking. Buried valves that are 12-inches and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
- C. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the County. Valves shall be closed before being installed.
- D. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 60-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the County.
- E. All valve boxes set in non-paved areas shall have concrete pads poured around the top section of the valve box. The pad shall be a 24-inch square and shall be centered on the valve box. All water valve covers shall be painted safety blue as prescribed by the American Public Works Association (APWA) uniform color code for utility systems. All valve covers shall be cast with the word WATER. A 2-inch monument shall be set on the North East corner of each 24-inch poured square pad of the valve box indicating the valve size, type, and number of turns required.
- F. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

- G. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Drawings or directed by the County, valve markers shall be installed 6 inches inside the right of way or easement. Raised pavement markers (RPM's) shall be provided and installed along the appropriate roadway centerline for each in-line valve on County owned right-of-way. RPM's for in-line valves shall be Type I, two-way, and white in color.
  
- H. Blow-Offs: Blow-offs shall not be connected to any sewer or submerged in any stream or be installed in any other manner that will permit back-siphoning of contaminated water.
  
- I. The valve and valve box shall be installed so water department personnel can insert a valve key through the valve box and completely open and close the valve.

### **3.04 Connections to Water Mains**

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
  
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the County to confirm the nature of the connection to be made.
  
- C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of the County.
  
- D. Testing: The County must be present for the pressure test of the tapping saddle and tapping valve before the tap is allowed. Test shall be done through the saddle and the test machine or the saddle and tap valve.
  
- E. Tapping Saddles and Tapping Sleeves
  1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted. The coupon shall be delivered to the County.
  2. Prior to attaching the saddle or sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
  3. Before performing field machine cut, the water tightness of the saddle or sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. Then using a hydro-static hand pump, pump to a pressure of 150 psi to insure all air is expelled. No leakage shall be permitted for a period of thirty minutes.

4. After attaching the saddle or sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.
- F. Connections and Repairs: Where connections or repairs are required, Contractor shall only use solid sleeves and provide all materials and labor necessary to make the connection or repair to the existing pipeline, excluding service lines 2-inch or smaller.

### **3.05 Installation of Fire Hydrants (See Utilities Standard Detail W-2)**

- A. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the County.
- B. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway, except that hydrants having two-hose nozzles 90 degrees apart shall be set with each nozzle facing the roadway at an angle of 45 degrees.
- C. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12-inches above the ground or as directed by the County.
- D. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve located adjacent to the main. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by first wrapping the weep hole/drain hole with a felt/mesh material that will allow the hydrant to drain. Then place coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.
- E. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.
- F. Hydrants shall be located as shown on the Drawings or as directed by the County. In the case of hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil resistance to avoid

transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.

- G. Raised pavement markers (RPM's) shall be provided and installed along the appropriate roadway centerline for each fire hydrant on County owned right-of-way. RPM's for inline valves shall be Type I, two-way, and blue in color.

### **3.06 Thrust Restraint**

- A. Retainer Glands: Provide retainer glands at all points where hydraulic thrust may develop and on fire hydrants and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly; the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- B. Thrust Collars: Concrete collars shall be constructed as shown on the Drawings. The welded-on collar shall be attached to the pipe by the pipe manufacturer. Filter fabric shall be installed between the thrust collar and the adjacent soil.
- C. Concrete Blocking:
  - 1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings. Filter fabric shall be installed between the concrete blocking and the adjacent soil.
  - 2. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the County. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.
- D. Cement Slabs: All 12-inch and larger tap valves will be supported by a poured cement slab. Slab size and thickness to be determined on a case by case basis by engineer and the County.

### **3.07 Detection Tape and Trace Wire**

- A. Provide detection tape and trace wire for all water mains.
- B. Detection tape shall be located 18-inches above the crown of the pipe.
- C. Trace wire shall not be wrapped around the pipe.
- D. Trace wire shall be laid parallel to the 12 o'clock position of the main with at least 6-inches of separation.
- E. Trace wire shall be looped into each valve box and pulled out a minimum of two feet from the top of the valve box.

### **3.08 Water Service Connections**

- A. Water service connections shall be installed to the properties adjacent to the water transmission mains both to the same side of the roadway (Short Side Service) and to the opposite side of the roadway (Long Side Service) as directed by the County.
- B. Water service connections installed under roadway shall be pulled through a casing. Casings shall be installed through a bored hole approximately equal in diameter to the external diameter of the casing. Minimum cover under roadway shall be four feet. At other locations, minimum cover shall be two feet.
- C. Installation shall conform to the details for water service connections appearing schematically on the Drawings. Contractor shall provide any and all appurtenant work required to provide the intended water service connections.
- D. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter, to the new copper service line, or the existing private service line, shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.
- E. Backflow preventers shall be provided on all water services. Please refer to Paragraph 2.16(C)10 for further backflow specifications.

- F. GPS coordinates shall be provided for each service connection and lateral.

### **3.09 Testing, Flushing and Inspection Requirements**

It will be the responsibility of the Contractor to coordinate all testing, flushing and inspections. The Contractor shall notify the County and applicable agency inspectors 48 hours in advance of testing, flushing and inspections.

### **3.10 Hydrostatic Test**

- A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. All tests shall be in the presence of the County.
- C. Each segment of water main between main valves shall be tested individually.
- D. Test Preparation
1. Flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats.
  2. Partially operate valves and hydrants to clean out seats.
  3. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipes, valves and appurtenances will be pressure tested.
  4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as detailed on the Drawings with a meter box.
  5. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
  6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
  7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: Test the pipeline at 150 psi or 1.5 times the operating pressure, whichever is greater, measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration (at least two hours). Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation not greater than 5 psi.
- F. Leakage

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1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration. Leakage shall be the total cumulative amount measured on a water meter.
2. The County assumes no responsibility for leakage occurring through existing valves.

G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD^4(P)}{133,200}$$

Where: L = allowable leakage, in gallons per hour  
 S = length of pipe tested, in feet  
 D = nominal diameter of the pipe, in inches  
 P = average test pressure during the leakage test, in pounds per square inch (gauge)

As determined under Section 4 of AWWA C600.  
 Allowable leakage at various pressures and pipe sizes is shown in the Table below (from AWWA C600 — Table 4.A) for 1000' of Pipe: \*

Avg. Average Pressure (PSI)	Pipe Diameter (inches)												
	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85
225	0.30	<b>0.41</b>	<b>0.61</b>	<b>0.81</b>	<b>1.01</b>	1.22	<b>1.42</b>	1.62	1.82	2.03	2.43	3.04	3.65
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43

\*If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

- H. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.
- I. Re-Testing: Any alterations made to pipeline performed after initial testing shall be re-tested and passed again, regardless of initial test results.
- J. Notification: Bay County shall be notified 24-hours in advance prior to Contractor performing pressure and leakage testing.

### **3.11 Trace Wire Continuity Test**

Prior to acceptance of pressure pipe by the County, the Contractor shall demonstrate that the locator tracer wire functions properly. During the tracer wire testing, the Contractor shall also demonstrate that the wire is connected to all services at meter boxes, hydrants, backflow preventers, butterfly valves, wastewater plug valves, tapping valves, air release valves, and blow-off valves. The Contractor shall use one of several commercially available utility locating instruments to energize and trace the locator wire for continuity. Direct signal locate method shall directly apply the current from the transmitter to the tracer wire and the signal shall be detected and followed with a receiver. Submit to the County Inspector for approval the method and equipment to be used. Testing of the locator wire shall be done prior to or concurrent with the hydrostatic pressure test.

### **3. 12 Disinfecting Pipeline**

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Specialty Contractor Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.
- C. Chlorination

1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours.
2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.
3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.

D. Disposal of Chlorinated Water: Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.

E. Bacteriological Testing

1. After final flushing and prior to DEP approval, and the water main being placed into service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Florida Department of Environmental Protection.
2. The Contractor shall give Bay County Utilities 48-hour written notice of the planned bacteriological testing to facilitate public notification, if required. A County representative must be present when bacteriological samples and free and total chlorine residual are taken. Immediately after samples are taken, the Contractor will be responsible for delivering the samples to the Laboratory for testing. The bacteriological samples shall be analyzed for both coliform and non-coliform growth. Testing shall be performed by a laboratory certified by the State of Florida and approved by the County.
3. All sampling and testing costs shall be paid for by the Contractor prior to final acceptance.
4. Re-chlorinate lines until required results are obtained.
5. All testing must follow FDEP 62-555.900 guidelines.

END OF SECTION

## **PART 1 – GENERAL**

### **1.01 Scope**

This Section describes products to be incorporated into sewers and accessories and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

In general, Bay County will require a Gravity Collection System, however, if the engineer can thoroughly justify that a gravity system is not feasible, Bay County will consider a

Vacuum System first, and a Low-Pressure Sewer System (LPSS) for small systems with less than 10 connections. The County may require the Engineer provide a cost analysis prior to approval of LPSS.

As an option, a development wanting LPSS, the sewer system for the development can be permitted with FDEP and constructed to be privately owned.

### **1.02 Description of Work**

- A. Extent of sewer collection system work is shown on the drawings.
- B. Sewer collection system work includes but is not limited to sanitary sewer mains, sewer laterals (services), manholes, frames, and covers.

### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction and the applicable standards of the American Water Works Association (AWWA), American National Standards Institute (ANSI), and the American Society for Testing and Materials (ASTM), latest editions.
- B. Testing and Inspection
  - 1. Leakage testing and deflection shall be performed by the Contractor. All gravity sewer lines will be videoed by the contractor and copy of the report and video will be provided to the County via USB memory drive. General inspection and flushing lines shall be performed by the Contractor with County Inspector present.  
It will be the responsibility of the Contractor to coordinate all testing and inspections. The Contractor shall notify the County, testing service, and applicable agency inspectors 48 hours in advance of testing and inspections.
- C. Deed Requirements (only applies to Low Pressure Sewer Systems): The following language in the deed is required; "Grinder Pump System is required at this location, it is the sole responsibility of the owner to maintain the grinder system to the property line".

### **1.04 Submittals**

Prior to beginning construction, the Contractor shall submit manufacturer's certifications and cut sheets for approval by the County for the following applicable items: sanitary sewer pipe, fittings, service laterals, clean outs, manhole and manhole frames and covers.

## **PART 2 – PRODUCTS**

### **2.01 General**

- A. All materials shall be in accordance with the Material Standard and shall, in no event, be less than that necessary to conform to the requirements of any applicable laws, ordinances, and codes.
- B. All materials shall be new, unused, and correctly designed. They shall be of standard, first grade quality and intended for the use for which they are offered. Materials or equipment which, in the opinion of the County, are inferior or of a lower grade than indicated, specified, or required will not be accepted.

### **2.02 HDPE Pipe**

- A. Pipe: 12- through 30-inch pipe shall be DIPS DR11 pressure class 200.
- B. Joints: Pipe shall have butt-fused restrained joints to transition to mechanical joints.
- C. Pipe Marking: All HDPE pipes for sewer shall have a green stripe at third points around the circumference of the pipe for its full length parallel to the centerline of the pipe.
- D. Coatings: Not required.
- E. Cutting: HDPE sewer pipe may be field cut using hand or power saws in accordance with the manufacturer's recommendations. The raw spigot end thus formed shall be filed to remove gasket damaging burrs and to form a standard bevel.
- F. Fittings: Fittings shall conform to ASTM F2619. Bell and spigot connections shall utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477. Fitting joints shall meet the watertight joint performance requirements of ASTM D3212.

### **2.03 Polyvinyl Chloride (PVC) Pipe**

- A. Pipe: PVC pipe shall be manufactured in accordance with ASTM D3034 and ASTM D1784. All PVC pipe shall meet the dimension requirements of standard dimension ratio (SDR) 26.
- B. Joints: Joints for PVC sewer pipe shall be of the bell and spigot type conforming to ASTM D3212 using factory installed flexible elastomeric seals. The elastomeric seals shall conform to ASTM F477.
- C. Pipe Marking: All pipe shall be marked as prescribed in ASTM D2241 (e.g., nominal pipe size, type of plastic pipe material, pipe dimension ratio, pressure rating, ASTM specification designation number manufacturer's name and code).
- D. Coatings: Not required.
- E. Cutting: PVC sewer pipe may be field cut using hand or power saws in accordance with the manufacturer's recommendations. The raw spigot end thus formed shall be filed to remove gasket damaging burrs and to form a standard bevel.
- F. Fittings: PVC sewer pipe fittings shall comply with ASTM D3034, ASTM 3212, and have elastomeric seals conforming to ASTM F477.
- G. All PVC pipe for sewer shall be green, which shall be throughout the pipe wall.

#### **2.04 Solid Sleeves**

Solid sleeves shall permit the connection of plain end ductile iron pipe and plain end PVC pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110 for long pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have a mechanical or restrained joint as specified in this Section and as shown on the Drawings. All Ductile Iron Solid Sleeves, and Mechanical Joint Fittings, will be lined with EMD Permox CTF, Perma-Shield PL Series 431, or approved equal. Solid sleeves shall be provided with gaskets suitable for the type of pipe to be connected. Solid sleeves shall be used only in locations shown on the Drawings or at the direction of the County. Solid sleeves shall be manufactured by ACIPCO or U.S. Pipe.

#### **2.05 Flexible Adaptor Couplings (Only used on Gravity Sewer lines)**

- A. Couplings for pipe sizes 15-inches in diameter and less shall be elastomeric plastic sleeves designed to connect pipes of same or dissimilar materials. Adapters shall provide a positive seal against infiltration and exfiltration and

remain leak proof and root proof up to 4.3 psi. The adaptor manufacturer shall provide a full jacket stainless steel clamps and required accessories.

- B. Couplings shall be products of Fernco with stainless steel shear ring and shall be installed in accordance with the manufacturer's recommendations.

### **PART 3 – EXECUTION**

#### 3.01 Existing Utilities and Obstructions

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the County. The Contractor shall call the Sunshine State One Call of Florida, Inc. (1-888-761-3042), as required by Florida Law and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Conflict with Existing Utilities
  1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed sewer line does not permit safe installation of the sewer line by the use of sheeting, shoring, tie-back, supporting, or temporarily suspending service of the parallel or crossing facility. The County will determine if the alignment can be changed to avoid the conflict. If, in the opinion of the County, the sewer line's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
  2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed sewer line does not permit the crossing without immediate or potential future damage to the utility, main, service, or the sewer line. The County will determine if the grade can be adjusted to avoid the conflict. If, in the opinion of the County, the sewer line's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
- C. Electronic Locator: The Contractor shall have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

D. Sewer Collection System Separation Requirements

1. Newly constructed sewers and force mains shall be laid at least ten feet (outside to outside) horizontally from water mains. If there is no reasonable alternative, smaller horizontal separation distances may be allowed if one of the following conditions is met:
  - a. The top of the sewer is installed at least 18 inches below the bottom of the potable water line.
  - b. The sewer is encased in watertight carrier pipe or concrete.
  - c. Both the sewer and the water main are constructed of slip-on or mechanical joint pipe complying with public water supply design standards and pressure tested to 150 psi to assure water tightness.
  - d. Documentation is provided showing that another alternative will result in an equivalent level of reliability and public health protection.
2. Newly constructed sewers and force mains shall be laid at least three feet (inside edge to inside edge) horizontally from any existing or proposed reclaimed water lines.
3. Newly constructed sewer pipes and force mains shall cross under water mains, unless there is no alternative. Sewers and force mains crossing water mains or reclaimed water lines shall be laid to provide a minimum vertical distance of 18 inches between the invert of the upper pipe and the crown of the lower pipe. The minimum vertical separation shall be maintained whether the water main is above or below the sewer. For sewer crossings, the crossing shall be arranged so that the sewer pipe joints are equidistant and as far as possible from the water main joints. Adequate structural support shall be provided for the sewer or force main to maintain line and grade. If there is no reasonable alternative, smaller vertical separation distances may be allowed if one of the following conditions is met:
  - a. The sewer is encased in a watertight carrier pipe.
  - b. The sewer is designed and constructed equal to water pipe and pressure tested to 150 psi to assure water tightness.
  - c. Documentation is provided showing that another alternative will result in an equivalent level of reliability and public health protection.

### 3.02 Pipe Distribution

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of

the distribution to the adjacent property owners.

- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No sewer pipes shall be placed inside drainage ditches.
- E. Sewer pipes shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured inside edge to inside edge.

### **3.03 Installation of Pipe**

- A. General: Upon satisfactory installation of the pipe bedding, as specified in the "Earthwork for Utilities" section of these specifications, a continuous trough for the pipe barrel and recesses for the pipe joints shall be excavated by hand digging so that, when the pipe is laid in the trench true to line and grade, the pipe barrel will receive continuous, uniform support, and the joint will receive no pressure from the trench bottom.
- B. HDPE Pipe: Installation shall be in accordance with the manufacturer's recommendations and ASTM D2321.
- C. Polyvinyl Chloride Pipe: Installation shall be in accordance with the recommended practices in ASTM D2321.
- D. Transportation: Care shall be taken during transportation of the pipe so that it is not cut, kinked, or otherwise damaged.
- E. Handling Pipe Lengths: Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipes.
- F. Special Precautions: Polyvinyl chloride pipe connected to heavy fittings, manholes, and rigid structures shall be supported in such a manner that no subsequent relative movement between the pipe and the joint with the rigid structures is possible.
- G. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

- H. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt, stones and other foreign material. The spigot ends of the pipe shall be lubricated lightly with a lubricant specified by the pipe manufacturer and approved by the County. Sufficient pressure shall be applied to the pipe so as to properly seat the socket in the bell of the pipe. All pipe shall be laid straight, true to the lines and grades shown on the drawings in each manhole section.
- I. Under no circumstances shall pipe be laid in water or when trench conditions or the weather is unsuitable for such work, except by permission of the County. At all times when work is not in progress, the exposed ends of all pipes shall be fully protected by a board or other approved stopper to prevent earth or other substances from entering the pipe.
- J. Lowering Pipe Into Trench: Care shall be exercised when lowering pipe into the trench to prevent damage to, or twisting of, the pipe.
- K. After each pipe is laid, it shall be partly backfilled and made secure before the next joint is laid.
- L. Any pipe which is disturbed or found to be defective after laying shall be removed and relayed or replaced at the Contractor's expense. Sun bleached PVC Pipe is considered defective.
- M. Whenever pipe laying is stopped for the night or for any other cause, the end of the pipe shall be securely closed with a stopper to prevent the entrance of water, mud, or other obstructing matter, and shall be secured in such a manner as to prevent the end pipe from being dislodged by sliding or other movement from the backfilling.
- N. Interior Inspection: The Contractor shall inspect pipe to determine whether line displacement or other damage has occurred. The Contractor shall pull a 12-inch long mandrel through the pipe to make sure the pipe has not been deflected during compaction or has a belly in it. The Contractor shall make inspections after lines between manholes, or manhole locations have been installed and approximately two feet of backfill is in place and at completion of project. If inspection indicates poor alignment, debris, displaced or deflected pipe, infiltration or other defects, correct such defects to satisfaction of County. All gravity sewer pipes and manholes shall be audio video recorded and the audio video shall be provided to the County on a USB memory drive.

- O. Prior to connecting new work to existing lines or appurtenances, the Contractor shall verify location and elevations of existing connection point and notify County of any conflicts or discrepancies.
- P. All sewer laterals shall be located a minimum of 36 inches below grade and at greater depths as required to provide service.
- Q. Long radius wyes or tees of specified diameter shall be inserted in the sewer lines to provide service to each lot or wherever designated by the County.
- R. Where new laterals are specified on the plans, or instructed to be installed by the County, they shall be laid to the edge of the right-of-way or as the County may direct. The location of the lateral at the right-of-way shall be recorded on the record drawings. In sewers over eight feet in depth, or where directed, stacks shall be carried up from the wye connections at a maximum angle of 45 degrees. The ends of the stacks or laterals shall be closed with plugs or covers. Materials for stacks and laterals shall be as shown on the details or designated in the proposal.
- S. Wherever existing house laterals are encountered or identified by the County to be installed, they shall be replaced and connected to the existing lateral at the edge of right-of-way. A new PVC cleanout, as shown on typical wye with a PVC glued cap, lateral installation shall be installed. If necessary, the new lateral could be plugged with a pneumatic plug for pressure testing the sewer main; however, under no circumstances should the lateral be plugged for more than one hour. Additionally, it shall be the Contractor's responsibility to notify the resident 24 hours prior to such outage. House laterals are not to be shared between houses.
- T. Wherever house laterals are intercepted by the excavation for the new sewer, connection shall be maintained temporarily to the old sewer until the particular section of new sewer is completed, tested, and approved. The house lateral shall then be broken and reconnected to the new sewer through a wye which shall have been placed in the new sewer for that purpose.
- U. The dead end of the house lateral shall be capped with a cover or plug as specified on the drawings. The covers or plugs shall have a factory-molded joint of the same type as used for the lateral pipe, and shall be of the same material. Record the location of all laterals at the right-of-way and place the information on the record drawings.

### **3.04 Storage and Handling Pipe**

- A. Storage: Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe.
- B. Stacking of polyvinyl chloride pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with sleeper or between supports.
- C. Handling Pipe: The handling of pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of the pipe with deep cuts and gouges shall be rejected and removed.

### **3.05 Closing Abandoned Utilities**

- A. Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed.
- B. Close open ends of concrete or masonry utilities with not less than 8-inch thick brick masonry bulkheads.
- C. Close open ends of conduit with plastic plugs, or other acceptable methods suitable for size and type material being closed. Wood plugs are not acceptable.

### **3.06 Connection to an Existing Manhole**

Connection to an existing manhole shall be made by mechanically coring into the wall structure of the manhole. Cored opening shall be sized to properly accommodate a rubber boot seal as specified in this Section. The manhole is to be lined if it is going to be used for a force main or a grinder station. The liner shall be epoxy or fiberglass. No house lateral shall be terminated unless it goes into a dead end manhole.

### **3.07 Testing Requirements**

A. General

1. The Contractor shall perform one or more required tests and shall furnish all apparatus and materials needed for these tests, the cost of which shall be included in the appropriate bid item.
2. After backfilling has been completed, the pipes cleaned and before permanent paving has been installed, the Contractor shall complete required testing to ascertain that there are no broken pipes, leaking joints or deflected pipe sections. Pipes failing these tests shall be repaired or replaced by the Contractor to meet requirements of project documents.
3. The sewer lines and laterals shall be tested for leakage between manholes as the work progresses by one of the following methods as determined by the County. The low pressure air test will be used unless field conditions warrant otherwise.
  - a. Infiltration Test
  - b. Low Pressure Air Test
4. A deflection test, using a mandrel, will be required for PVC pipe in addition to the above leakage tests.
5. The Contractor shall check alignment by “flushing” the lines. All gravity pipes will be audio video recorded and copy shall be provided to the County on a USB memory drive.
6. All tests will be witnessed by the County. The Contractor shall notify the County at least 48 hours in advance of testing.
7. The County may also “flash” the lines for verification of alignment at their own expense. The pipe line will be rejected if a full diameter is not visible from manhole to manhole.

B. Low Pressure Air Test Method (6-24 inches)

1. Low pressure air test of sewers and laterals shall be as specified hereinafter. Each manhole run will be tested separately as the construction progresses, before trench surface restoration, and preferably with not more than four manhole runs constructed ahead of testing.
2. Equipment shall be as manufactured by Cherne Industries, Inc., of Minneapolis, MN; or equal. Equipment used shall meet the following minimum requirements:
  - a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
  - b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
  - c. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be used. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be

pressurized, as noted below. The plugs must hold against this pressure without having to be braced.

- d. All air used shall pass through a single control panel.
  - e. Three individual hoses shall be used for the following connections:
    - i. One hose from control panel to pneumatic plugs for inflation.
    - ii. One hose from control panel to sealed line for introducing the low-pressure air.
    - iii. One hose from sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
3. Procedures
- a. After a manhole reach of pipe including laterals has been backfilled in accordance with the specifications, the pipe cleaned, and the pneumatic plugs have been checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average ground water back pressure. At least two minutes shall be allowed for the air pressure to stabilize.
  - b. After the stabilization period the pressure can be reduced to 3.5 psig prior to starting the test., the air hose from the control panel to the air supply shall be disconnected. The portion of the sanitary sewer (line) being tested shall be termed "Acceptable," if the time required in minutes is greater than the times indicated in the following table for the pressure to decrease from 3.5 psig (greater than the average ground water back pressure) to 2.5 psig (greater than the average ground water back pressure) or drop 1 psig if the start pressure is greater than 3.5 psig. If a leak is detected, a segment test will be completed to determine which joint(s) are leaking.

**Table 1 (from ASTM F1417)  
Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe Indicated for Q=0.0015**

Pipe Diameter In.	Minimum Time Min:s	Length For Min. Time, ft.	Time for Longer Lengths; s	Specification Time for Length (L) Shown, min:s							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41

SECTION 02510  
MANHOLES, WET WELLS, AND VALVE VAULTS

21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

- c. In areas where a high groundwater table (groundwater back pressure) is known to exist, the Contractor shall install a 1/2 inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The plastic tube shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height of water in the plastic tube in feet shall be divided by 2.31 to establish the pounds of groundwater back pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added groundwater back pressure shall be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same as defined in Table 1.) Should the Contractor desire to use an alternate method for establishing back pressure due to high water details may be provided to the County for review and consideration of approval.)
- d. The Contractor shall keep records of all tests made. Copy of such records will be given to the County. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the County.

C. Deflection Test – PVC only

1. General

- a. Deflection testing shall be performed on all portions of the PVC sewer system. This test shall be performed in sections between manholes at least 30 days after final backfilling has been completed.
- b. Deflection testing shall be performed in accordance with the procedure outlined below.

2. Maximum Deflection

- a. The maximum allowable deflection for all installed PVC sewer pipe shall not exceed 5% of the pipe's original internal diameter.

3. Testing Apparatus

- a. All PVC sewer pipe shall be tested by the Contractor and at his expense for diametric deflection using a GO-NO-GO type mandrel or other approved method. The mandrel shall have an outside diameter of no less than 95% of the PVC pipe inside diameter. No allowances will be made for standard pipe deflections noted in the manufacturer's specifications. The size of mandrel shall be determined by the following: Pipe inside diameter x 0.95. Any section not allowing passage of said mandrel shall be deemed unacceptable. The Contractor shall, at his expense, determine the location and extent of the problem and make repairs or re-lay the line segment as determined by the County. This test procedure, in accordance with these Specifications, will be repeated after a problem has been corrected. This testing shall be accomplished prior to final acceptance.

Nominal Size	Average I.D.	Base I.D.	Minimum Mandrel Diameter
<b>ASTM SDR 35</b>			
8	7.920	7.665	7.28
10	9.900	9.563	9.08
12	11.780	11.361	10.79
15	14.426	13.898	13.20
<b>ASTM F 679</b>			
18	17.629	16.976	16.13
21	20.783	20.004	19.00
24	23.381	22.480	21.36
27	26.351	25.327	24.06

(All Dimensions in inches)

4. Deflection Testing Procedure

- a. Completely flush the line making sure the pipe is clean of any mud or debris that would hinder the passage of the mandrel.
- b. During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line. (A braided nylon rope is recommended).
- c. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
- d. Connect a retrieval rope to the back of the mandrel to pull it back if necessary.

- e. Remove all the slack in the pull rope and place a tape marker on the rope at the ends of the pipe.
- f. Draw mandrel through the sewer line. If any irregularities or obstructions are encountered in the line, corrective action shall be taken as required.
- g. If a section with excessive deflection is found, it shall be located and excavated. The pipe shall be inspected for damage; if any damaged pipe is found, it shall be replaced at the Contractor's expense; if pipe is not damaged, replace and thoroughly tamp the haunching and initial backfill; replace remainder of backfill.
- h. Re-test this section for deflection.

**D. Flushing Lines**

Upon completion, and in the presence of the County, the sewer lines shall be flushed between manholes. In each section of the sewer, a round circle of light, full diameter, shall remain constantly in plain view throughout the entire length. The test shall be applied for each section after the sewer is completed in all respects and before it is accepted.

**E. Test Failures**

1. If the installation fails to meet the stated test requirements, the Contractor at his own expense shall determine the source of leakage, repair or replace all defective materials and/ or workmanship failing to meet tests and shall retest same until it is proven that installation meets requirements of project documents as determined by the County.
2. In the event the test results are not within the allowable range of acceptance, the Contractor shall take whatever corrective action is necessary including replacement of the said pipe, etc., to bring the test results within the allowable range of acceptance at no cost to the County.

END OF SECTION

**PART 1 - GENERAL**

### **1.01 Scope**

A. Description of Work

Provide all labor, materials, tools and equipment necessary to furnish and install manholes, wet wells and valve chambers as indicated on the Drawings, Construction Details and as herein specified. Throughout this specification section, the word "manhole" refers to "manholes, wet wells, and valve vaults."

B. Coordination

If pumps are proposed for installation in a wet well, the Contractor shall have the manufacturer of the pumps verify that the wet wells specified herein and detailed on the Drawings are of adequate size to suit his equipment.

### **1.02 Manhole Types**

A. Manholes shall be made up of precast concrete sections; bottom section shall also be precast concrete or a single piece fiberglass, or composite type with ballast ring.

B. Pumping station and valve chamber walls shall be precast concrete manhole sections. Top and bottom sections shall also be precast unless shown otherwise or approved by the County.

## **PART 2 - PRODUCTS**

### **2.01 Mortar**

Composition of mortar shall conform to "Standard Specification for Mortar for Unit Masonry", ASTM C270, Type N and shall be a silica cement mortar only.

### **2.02 Grout**

Grout shall be "Masterflow 713 Plus" manufactured by BASF Building Systems, or "Non-Shrink 5 Star Grout" manufactured by Five Star Products, Inc., or equal. Grout shall be capable of meeting test requirements of ASTM C827.

### **2.03 Manhole Steps**

There shall be no steps in manholes.

### **2.04 Manhole Frames, Covers and Access Hatches**

#### **A. General**

1. Castings shall be traffic rated ductile iron, meeting ASTM A48, designed for H-20 loading as designated by AASHTO. A Pam-Rex, or equivalent, hinged lid with lock shall be used.
2. Castings shall be free from cracks, holes, swells and cold shuts. All manhole castings shall be made accurately to the pattern and to the dimensions as specified, and shall be machined to secure perfectly flat and true to surfaces. All lids which "rock" and do not lie solid will not be accepted and must be replaced.
3. No plugging, burning in or filling will be allowed. Covers must fit the frames in any position.
4. The covers shall have non-penetrating pick holes.

#### **B. Standard Type Manhole Frame and Cover**

1. Standard manhole frame and covers shall be manufactured by Composite Access Products (CAP) Product Code: A-1BK24S4-BCUDMDSS-H1, or approved equal, with 24-inch clear opening. A label saying "BAY COUNTY SANITARY SEWER" shall be cast on the cover.
2. Manhole frames shall have an inflow dish installed beneath the cover to prevent inflow around the cover.

C. Watertight Covers

1. Manholes at specific locations, subject to periodic flooding, as indicated on the Drawings, to be water tight, shall be equipped with a watertight frame and cover. A label saying "BAY COUNTY SANITARY SEWER" shall be cast on the cover. Lids will be bolted down against a rubber o-ring. Composite Access Product (CAP) specifications, or approved equal, must be met.
2. Frame and Cover shall be watertight type with stainless steel bolts, machined bearing surfaces and flat gasket.

- D. Any manhole receiving forcemain discharge must have a gas tight lid. PAMTIGHT lid or equivalent is required.

E. Access Hatches

1. Access hatches shall be provided for the pumping stations as specified on the drawings.
2. Access hatches, for valve chambers and in other locations that are indicated on the Drawings, shall be as specified on the drawings.

## 2.05 Precast Concrete Manholes and Components

A. Concrete

1. Provide all sanitary manholes constructed with Portland ASTM C150, Type 1 or 2 cement with a tricalcium aluminate content not to exceed 8 percent.
2. Mixed aggregate shall be a minimum of 50 percent crushed limestone.
3. Provide 3000 psi non-shrink grout.
4. Lined Manholes: A manhole will be considered a junction manhole when three or more sewer lines connect into the structure, when a force main discharges into the structure, when a low-pressure grinder pump discharges into the structure, drop lines enter into the structure, as well as a receiving manhole before the wet well of a pump station. All precast concrete structures and receiving manholes shall be lined with AGRU Sure Grip, Spectra Shield, GML Coating, or an approved equal, prior to being placed into service. This lining shall not be penetrated after applied and is designed to resist hydrogen sulfide-based corrosion.
5. All manholes, and wet wells shall have an exterior joint wrapped material applied, such as 12-inch wide BOA joint tape, or approved equal.

B. Sections

1. The sections for manholes shall be a minimum of 4 feet in diameter for pipe sizes up to, and including 24-inches internal diameter. For pipes with an internal diameter between 24-inches and 36-inches, the manhole shall be 5 feet in diameter, unless otherwise noted.
2. The sections for the wet wells and valve chambers shall be of the size indicated on the details.

3. The Sections shall conform to the requirements of "Standard Specification for Precast Reinforced Concrete Manhole Sections" (ASTM C478), except that the joints shall be of the tongue and groove joint type and sealed with a preformed flexible plastic gasket. No other type of manhole joint will be accepted. Face of tongue and groove shall be sloped and not perpendicular to manhole wall.

4. C. Risers and Top Sections

1. The top of base walls, the ends of reinforced concrete risers and the bottom ends of precast tops shall be so formed that when risers and tops are assembled with the base, they will make a continuous manhole. The tongue and groove joints shall be of such design as will permit effective joining and placement without irregularities in the interior wall surface of the manhole.
2. Precast barrels shall consist of riser and top sections. The top section of manholes 6 feet or greater in depth shall be an concentric conical top section with thickened upper walls with the smallest inside diameter equal to 24 inches, to receive the manhole frame and cover. In the event of unforeseen obstacles, eccentric conical barrel top sections shall be considered for approval by the County. Top sections of manholes less than 6 feet in depth shall be flat concrete slabs. No more than two lift holes shall be cast in each riser or top section. Lift holes shall be non-penetrating.
3. Precast riser and top sections shall be designed, manufactured, tested, finished and marked in accordance with this specification and "Standard Specification for Precast Reinforced Concrete Manhole Sections" (ASTM C478).

D. Precast Manhole Bases

1. The bases shall be integrally cast and shall consist of a manhole bottom and a wall which shall extend a minimum of 6 inches above the top of the highest inflowing sewer. The top of the base section shall be carefully formed to receive the tongue of the barrel section. There shall be a minimum distance of 4-inches between the invert of the lowest outflowing sewer and floor of the precast base to provide for construction of a formed invert and bench wall within the manhole. No more than two lift holes shall be cast in the bases. Lift holes shall be non-penetrating.
  - a. Manholes 4 feet in diameter shall have a bottom at least 8-inches thick and a wall at least 5-inches thick.
  - b. Manholes 5 feet in diameter shall have a bottom at least 8-inches thick and a wall at least 6-inches thick.

E. Joint Material

1. The joint material shall be a preformed flexible plastic gasket such as Ram-Nek manufactured by the Henry Company or equal. It shall consist of hydrocarbon plastic and vulcanized rubber and shall be capable of meeting the following conditions:
    - a. Hydrocarbon plastic content 50-70% by weight per ASTM D297
    - b. Volatile matter 2.0% max. by weight per ASTM D6
    - c. Specific gravity @ 77 deg. F: 1.20 to 1.35 per ASTM D71
    - d. Ductility @ 77 deg. F: 5.0 cm min. per ASTM D113
    - e. Softening Point, ring and ball: 320 deg. F min. per ASTM D36
    - f. Penetration, cone 77 deg. F, 150 gm, 5 sec.: 50-120 per ASTM D217
    - g. Flash point, C.O.C.: 600 deg. F min. per ASTM D92
    - h. Fire point, C.O.C.: 625 deg. F min. per ASTM D92
    - i. Inert mineral filler: 30-50% by weight
    - j. Material, when in place, shall not leak at joints while being subjected to 10 psig test for a 24-hr. period.
    - k. No sagging of vertical and overhead 1-inch wide joints shall be detected while being subjected to temperature of 135 deg. F for period of 5 days.
    - l. No visible deterioration of compound when immersed separately in solution of acid, alkalis and saturated hydrogen sulfide, for a period of 30 days.
  2. Sealing compound shall be supplied in extruded rope-form of suitable cross-section and of such sizes as to seal the joint space when the sections are set in place. The sealing compound shall be protected by a suitable removable two-piece wrapper. The two-piece wrapper shall be so designed that one-half may be removed longitudinally without disturbing the other half to facilitate application of the sealing compound.
  3. Precast Reinforced Concrete Manhole Sections must also have 12-inch wide Boa-Tape Extra Grip Infiltration Taping Seal System, or approved equal, applied to the outside of each section joint.
  4. Joints of manholes shall not be sealed with grout.
- F. Non-penetrating lifting holes
- Lifting holes shall be constructed using plastic inserts cast into the manhole, stopping short of extending all the way through the wall. Plastic inserts and lifting eyes shall be as manufactured by Press-Seal Gasket Corporation or equal.

- G. Pipe Connections to Precast Manhole Bases and/or Sections  
A flexible pipe-to-manhole connector shall be provided with the manhole. Preformed rubber boots and fasteners shall be equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation. The connector shall provide a water tight seal and accommodate ground movement to prevent pipe shear. All clamps and miscellaneous metal shall be type 304 stainless steel. Connectors shall be installed in accordance with manufacturer's recommendations. No inlet or outlet piping in manholes, valve chambers or wet wells shall be at a manhole section joint. A minimum space of 6-inches from the joint shall be provided.

## **2.06 Rectangular Precast Manholes**

- A. Rectangular precast manholes shall be constructed to the sizes detailed on the Drawings.
- B. Manholes shall be designed in accordance with the Building Code requirements of ACI 318 and AASHTO H-20 traffic loading.
- C. The materials shall conform to the following standards:
1. Concrete shall be 4000 psi using ASTM C150 Type II cement.
  2. Wire mesh shall conform to ASTM A185.
  3. Reinforcing rods shall be ASTM A615 grade 60.
- D. Cover shall be cast with the access hatch in place. Access hatch shall be as specified on the drawings.

## **2.07 Fiberglass Structures**

- A. Wetwells and manholes shall be one piece units manufactured to meet or exceed all applicable sections of ASTM D3753.
- B. Structures shall be suitable for continuous immersion in raw municipal sewage. This shall include concentrations of H<sup>2</sup>S found in municipal sewer systems and sulfuric acid.
- C. Structures shall be manufactured of 100% premium resin and chopped glass. The structures shall be tested by the manufacturer to a minimum of 80% of the resin manufacturer's specific hardness for fully cured resin in accordance with Barcol Hardness.

- D. Materials used for construction of the structure shall have the following average material properties:
1. Tensile Modulus — 900,000 psi
  2. Flexural Modulus — 900,000 psi
  3. Tensile Strength — 10,000 psi
  4. Compressive Strength — 20,000 psi
  5. Poisson's Ratio — 0.33

### 2.08 Pump Station Wetwell

- A. All wetwells shall be 6 feet in diameters, and larger. 4 foot and 5 foot diameter wetwells shall be used only for special grinder pump applications as approved by the County on a case by case basis. The minimum wall thickness for concrete wetwells with liners as follows:

<u>Diameter</u>	<u>Wall Thickness</u>	<u>Diameter</u>	<u>Wall Thickness</u>
4'-0"	8"	8'-0"	8"
5'-0"	8"	10'-0"	10"
6'-0"	8"	12'-0"	12"

- B. All wetwells shall be precast concrete with a full protective liner designed to accommodate the peak hour development flow from all contributing areas.
- C. The wetwell shall have a minimum of 4 feet from the lowest invert to the wetwell bottom.
- D. The Pump Station wetwell size shall be determined using the following formula to determine the minimum volume between the off-level elevation and the influent invert elevation: Minimum Volume (Gallons) = Pump Capacity (GPM) X4
- E. The pumps station wetwell size and control equipment shall be designed to limit the pumping cycles of each pump to a maximum of 5 starts per hour for duplex stations and 3 starts per hour for triplex stations
- F. Pump stations discharging through pipes 12-inches or larger shall have more than two variable speed pumps.
- G. The pump cycle off level shall be no lower than the top of the sewage pumps.

- H. The lead pump on level shall be no higher than 18-inches below the invert elevation of the influent pipe for duplex stations, and no higher than 2-inches below the invert for triplex stations.
- I. All pump stations shall have a single gravity-flow influent pipe discharging into the wetwell.
- J. Multiple gravity pipelines and force mains upstream shall all terminate at a separate manhole before flowing into the pump station wetwell.
- K. The influent gravity sewer shall be aligned, so that the inflowing stream drops into the front side of the wet well opposite from the riser side, within an angle of 25 degrees on either side of the centerline passing between both pumps in a duplex station, or between two of the three pumps in a triplex station.
  - a. As an option to the influent gravity sewer main entering the wetwell directly between the pumps, a plastic composite/fiberglass drop bowl and pipe (Reliner/Duran, Inc. or equal) shall be installed.
- L. The wet well volume shall be capable of 6 hours detention time at peak flow, in lieu of this volume requirement, a diesel powered bypass pump shall be required.

## **2.09 Valve Vault**

- A. A precast valve vault for three gate valves, two resilient seated check valves American Series 2100, or equal, and a pump out connection shall be constructed adjacent to the wetwell.
- B. The valve vault shall have a 2-inch PVC drain installed at a 2 percent slope and with a P-trap installed inside the wetwell.
- C. The pump out connection shall be equipped with a gate valve and a male aluminum quick-coupler; 4-inch for 4-inch or smaller valve assemblies, 6-inch for all others.
- D. The valve vault shall be of adequate size to allow a minimum clearance of 12-inches from flanges to the valve vault wall, 18-inches from the flanges to the valve vault flow and 12-inches from the cross to the valve vault wall at the force main exit point.
- E. The depth of the valve vault, as measure from the bottom of the top slab to the valve vault floor, shall not exceed 6 feet for duplex lift stations.
- F. All valves and fittings shall have factory applied, fusion bonded epoxy coating on interior and exterior.

- G. Valve vaults designed with exit pipe turning 90 degrees either way to exit to the side rather than straight through shall have two braces from the elbow to the walls, to hold the assembly solidly in place.

## **2.10 Entrance Hatches**

- A. The lift station wetwell and valve pit shall be equipped with an aluminum access cover of adequate size to permit easy removal and installation of sewage pumps and equipment.
- B. The wetwell access cover shall be a minimum 36" x 48" single or double door.
- C. The valve pit access cover shall be a minimum 48" x 48" double door.
- D. Protective Safety Grating, for under access hatch covers, must be hinged grating panel design, manufactured by Halliday Products (HP) or approved equal.
- E. All access covers shall be constructed of aluminum with a minimum load rating of 300 lbs./sq. ft. and equipped with stainless steel hinges, a recessed lifting handle which lies flush with the door surface, and a stainless steel staple which may be used to secure the door with a padlock when closed. The doors shall have a raised diamond thread pattern to provide a skid-resistant surface and shall open to 90 degrees and lock automatically in that position, with a handle to release the doors for closing.
- F. The hatch assemblies shall be as manufactured by U.S. Foundry, Halliday, or an approved equivalent.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Ground Water  
All ground water shall be kept away from newly poured concrete until concrete has properly set, and a watertight job is obtained. Manholes which admit ground water after completion, must be repaired to the satisfaction of the County.

**B. Line and Grade**

1. Where manholes occur in pavements, set top of frame and covers flush with finished surface. Where manholes occur in dirt roads, set top of frame and cover 6 inches below finished surface. Elsewhere set top of frame and cover 3" above final grade, unless otherwise indicated.
2. Care shall be taken to have all pipes to and from manholes laid to correct lines and grades as established for the project.

**C. Drop Manholes**

Where shown, drop manholes shall be constructed in accordance with the details shown on the Drawings.

**3.02 Precast Manholes**

**A. Handling**

1. All precast manhole components shall be lifted and moved by use of lifting eyes that are slipped into the insert which are cast into the manhole. The lift system shall not damage the precast manhole.
2. All damage to precast sections shall be thoroughly repaired in the presence of the County. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before application of grout. Sufficient time shall be allowed for curing before the precast sections are joined. Cast-in-place concrete bases shall be specially formed and keyed to accommodate the bottom precast section.

**B. Site Inspection of Precast Sections**

1. Precast sections not conforming to any of the specification requirements shall be rejected. In addition, individual manhole sections may be rejected due to any of the following:
  - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
  - b. Defects that indicate imperfect proportioning, mixing, and molding.
  - c. Surface defects indicating honey-combed or open texture.
  - d. Damaged or cracked end, where such damage would prevent making a satisfactory joint.
  - e. Any continuous crack having a surface width of 0.01 inch (0.25 mm) or more and extending for a length of 12-inches (305 mm) or more, regardless of position in the section wall.

**C. Bitumastic Coating (Outside Only)**

1. Prior to setting the precast sections in place each section shall have the exterior concrete surface blown free of all dirt and debris and brushed clean and then coated with bitumastic. As an alternative, the bitumastic coating may be applied at the manufacturer's plant in accordance with this Specification.
2. The coating shall be Bitumastic 50 as manufactured by Carboline Co., or equal.
3. At least three coats shall be applied giving a total minimum dry film thickness (DFT) of 32.0 mils.
4. After installation, damaged surfaces including plugged lifting holes, shall be recoated in accordance with the coating manufacturer's recommendation to give the required minimum 32.0 mils DFT.
5. The Contractor shall provide a certification to the County stating that he has installed the exterior manhole, wetwell and valve chamber coatings in accordance with the manufacturer's recommendations, and that there is a minimum 32.0 mils DFT of material on all component structures.

D. Placement

Manhole sections shall not be set by wedging or placing shims to secure proper level and manholes shall not be backfilled without the approval from the County.

E. Masonry Work

1. The top of all precast manholes may be brought to proper grade for receiving manhole frames after paving has been replaced on paved streets by using HDPE plastic rings, traffic rated. In lieu of the HDPE plastic rings, precast manholes may be brought to grade by the use of no more than two precast concrete extension rings. The total depth of the rings shall not exceed 6 inches. The construction shall be performed by experienced and qualified laborers only. All work shall be laid plumb, straight, square and true. Where manholes are installed in areas with sloped pavement, the manhole ring and cover shall be set flush and in the same plane as the finished surface (not level). Rings shall be laid in full beds of mortar necessary to ensure cover is flush with finished pavement surface. All joints shall be full and not more than 1/2 inch in thickness. The Contractor shall set in place and bond in the masonry all necessary steps and miscellaneous items specified elsewhere. The masonry walls shall be parged on the outside with a one-half inch coat of Portland cement mortar.
2. All mortar shall be a mixture of non-shrink grout.
3. Masonry shall not be constructed during cold weather (air temperature below 40 deg. F) unless necessary precautions are observed as permitted by the County.
4. Concrete collar, to be constructed around frame and cover after adjustment. Concrete strength shall be 3,000 psi.

### 3.03 Flow Channels and Bench Walls

- A. The method of constructing flow channels and bench walls is dependent on which manhole base (i.e. manhole, wetwell, or valve chamber) has been installed.
- B. In precast bases, the flow channels and bench walls in each manhole shall be carefully formed of mortar and concrete. Precast inverts will not be accepted unless specifically approved by the County.
- C. The minimum depth of flow channel shall be equal to % the diameter of the largest sewer in the manhole to which it connects. The channel shall be graded to give a smooth, uninterrupted flow through the manhole.
- D. Bench walls shall be pitched a minimum of 1-inch but not more than 2-inches per foot from the inside periphery of the manhole to the edge of the flow channel.

### 3.04 Testing

- A. Manholes shall be constructed to be completely watertight. The contractor shall test the manhole by one of the following methods:
  - 1. Infiltration Test: If the manhole is located below the groundwater table, the inverts shall be plugged and the infiltration into the manhole shall be measured after a 24-hour period. If any visible infiltration has occurred into the manhole, visible by wet walls or any accumulation on the bench, the infiltration shall be considered excessive.
  - 2. Exfiltration test: If the manhole is above the current groundwater table, an exfiltration test will be conducted. All incoming sewer lines shall be plugged and the manhole filled with water to a level above the highest section joint and allowed to stand for three hours to compensate for potential absorption by dry concrete. After the soaking period, water shall be added as required to raise the water to a level that is above the highest joint section. If the water level drop exceeds 1/8-inch per vertical foot of manhole depth in 24 hours, the manhole shall have failed the test.
- B. As an alternative to infiltration and exfiltration test, concrete sewer manholes could be tested in accordance with test procedure described in ASTM C1244.

END OF SECTION

**PART 1 — GENERAL**

**1.01 Scope of Work**

- A. Furnish and install all labor, materials, equipment, and incidentals required to supply and install High Density Polyethylene (HDPE) concrete protective liner (CPL) or structural epoxy in the lift station wet wells, receiving manholes, drop manholes, and manholes as required or as shown on the plans.
- B. HDPE CPL or sprayed on Structural Epoxy coating shall be designed and installed to protect concrete surfaces from corrosion and to resist pull out from back pressure up to 29 psi and 112.5 lbs./anchoring stud. The structural epoxy shall have a minimum of 350 psi.

**1.02 Spray on Structural Epoxy**

- A. The condition of the structures to receive the protective coating will be classified in accordance with the following criteria:

Condition	Description
New	New structures or structures that have not been exposed to sanitary sewer. No evidence of infiltration.
A	Minimal damage. Minimal evidence of exposure to sanitary sewer gases. No evidence of infiltration.
B	Moderate damage such as missing mortar between bricks in brick manholes, some exposed aggregates in concrete structures. Moderate evidence of exposure to sanitary sewer gases. Evidence of minimal infiltration.
C	Severe damage such as missing bricks in brick manholes, severe exposed aggregates or exposed reinforcing steel in concrete structures. Severe evidence of exposure to sewer gases. Evidence of moderate infiltration.

- B. The minimum coating thickness shall be described in the following table:

Type of Structure	Condition	Minimum Coating Thickness (mils)
Manhole (precast)	New	125

Manhole (precast) with force main or grinder pump discharge and next 3 downstream manholes	New	250
Manhole (precast)	A	150

Manhole (brick)	A	500
Manhole (precast)	B	250
Manhole (brick)	B	500
Manhole (precast)	C	300
Manhole (brick)	C	500
Wetwell or Lift Station	New	250
Wetwell or Lift Station	A	250
Wetwell or Lift Station	B	250
Wetwell or Lift Station	C	350

C. The following standards are hereby incorporated into these specifications by reference:

1. ASTM D638 — Tensile Properties of Plastics
2. ASTM D790 — Flexural Properties of Un-reinforced and Reinforced Plastics
3. ASTM D695 — Compressive Strength of Rigid Plastics
4. ASTM D4541 — Pull-off Strength of Coatings Using a Portable Adhesion Tester
5. ASTM D2584 — Volatile Matter Content
6. ASTM D2240 — Durometer Hardness, Type D
7. ASTM D1653 — Water Vapor Transmission of Organic Coating Films
8. ASTM D543 — Resistance of Plastics to Chemical Reagents
9. ASTM C297 — Flatwise Tensile Strength of Sandwich Constructions
10. ASTM — The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
11. NACE — The published standards of the National Association of Corrosion Engineers (NACE International), Houston, TX.

D. Submittals

1. All submittals shall be submitted in accordance with the applicable portions of these specifications
2. The Contractor shall submit the following information to the Engineer for approval prior to beginning the installation of the protective coating
  - a. Manufacturer's data sheets for the lining or coating materials.

- b. Third party test results verifying the physical properties of the lining/coating materials meet or exceed the requirements of these specifications.
- c. Applicators' procedures for preparing the surface of the structure and installing the coating system.
- d. Documentation that the Applicator of the coating has been trained and certified by the Manufacturer and meets the experience requirements of these specifications.

### **1.03 Warranty Provisions**

The liner/coating manufacturer shall provide a ten-year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system, and shall protect the structure for at least ten years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

## **PART 2 — PRODUCTS**

### 2.01 Materials

- A. Liner shall be AGRU Sure Grips HDPE, Structural Epoxy, Fiberglass or equal with a minimum thickness of 2 mm. All HDPE liner sheets shall be extruded with a large number of anchoring studs (as required to distribute back pressure and minimize deflection of the HDPE) manufactured during the extrusion process in one piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a pullout of 112.5 lbs./anchoring stud. Liners shall not be used to prevent water leakage into the structure. Proper surface preparation shall be performed before the liner is installed.
- B. Flat liner sheet, non-anchored, used for overlapping joints, shall have a minimum thickness of 3 mm. All joints shall be sealed by means of thermal welding performed by certified welders. The shop drawings shall demonstrate that the welder has successfully completed 10 projects with the material to be welded and of similar nature.
- C. The lining shall have good impact resistance, shall be flexible, and shall have an elongation sufficient to bridge up to a 1/4-inch settling crack, which may occur in

the joint after installation, without damage to the lining. The liner shall be able to bridge any expansion cracks that may occur.

- D. The lining shall be repairable at any time during the life of the structure.
- E. The fabricator will custom fit the liner to the structure in order to protect the concrete surfaces from sewer gases. The interior surfaces to be protected shall include the walls, ceiling, pipe penetrations, and structure chimney. The shop drawings shall demonstrate that the fabricator has successfully completed 20 projects of similar nature.

## 2.02 Physical Properties

- A. The HDPE material used to form the liner shall meet the following properties:
1. Density of 945 g/ cm<sup>3</sup> as defined by ASTM D792.
  2. Melt Flow Index of 0.07 - 1.0 g/ 10 min. (190/ 5) as defined by ASTM D1238.
  3. Yield stress equal to or greater than 2320 psi as defined by ASTM D638.
  4. Elongation yield equal to or greater than 12% as defined by ASTM D638.
  5. Maximum working temperature of 140° F/ 60° C.
  6. Fire Classification of V2 as defined by Underwriters Laboratories UL-94.

B. Upon request, the manufacturer shall provide written certification that the liner meets or exceeds the requirement of this specification.

## 2.03 Spray on Structural Epoxy

- A. The coating shall be spray applied 100% solids epoxy monolithic surfacing system for use in coating new or existing manholes, wet wells, lift stations, treatment plants, and other structures. Material shall be Spectra Shield, GML coatings, or approved equal.
- B. In order to be considered as an equivalent, a product must have the following minimum physical characteristics as measured by the applicable ASTM Standards referenced herein.
1. Minimum Compressive Strength: 12,000 psi
  2. Minimum Tensile Strength: 7,000 psi
  3. Minimum Flexural Strength: 11,000 psi
  4. Minimum Bond Strength: 500 psi
  5. Minimum Corrosion Resistance Suitable for Environments pH of 0.5 or higher
- C. Other manufacturer's or products seeking pre-approval must submit the following documentation to the Engineer a minimum of two weeks prior to the bid date:
1. Documentation that the proposed product meets the above minimum physical characteristics including results of testing performed by a bonded, third party testing company.
  2. An affidavit attesting to the successful use of the product as a protective coating for concrete or masonry structures for a minimum continuous period of five years in wastewater conditions recognized as corrosive or otherwise detrimental to concrete and masonry.
  3. A verifiable list of references that document the successful installation and use of the product in a minimum of 750,000 square feet of sanitary sewer structures.

4. This time frame allows the Engineer ample time to determine if the proposed product is an acceptable alternative.
- D. All additional products that are pre-approved by the Engineer shall be identified in an addendum issued prior to the bid date.

### **PART 3 - EXECUTION**

#### **3.01 Welding**

- A. All welding shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer. Completion of welding will provide a one-piece monolithic concrete protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs.
- B. The following welding techniques are acceptable:
1. Extrusion Welding
  2. Wedge Welding
  3. Butt Welding
  4. Hot Air Welding
- C. Testing and supervision of the installation and welding shall be performed by qualified staff of the manufacturer and must be checked when completed by visually checking with a putty knife each weld and by spark testing all welded joints.

#### **3.02 Spray on Structural Epoxy**

- A. Use a high pressure (5,000-10,000 psi at 4 gpm) water spray to remove all foreign material from the walls, ceiling, and bench of the manhole. Loose or protruding masonry materials shall be removed using a hammer and chisel. Fill any voids, holes, or cracks with epoxy mortar to form a uniform surface. Place covers over all pipe openings to prevent extraneous material from entering the pipes. Block or divert sewer from entering the manhole or a flow through plug. Any infiltration leaks shall be stopped by using such methods as approved by the Manufacturer.
- B. The liner material shall be sprayed onto the invert, bench, ceiling, and wall areas. The sprayed-on material shall be applied such that the entire manhole is lined with a structurally enhanced monolithic liner. The thickness of the wall liner material shall be such that it will withstand the hydraulic load generated by the surrounding groundwater table, using a factor of safety of two, and using the assumption that the groundwater table is at the level of the top of the structure. See Section 1.02 for minimum thickness. The invert and bench liner material shall be the same thickness as that required for the base of the wall.

- C. Special care shall be used to provide a smooth transition between the intersecting pipelines and the manhole inverts such that flow is not impaired. Remove concrete material from the existing manhole base channel in depth to the required thickness of the new liner material as needed.
- D. No active sewer flow shall be allowed in the newly lined manhole, nor shall any vacuum tests be performed, until the liner material has had adequate time to cure, as recommended by the liner material manufacturer.
- E. Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto the manhole ring, onto and around the pipe openings and any other protrusions, and completely cover the bench, ceiling, and flow invert.

END OF SECTION

## **PART 1 — GENERAL**

### **1.01 Summary**

This section presents the requirements for Bypass Pumping that will be required for all sewer line and manhole replacement, unless the Contractor can demonstrate to County that the work can be accomplished without bypass pumping.

### **1.02 Bypass Pumping Plans**

- A. Contractor shall meet with the County, to establish locations of pumps and equipment needed to achieve flow stoppage of adequate time to complete the work.
- B. The Contractor shall be solely responsible for all work associated with Bypass Pumping to include the design of all pump equipment, piping, power, collection and distribution elements to achieve the bypassing of existing sewage from intake point to discharge point.
- C. Contractor shall provide County at the Pre-Construction Meeting a plan detailing the anticipated start date and length of time required to perform Bypass Pumping. Contractor shall provide a minimum of one full day written notice to the County in advance of start of Bypass Pumping. County shall acknowledge such notice.
- D. The Contractor shall provide the County a map showing the location or locations at which flow will be stopped, as well as the locations at which pumping will occur, and the location at which the flow will be returned to the sanitary sewer system. The map shall show the location, size, and length of hoses, location and capacities of pumps, and the method used to stop flow. A plan shall accompany the map and also detail the number of people required to perform the work, and the frequency with which checks of sewage levels in manholes will be made. Additionally, Contractor shall provide the County the names and phone numbers of Contractor's employees who will be on-site, 24 hours/ day 7 days per week to ensure that the pumps and piping do not cause a Sanitary Sewer Spill (SSO). Contractor's employees performing the bypass pumping operations shall have cellular phones with them at all times.
- E. For purposes of bypass pumping lateral flows, right of entry onto private property is not permitted without property owner/homeowner association permission. Contractor shall be responsible to acquire this permission. Laterals shown on Drawings are from best available documents. Internal inspection may identify additional laterals not shown on the drawings that may require bypass pumping.

### **1.03 Regulatory Requirements**

- A. Maintenance of Traffic: Contractor shall maintain the flow of traffic in a manner consistent with the requirements of the County and/or the Manual of Uniform Traffic Control Devices such that bypass pumping does not interfere with travel, or access to houses or businesses in accordance with FDOT Maintenance of Traffic. The Contractor shall be responsible for providing a FDOT Maintenance of Traffic (MOT) Plan to the County and local traffic law enforcement agency for review. The MOT Plan shall show the location of all barricades, signs, devices and alternate routes for local traffic and pedestrian safety. Erection of the appropriate safety and warning devices in accordance with the USDOT/ FHWA Manual on Uniform Traffic Control Devices (MUTCD) shall be completed prior to beginning work and maintained until all construction is completed and the site restored.
- B. Sanitary Sewer Spills (SSOs):
1. The Contractor shall establish an emergency response plan for promptly notifying the Department of Environmental Protection (FDEP) and the County in the event of a sewage spill/SSO.
  2. The Contractor shall verbally report all unauthorized releases or spills of untreated or treated wastewater to the County and the Florida Department of Environmental Protection as soon as practical, but no later than 12 hours from the time the Contractor becomes aware of the discharge. Any size spills or releases which enter the "Waters of the State" or where public health or the environment may be endangered, are to be reported to the State Watch Point at (800) 320-0519. Spills or releases of any amount are to be reported to the County and FDEP. The Contractor, to the extent known, will provide the following information to the County, State Warning Point and FDEP branch office:
    - a. Name, Address and Telephone Number of Person Reporting.
    - b. Name, Address and Telephone Number of Responsible Persons for the Discharge.
    - c. Date and Time of the Discharge and Status of the Discharge (Ongoing or Ceased).
    - d. Characteristics of Wastewater Spilled or Released (Untreated or Treated, Industrial or Domestic).
    - e. Estimated Amount of the Discharge.
    - f. Location or Address of the Discharge.
    - g. Whether the Discharge was Contained On-Site and Cleanup Actions Taken.
  - h. Description of Area Affected by the Discharge, Including Name of Any Water Body.
  - i. Other Persons or Agencies Contacted.
3. In addition, a written report shall be provided to the County, FDEP and other affected agencies no later than 72 hours following the discharge. All notifications shall comply with applicable provisions which may apply to the project and shall be in accordance with Rule 62-604.550, F.A.C.

4. The Contractor shall be solely liable for any FDEP penalties, fines or actions resulting from any unpermitted wastewater discharge and/ or the failure to provide proper notice according to the above requirements.

## **PART 2 — PRODUCTS**

### **2.01 Equipment**

- A. Contractor shall use only materials and equipment suitable for bypass pumping of raw, unscreened sewage. The material and equipment shall be in and kept in good repair throughout the work. Standby equipment as may be needed shall be ready for use in the event maintenance or repair of the equipment in service is required.
- B. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during a rainstorm. The Contractor shall field verify minimum, maximum, and average flow to be bypassed. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hours basis, all engines shall be equipped to keep noise to a minimum, within local noise abatement regulation with residential-critical mufflers, sound deadening enclosures, and other means. Number and size of pumps used in bypass pumping shall be such that if the largest pump is out of service, bypass flows will be maintained during the bypass operation.
- C. When flow in a sewer line is plugged, blocked, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precaution must be taken to public or private property served by the sewers involved.
- D. Batteries:
  - a. Type: Lithium Ion or Lead-Acid (liquid or gel)
  - b. Size batteries to provide cycle cranking of 10 seconds crank, and 10 seconds rest for 5 cycles at 32 degrees F.

### **2.02 Supplies**

The Contractor shall be responsible for supplying any and all supplies, spare parts, material, fuel, labor, incidentals and expendables required to execute the work in a timely manner.

### **2.03 Regulation**

All work shall be in accordance with all Federal, State, and Local regulations.

## **PART 3 — EXECUTION**

### **3.01 Examination**

- A. Verification of Conditions
  - 1. Contractor shall verify receipt of notice from County.
  - 2. Contractor shall verify site is ready for bypass pumping.
  - 3. At each project site the Contractor shall have the entire bypassing system in place and tested before bypassing any sewage.

### **3.02 Preparation**

- A. Traffic Maintenance: The Contractor shall ensure all required traffic control devices are in place. Vehicular and pedestrian access to public and private facilities shall be coordinated with the traffic control plan. The traffic control plan shall show how vehicles and pedestrians will be protected from injury resulting from bypass operations. Must follow FDOT Movement of Traffic.
- B. Emergency Response Plan: Contractor shall ensure the necessary phone numbers and procedures are posted at the bypass location to ensure rapid response in the unlikely event of a spill/SSO.
- C. Bypass Pumping Route: Contractor shall ensure adequate space is available to accommodate pumps, piping, and thrust restraint as may be needed to perform work.
- D. Protection of Existing Property: Adequate examination and preparation shall be made by Contractor to assure existing property (public or private) remains undamaged during the work. Contractor shall be solely responsible for protecting public or private property from damage.

### **3.03 Closeout**

- A. Contractor shall verify all work required during the performance of Bypass Pumping is complete and approved by the County.
- B. The Contractor may then notify the County of the intent to stop pumping. The Contractor shall keep all equipment ready for reuse should the need arise during switch over.
- C. The Contractor may, once approval is granted, begin removing equipment from site.

- D. Contractor shall perform a thorough cleaning and restoration, including any areas disturbed or damaged, at no cost to County.

END OF SECTION

SECTION 02560  
LIFT STATION INSTRUMENTATION AND  
CONTROL SYSTEM

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This Section covers work related to the furnishing, installation supervision, and testing of the various field elements and panels to be supplied with the (Process Control and Instrumentation System) PICS. This work is to be included in the lump sum price for the PICS as provided through the PICS supplier in accordance with these specifications.
- B. Furnish all instrumentation and controls hereinafter specified to perform the intended function. Work shall include all labor, materials, and equipment, performance of all work necessary to complete the manufacturer, to make factory tests, to prepare and load for shipment, to deliver to the site, to provide programming, calibration, installation supervision, system start-up, services and incidentals required as shown on the Standard Drawings WW-16- 19.
- C. All equipment, materials, programming and services hereinafter termed "the system", shall be by the PICS supplier who, with the contractor, shall coordinate and have responsibility for interconnecting with equipment being installed.
- D. Auxiliary and accessory devices necessary for system operation or performance such as transducers or relays to interface with existing equipment or equipment provided under other sections of this Specification shall be included whether specified or not.
- E. The PICS shall be furnished by the local representative of or a manufacturer certified integrator of the system controller / remote terminal unit who shall provide all of the services, equipment and appurtenances required to achieve a fully integrated and operational system. To facilitate the owner's future operation and maintenance, products shall be of the same major instrumentation manufacturer with panel mounted devices of the same type and model as far as possible.
- F. Substitutions on functions or equipment specified will not be acceptable. In order to ensure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various sub-systems and the establishment of minimums with

regard to ranges and accuracy, strict compliance with the above requirements shall be maintained. In order to ensure compatibility between all equipment, it shall be the responsibility of the PICS supplier hereunder to coordinate all interface requirements with existing equipment and with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.

## 1.02 SUBMITTALS

### A. Materials and Shop Drawings:

1. Furnish, as prescribed under the General Requirements, Shop Drawings covering the items included under this section or work.
2. Submit Shop Drawings at one time, as a package, for complete interface checking. Partial submittals will not be accepted. However, a separate submittal for the field instruments and the control panels will be allowed.
3. Specifically, include the following information:
  - a. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments.
  - b. Individual data sheets for all components of the field instruments and control panels to supplement the above information by citing all specific features for each specific component (e.g., scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.
  - c. Catalog information on all miscellaneous electrical and mechanical devices furnished under this section.
  - d. Shop drawings and catalog material for all control panels and enclosures. Include panel elevation (front, side, interior), construction shop drawings, schedules, and sizing, calculations.
  - e. Panel wiring diagrams of all control panels. Diagrams shall be complete electrical wiring diagrams showing all components and all auxiliary devices such as relays, alarms, fuses, lights, fans, heaters, etc. All wires and terminals shall be numbered on the diagrams, and line cross references shall be labeled. Include wiring interface to I/O of the PLCs. Include on the drawings, a tag number to identify each component, referenced to a component identification list.
  - f. Number all electrical terminal blocks and field wiring. Identify each

line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme. Coordinate the electrical interconnect wiring diagram with Electrical Contractor.

- g. Installation details for all field mounted devices and panels to show conformance with those shown on the Drawings.
        - h. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.
  - 4. Submit a list of manufacturer's recommended spare parts and expendables to be supplied with the field instruments and control panels.
- B. Operating and Maintenance Manuals: For each field device and panel mounted control device provided, assemble the fully updated approved submittal information plus all available service manuals for the devices in binders with identifying tabs and data sheets.

### 1.03 WARRANTY AND GUARANTEES

- A. The PICS supplier shall furnish to the Owner a written one year guarantee commencing with final acceptance, that all equipment and parts thereof, material and/or workmanship for the field elements, instruments, and control panels are of top quality and free from defects.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Products must conform to the latest Bay County Standard Drawings Bill of Material. In the event a bill of material listed item is no longer offered by the manufacturer alternate items will be acceptable but must be noted in submittal documents.

### 2.02 CONTROL PANELS

- A. PICS Control Panels: Provide the control panels shown on the standard drawings.
  - 1. Corrosion Control: Protect all panels from internal corrosion by the use of corrosion inhibiting vapor capsules, Hoffman, model A-HCI, or equal. Provide sealed panels with combination drain/breathers, Crouse-Hinds model ECD18; or equal.
  - 2. Temperature Control: Provide panels mounted in outdoor or unheated areas with thermostatically controlled space heaters to maintain internal temperatures above dew point. Provide outdoor panels with integral sun shields.
  - 3. Construction: All panels shall be manufactured items, Hoffman Engineering,

or equal. Minimum metal thickness shall be 14 gauge. Provided stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion. When required, provide removable lifting rings and fill plugs to replace rings after installation.

4. Electrical:
  - a. Provide a main circuit breaker and branch circuit breaker for each branch circuit as required to distribute power within each panel from the main power feed. Make provisions for bottom feeder conduit entry and provide terminal board for termination of all wiring. Provide access to the breakers when the panel door is open. The following rules apply for actual circuit wiring:
    - 1) No more than 20 devices on any single circuit.
    - 2) Do not group multiple units of parallel operations on the same board circuit.
    - 3) Do not exceed an amp capacity of 12 amps for any branch circuit.
    - 4) Panel (or site) lighting, receptacles, heaters, controls, telemetry, and fans shall be on a separate branch circuit.
  - b. The panel manufacturer shall design, furnish and install all interior wiring within the control panels and furnish complete wiring diagrams showing the electrical circuits inside the panel and interconnections between the panel and the external instruments and components. Identify and number all terminals and wires. Attach numbered tags to each panel wire for identification. Inside each panel, provide a copy of the panel wiring diagram. No power shall be applied until the PICS supplier has approved the installation.
  - c. Wiring within panels shall meet the following requirements:
    - 1) Discrete wiring shall be 300 volt, type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.
    - 2) Power wiring shall be 300 volt type, stranded copper No. 14 AWG size, for 120V service.
    - 3) Analog signal wiring shall be 300 volt, stranded copper in twisted shielded pairs, no smaller than No. 16 AWG.
    - 4) Restrain wiring with plastic ties or ducts. Hinge wiring shall be secured at each end with bend area protected with a plastic sleeve.

- d. All relays shall be the compact, general purpose, plug in type. Contacts shall be rated for not less than 10 amperes at 120V. Provide relays with status lights. Time delay relays shall have integral adjustment knob and rangeability of at least 10:1. All relays shall have permanent, legible identification.
- e. Terminal blocks shall meet the following requirements:
  - 1) Provide the greater of 20 percent of all connected terminals or four unused spare terminals for each type supplied.
  - 2) Provide terminal blocks for DC and analog signals separate from AC circuit terminal blocks.
  - 3) Screw type terminal connections shall be locking, fork-tongue or ring-tongue lugs crimped with proper sized anvil. Terminate no more than two plugs per terminal with no more than one wire per lug.
  - 4) Compression clamp terminal connections shall be stripped and prepared per manufacturer's recommendations.
  - 5) Use of aluminum connectors shall not be permitted without prior approval of the Engineer. Connectors shall be either copper or steel.
  - 6) Terminate data highway and other communications cable connections per manufacturer's recommendations, located near the bottom of the panel at the point of entrance to the panel.
- f. Provide power supplies as required to power instruments of circuits requiring DC power. Convert 120V AC to DC power of appropriate voltage, voltage regulation, and ripple control to operate within equipment tolerances. DC power supplies shall be of the linear type and design to eliminate switching RFI. Output over voltage and over current protection devices shall be provided.
- g. Provide, when shown on the wiring diagrams, the indicated control panels with an internal, hand switch controlled, 10-watt L.E.D. light and a 120V, 1 amp, duplex receptacle.
- h. Provide all panels with an isolated copper grounding buss to ground all signal and shield connections. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices.
- i. For 480V panels, provide a 120V dry type control transformer for the panel control and other 120V circuits. Transformers shall be sized to

meet higher service rating than actually applied and shall be provided with fused primary and secondary.

- j. Install surge suppression devices so that they may be easily identified and replaced. A permanent I.D. # or nameplate shall be affixed to each device.

## 2.03 MATERIALS AND EQUIPMENT

A. The following are the component specifications for specific devices identified on the standard drawings and bill of material and instrumentation listed as a field device.

- 1. Alarm, Audible Horn:
  - a. Provide audible horn that generates a loud audible alarm when activated by 115V AC power. The horn shall surface mount remotely as noted, suitable for outdoor use.
  - b. Outdoor units with sealed conduit entry, shall be Ronon Model 350W, or equal.
- 2. Alarm, Visual Beacon:
  - a. Warning lights shall be flashing type units that produce 360 degree beams of colored light. Flashing light shall be 60 to 80 flashes per minute. Unit shall be a solid state strobe source. Light color shall be red and unit shall have simple technique for re-lamping. Units shall be suitable for remote mounting, as note, and shall operate on 120V AC power, unless otherwise notes or shown. Housing shall be weatherproof, suitable for use in outdoor environments without other protection. General purpose units shall be Benjamin Electric Manufacturing, Series KL-4000; or equal.

B. The following are the general components descriptions for the miscellaneous components of the PICS that are required to implement the various control functions of the field elements and control panels that are not specifically identified on the drawings:

- 1. System Controller / Remote Terminal Unit
  - a. The System Controller shall be DIN Rail mountable as shown on the standard drawings.
  - b. A 7" Touch Screen Operator Interface Unit shall be provided and mounted in the swing out door of the control panel.
  - c. Cellular IOT communications devices shall be provided. Sites shall be tested to assure connectivity to the cellular network.

- d. Make/Model:
    - 1. Hydralink Control Unit.
    - 2. No equal.
  - e. Service. The PICS system supplier shall offer full factory support of the installed system through the use of factory-trained employees. The Owner shall have 24 hour per day access to service personnel through a pager and/or cell phone.
2. Submersible Level Transmitter
- a. The submersible level transmitter shall provide reliable, continuous level monitoring of liquids in the pump station. Basis of design is Blue Ribbon Model Birdcage.
  - b. The transmitter shall provide high-accuracy level measurements for hazardous locations. Housing shall be 316L stainless steel construction and hydrophobic breather vent.
  - c. The transducer shall be compatible with the Hydralink controllers, from a basic system for high/low alarm or simple pump control.
3. Level Float Switch, Suspended:
- a. Units shall be direct acting float type level switches consisting of a mercury switch enclosed in a float connected to a two conductor, combination support and signal cable. The entire assembly shall be watertight and impact resistant. Floats shall be formed of a chemical resistant plastic material. Cable shall be rugged and flexible with heavy neoprene or PVC jacket. The actuation/de-actuation differential shall not exceed 1 inch. The switch shall be rated at 5 amperes at 120 volts. Provide each float with 40 feet of cable.
  - b. Units shall be supplied with integral weight assemblies for stabilization and positive operation of suspended units. Units shall be Consolidated Electric Co., Model LS; Anchor Scientific, Inc., Model Roto-Float Type S; or approved equal
4. Force Main Pressure Transmitter (if required)
- a. The pressure transmitter shall provide reliable, continuous pressure monitoring of liquids in the station force main. Basis of design is Blue Ribbon Model 311.
  - b. The unit shall be stainless steel housed with ¼" MPT integral in the design.
  - c. Pressure shall be 0-100 PSI with 4-20mA output.
  - d. Integral cable shall be outdoor rated 15' in length.

- e. The unit shall be couple with a Stainless-Steel isolation diaphragm pre-mounted by the manufacturer with ½” MPT connection to the process fluid.
- 5. Magnetic Flow Meter (if required)
  - a. See construction notes as detailed on the Standard Drawings.
- 6. Combustible Gas Detector (if required)
  - a. Continuous gas monitoring with relay output for system alarm.
  - b. Per latest Bay County Standards specification.

#### 2.04 SPARE PARTS

- A. Obtain from the manufacturer(s) and provide the recommended critical spare parts as part of the work. The spare parts are the property of the Owner.
- B. All system spare parts and expendables, as required for a period of one year, shall be included.

END OF SECTION

### **PART 1 - GENERAL**

#### **1.01 Scope**

- A. This Section covers the work necessary to furnish, install, test and place in operation the pumps, gauges, and valves for pump stations. Pipe for pump stations shall be installed as shown on the Drawings (in accordance with County Standard Detail WW-11 and 12) and as specified herein. Electrical work shall be in accordance with Electrical Sections of these Specifications. All power to pump stations shall be 3 phase, no single phase shall be allowed.
- B. Associated wetwell, piping, valves and site work shall be as specified in Sections 02510 and 02571.

#### **1.02 Qualifications**

The pump manufacturer shall have similar units in operation for a minimum of five years in the United States.

#### **1.03 Design Requirements**

- A. Pumps shall be totally submersible, explosion proof, electric motor driven, non-clog,

sewage pumps.

- B. The pump manufacturer shall review design and layout drawings to insure that installation arrangements are suitable for their equipment. Any potential conflicts or recommended modification shall be noted on the shop drawings or by a pre-submittal request for information if appropriate. Any modifications required to satisfy manufacturer's recommendations shall be at the Contractor's expense.
- C. Operating requirements for pumps shall be as shown in Table 1 of this Section.
- D. The operating range of the pump shall include minimum head, rated and shut-off conditions. The pumps shall be non-overloading throughout this operating range.
- E. Pump design shall incorporate an automatic discharge connection, allowing each unit to be removed for inspection or service by simply lifting the pump. Re-connection shall require only lowering of the pump into position.
- F. All pumps shall be fitted with a "Mix-Flush Valve", equivalent to Flyght model 4901.

#### **1.04 Factory Testing**

- A. The pump manufacturer shall conduct full scale, full range factory performance tests with respect to capacity, head and horsepower on each of the pump units to be provided on this Project. Certified test reports shall be submitted for approval, prior to shipment of the pumps. Tests shall be conducted in accordance with applicable Hydraulic Institute standards for acceptance Level "A".
- B. The County shall have the option to witness the pump tests. The County shall be notified at least two weeks prior to the date of the testing.

#### **1.05 Submittals**

- A. Submit shop drawings for all equipment furnished. Specific submittal information shall include:
  - 1. Pump manufacturer's name, pump size or model number, weight and a descriptive bulletin of the pump to be furnished.
  - 2. Outline dimension drawings of the pump.
  - 3. Pump characteristic curves showing head capacity and horsepower, including minimum head, rated and shutoff conditions.
  - 4. Motor manufacturer's name, motor horsepower, RPM and frame size, weight and descriptive bulletin of the motor to be furnished. Include motor manufacturer's certified dimension sheet that lists motor features and include typical motor data sheet.
  - 5. Control panel schematics, panel dimensions and layout, and product data sheets.
- B. Operation and maintenance manuals shall be furnished for the equipment.

## **1.06 Storage and Protection**

- A. Pumps and accessories shall be stored and protected in accordance with the manufacturer's recommendations.
- B. Pumps shall be completely drained prior to shipment. Suction and discharge ports shall be provided with plastic plugs. Each pump shall be secured to a wooden skid to facilitate handling and storage.

## **1.07 Quality Assurance**

The manufacturer shall provide a written certification to the County that all equipment furnished complies with all applicable requirements of these Specifications

## **PART 2 – PRODUCTS**

### **2.01 Acceptable Pump Manufacturer's**

- A. Pumps shall be as manufactured by Flygt, Wilo or approved equal.
- B. All pumps shall be supplied by a single manufacturer.

### **2.02 Pump Materials and Construction**

- A. Pump Construction
  - 1. All major castings, including the motor housing, bearing housing, volute and impeller shall be of as a minimum ASTM A48 Class 35 cast iron or 316L stainless steel. The volute and impeller shall be ceramic coated.
  - 2. All major parts, such as the stator casing, oil casing, volute, sliding bracket and discharge connection shall be of gray iron. All exposed bolts and nuts shall be 316L stainless steel. All mating surfaces of major parts shall be machined and fitted with rubber O-ring seals where watertight sealing is required. All parts shall be interchangeable and watertight sealing shall not require additional machining of replacement parts, sealing compounds, or the application of specific torques to connectors.
  - 3. No portion of the pump unit shall bear directly on the floor of the wet well. There shall be no more than one 90 degree bend allowed between the volute discharge flange and station piping.
  - 4. A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange which automatically connects directly to, or through an intermediate coupling to a discharge base. The discharge base shall be bolted to the floor of the sump and shall have a flanged connection to the discharge piping. There shall be no need for adjustment, fasteners, clamps, or other devices to connect the pump to the discharge base.

B. Impeller

1. The pump shall be provided with wear rings of 400 series stainless steel having a Brinell Hardness Rating of a minimum 300. The impeller shall have a Brinell Hardness Rating of 200 minimum, of non-clogging design, capable of handling 3-inch diameter solids, fibrous material, heavy sludge and other matter found in normal sewage applications.
2. The impeller shall be constructed with a long through let without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. The impeller shall be a slip fit or taper fit to the shaft and key driven. Non-corroding fasteners shall be used.

C. Abrasion Resistance: All parts exposed to abrasive wear, case and impeller shall have a minimum Brinell hardness of 200 and ceramic coated.

D. Shaft Seals

1. Each pump shall be provided with a mechanical, rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated, lapped seal faces. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven, rotating tungsten-carbide or silicon-carbide ring. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide or silicon-carbide ring and one positively driven rotating tungsten-carbide ring.
2. Each interface shall be held in contact by its own independent spring system, supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication. The oil reservoir shall have a drain and inspection plug, with positive seal, which shall be easily accessible from outside the pump.
3. A leakage sensing system shall be provided to detect the intrusion of moisture in either the seal chamber or stator housing.

## 2.03 Guide Bars

Guide bars shall be 316L stainless steel pipe or structural section attached to the automatic discharge connection at their lower end and to an upper 316L stainless steel guide bar bracket at their upper end. Intermediate 316L stainless steel guide bar supports shall be provided as required to insure a rigid installation. Guide bars shall not support any of the weight of the pump. Any anchors or brackets shall be 316L stainless steel. Guide bars shall be fastened with 316L anchors and not attached to piping.

## 2.04 Motor

A. Pump Motor

1. The submersible motor shall be housed in a completely watertight and oil filled chamber. The motor shall be suitable for use in Class I, Division I, Group D atmospheres as Explosion Proof. The motor stator shall use at minimum Class F insulation warranted for 311 degrees F. The motors shall be designed, rated, and warranted for continuous operation and capable of at minimum fifteen 15 starts per hour. Refer to Table 1 for additional pump characteristics.

2. Provide a common pump/motor shaft of sufficient size to transmit full driver output with a maximum deflection of 0.002 inches measured at the lower mechanical seal. The shaft shall be of ASTM A 276 Type 400 series stainless steel.
3. The shaft shall be supported above and below the rotor by anti-friction bearings designed to provide long life and minimize shaft deflection. At least one bearing shall be double row type. Bearings shall have a minimum AFBMA B10 life of 50,000 hours.
4. Thermal sensors shall be provided to monitor stator temperature. One thermal switch shall be imbedded in the end coils of each stator winding. The thermal switch shall be used in conjunction with, and in addition to, external motor protection and shall be wired into the control panel.
5. Provide a sensor to detect moisture in the stator housing of all pumps.
6. Motors shall have a maximum rotating speed of 1,800 RPM.
7. Motors shall be 3-phase, 60 Hz, 230/460 volt electric current.
8. Seals shall be either Tungsten-Carbide or Silicone Carbide type.

B. Cable

1. Cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors.
2. The cable entry sealing fitting shall relieve stress on conductors and provide a watertight and submersible seal, without the use of sealing compounds and without the application of specific torques to connectors. The conductors shall connect to a terminal board which shall be provided with a moisture-tight seal between the cable entry junction chamber and the motor.

## 2.05 Controls

A. Supplier: All controls specified shall be furnished by the pump manufacturer.

B. Pump Control Panel

1. Furnish a complete pump control package for each station as specified below and in Table 1, and as associated with the combustible gas detector.
2. Power Supply: Power supply shall be as shown in Table 1. Each control panel shall have a main disconnect switch. All controls shall operate on 120 volts or lower. Provide a suitably sized control power transformer, 120/240 volt secondary, with primary and secondary overcurrent protection. Provide control power transformer spare capacity and 2 pole, 240 volt breaker sized per Table 1 to supply generator accessories, or minimum 3kVA spare capacity for installations with no on-site generator. In addition, provide 4-20 amp 1 pole breakers to supply other station auxiliary devices. Equip one auxiliary circuit with front panel On/Off selector (area light). Transformer 3R is to be located on the outside of the Control Panel.
3. Starters: NEMA rated, circuit breaker combination type, with overcurrent protection in each phase. Interrupting rating shall exceed the available short circuit current. If the pumps are requiring greater than 10hp, a VFD or soft start will be required, the decision as to which one will be required will be made by the County. If VFD's are required to control pumps, SqD or approved equal. Provide VFD with a display, keypad, and data connection with supplied software equipment for configuration. VFD's shall provide protective functions including phase loss and phase reversal.

4. Surge Protection: Equip each panel with main panel protection. Provide a surge protection device as manufactured by Surge Suppression Inc. with status lights.
5. Relays: For non-motor contactor control, 120 VAC, 10 amp, continuous duty, solid state relays. Contactor control relays, heavy duty, industrial grade, convertible contacts, continuous duty, or solid state relays. Acceptable manufacturers: Potter & Brumfield, Allen-Bradley, General Electric, or Square D, or equivalent. A different shape for each voltage shall be used.
6. Programmable Logic Controller (PLC): A PLC will be used to accomplish control logic. Provide four spare I/O points, of each type of I/O used. Provide interposing relays for all external interface discrete signals. Provide isolated analog input/outputs for all external interface analog signals. Provide an licensed electronic copy of the PLC programming software and an electronic copy of the PLC application program that includes annotations. PLC logic is to be fully annotated, including point tag descriptors. Acceptable manufacturer is Allen-Bradley using RS Logix type. All PLCs will be required to have battery backup
7. Selectors and Pushbuttons: Heavy duty, oil-tight with octagonal ring and electrical connections shall be shielded.
8. Provide a means to automatically transfer service to the on-site generator or pump or manually transfer service to the generator receptacle, as appropriate.
9. Indicating Lights: Heavy duty, oil-tight, transformer type with lens colors as follows:

<u>Color</u>	<u>Function</u>
Red	Motor Run
Green	Motor Stop
Blue	Call to Run
Amber	Alarm/Fault
White	Control Power On

All indicating lights shall be LED type

10. Panel Construction: Route all wiring in Panduit or similar wire ways. Protect all wiring across panel hinges. Provide numbered terminal strips for all field wiring terminations. All wires are to be labeled. Use metal flash shield barriers to separate control power of 120 volts from the control sections. All control fuses shall be in fuse holders that indicate whether the fuse is good. One complete set of spare fuses will be provided by the Contractor.
11. Provide accommodations for combustible gas detector with removable 316L specified in this Section. Combustible gas detection accommodations will be needed on a case by case basis determined by Bay County Utilities.
12. Control panel shall be free-standing, pad mounted, with removable 316L stainless steel screened 12" air space, front and back, below at cable entry point. A separate panel with flash protection shall be provided for voltages over 120.
13. Moisture Sensor: The Control panel shall include one completely enclosed solid-state electronic module (Sub Meg – Automatic Megger) per pump as manufactured by Flygt or approved equal to automatically monitor the motor winding insulation resistance of each pump in a duplex pump station. The monitoring device shall have two LED pilot lights to indicate power on, and low megger reading, as well as an emergency bypass and motor reset. The power source is to be 115 VAC. The test voltage applied to the motor windings is to be 500 to 600 volts DC minimum. Devices that use a lower voltage shall not be considered acceptable. The test current is to be limited to less than 0.25 milliamps. The device is to measure the winding resistance of the motor prior to the motor operation, after it has been called to run. No monitoring is to occur when both motors are running or idle. If the motor

- winding leakage resistance falls below one megohm, an alarm circuit is to be activated. The Sub Meg or approved equal can be used in lieu of a Leak Sensor.
14. Lift Station Controls Pre-Engineered Roof shall include a 3 foot overhang on the sides and a 4 foot overhang in the front. Refer to Wastewater Details (WW-13)
- C. Alarm Horn: Electro-mechanical diaphragm type, weatherproof housing for out-of-doors installation, 120 VAC power, 90-110dB at ten feet. Federal Signal Corporation Model 350.
  - D. Alarm Beacon: Heavy duty, corrosion-resistant, high intensity LED strobe, suitable for outdoor service, 120 VAC power, and red dome by Federal Signal Corporation.
  - E. Generator Receptacle: The generator receptacle shall be compatible with the Bay County portable generators if an emergency backup is not on site.
  - F. Enclosures: Control and electrical panels shall be housed in NEMA 3R rated enclosure. The enclosure shall provide temperature and climate control suitable for the equipment furnished in the enclosure. Climate conditioning is required for the control panel so that the control circuitry is not exposed to extreme temperatures.
  - G. Liquid Level Sensors: Level sensing and monitoring shall be accomplished utilizing switches encapsulated in a buoyant waterproof housing. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. A chain and anchor assembly of noncorrosive materials shall be provided. A Level Sensor, KPSI 700 or equivalent, shall be used for VFD Controls.
  - H. A Fiber Optic interface or a Cellular interface shall be provided to allow the lift station PLC to be monitored and/or controlled remotely by the County. .
  - I. Programming of the PLC/Fiber Optic or PLC/Cellular to the County's SCADA system shall be by the County's designated integrator. The costs of the lift station integration shall be paid by the Contractor to the County.

## **2.06 Pump Hoist**

Where shown on the Drawings, a certified pump hoist shall be provided. The pump hoist, manufacturer by a reputable company, such as, Thern, and not field constructed. Cranes shall be designed with a minimum safe load capacity of 2.0 times the weight of the pump and with a minimum cable length to raise and lower the pump as required for proper operation. The hoist shall be platform mounted at the location shown on the Drawings. All components shall be Type 316L stainless steel. This shall be required if the Lift Station footprint does not allow a crane truck access to the wet well.

## **2.07 Aluminum Floor Doors**

Provide as specified in Section 02510 of these Specifications and below.

- A. Floor Doors: Aluminum hatch doors shall be integrally cast into the top of the manhole. The pump manufacturer shall verify the size and location with the Contractor prior to installation of each floor door. Floor doors shall be cast into concrete in accordance with the manufacturer's recommendations.
  - 1. Hatch shall be a single or double leaf type as shown on the Drawings built to

- withstand 150 pounds per square foot.
2. The frame shall be 1/4-inch extruded aluminum with built-in neoprene cushion and with strap anchors bolted to the exterior. Door leaf shall be 1/4-inch aluminum diamond plate reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be equipped with a snap lock and removable handle. A two part Epoxy coating shall be applied to the exterior of the frame by the manufacturer. All hardware shall be stainless steel.
  3. Door shall be Type KD for double leaf doors and Type K for single leaf doors by The Bilco Company and be constructed of metal.
  4. Door shall have an OSHA approved fall protection grate manufactured by Romtec Utilities or approved equal located under the hatch door.
- A.
- A Output: A minimum of one discrete SPDT output, configurable to high alarm signal (to activate Alarm Light and Alarm Horn) plus an additional output for a trouble alarm.
- B. Enclosure: Mount sensor in wet well and other components in the control panel.
- C. Power: 120 VAC.
- D. Operating Range: 0-99 percent LEL for methane.
- E. Cable: Cable type between sensor and transmitter shall be coordinated with Division 16 of these Specifications.
- F. Calibrator kit for methane/H<sub>2</sub>S Detector is to be turned over to the County when the County accepts the Lift Station
- G. Schedule: CGD.
- H. Provide panel mounted alarm light for high combustible gas detection, if required. Alarm light and alarm horn shall automatically reset upon methane gas levels returning to normal.
- I. Provide calibrator fitting to provide calibration gas to sensor.
- J. Acceptable Manufacturer: MSA Ultima or approved equal.

## **2.08 Valves**

- A. Valves shall conform to the requirement of this Section and in particular with the Valve Specification Sheets located at the end of this Section.
- B. Plug or pinch valves located in the valve box shall be furnished with a handwheel operator or a 2" operating nut and valve key

## **2.09 Hardware**

All miscellaneous hardware, including straps, supports, bolts, and nuts, shall be 316L stainless steel or aluminum, where such is not designated otherwise on the Plans or Specifications.

## **2.10 Service Features**

- A. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or other fastenings to be disconnected.
- B. The pump discharge piping design shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place.
- C. Hardware necessary for the inspection or removal of each pump from the wet well shall be provided. Hardware shall include, but not be limited to the following:
  - 1. Vertical guide bar or bars
  - 2. Guide bar brackets
  - 3. Discharge pipe connections or elbows
  - 4. Stainless steel lifting chain or wire where indicated on the Drawings.

## **2.11 Discharge Pipe**

Discharge piping shall be in accordance with section titled "Sewage Force Main System" with exception that all exposed pipe shall be AWWA C150 and C151 Pressure Class 250, 316L stainless steel, unless noted otherwise on the drawings.

## **2.12 Water Service Line to Lift Station**

- A. General: A water service line shall be installed for each lift station unless noted otherwise. The water service shall include connection to existing water main, insulated cover, corporation stop with double strap saddle, tubing, fittings, curb stop, meter, meter box, backflow preventer, backflow preventer cover, hose bib and "incidentals" as necessary to complete the service line to the pump station shown on the drawings.
- B. Tubing shall be 1-inch polyethylene tubing with a minimum pressure rating of 160 psi. All fittings on the service line shall have plastic inserts.
- C. Service saddles shall be 313 Service Saddle, double strap iron with cc tap as manufactured by Smith-Blair, Inc.
- D. Curb Stop shall be B11-233W Ball Valve, as manufactured by Ford Meter Box Company, Inc. Curb stop shall have lock wings for locking the valve in the closed position.

- E. Service Couplings shall be Number C84-33 as manufactured by Ford Meter Box Company, Inc.
- F. Corporation Stop shall be Mueller No. H-9971, CC thread or an approved equal.
- G. Meter Boxes shall be Brooks Meter Boxes. Boxes shall be plastic unless located near driveway. Boxes located near or in driveways shall be traffic rated.
- H. Pump station service backflow preventer shall be Watts 909 reduced pressure as manufactured by Watts Regulator Company.
- I. Backflow Preventer Cover shall be Valve Guard® VGEz2 as manufactured by Hubbell Power Systems, Inc., or approved equal.
- J. Lift Station Service Hose Bibb shall be Watts 8A vacuum breaker hose bib as manufactured by Watts Regulator Company or approved equal.

## **PART 3 - EXECUTION**

### **3.01 Installation**

- B. Equipment Installation: All equipment shall be installed in accordance with approved shop drawings, the manufacturer's recommendations and these Specifications.
- C. Anchorage: 316L stainless steel anchor bolts, nuts and washers, as well as any templates necessary for setting the anchorage, shall be furnished by the equipment manufacturer. Placement of the anchor bolts shall be done by the Contractor from certified dimension shop drawings supplied by the equipment manufacturer.
- D. Leveling and Grouting
  - 1. Level and align pump and motor in accordance with the respective manufacturer's published data.
  - 2. Grout pump and discharge base with non-shrink grout in accordance with the ACI and the equipment manufacturers and grout manufacturer's published specifications.

### **3.02 Inspection and Testing**

Following installation, operating tests will be performed demonstrating to the County that each mechanism and the system as a whole will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory performance.

### **3.03 Cleaning**

- A. Prior to acceptance of the work of this Section, thoroughly clean all installed materials, equipment and related areas.
- B. Supplier's/Manufacturer's Service
  - 1. A supplier's and/ or manufacturer's representative for the equipment specified herein shall be present at the job site and/ or classroom designated by the County for the minimum man-days listed for the services herein under, travel time excluded:
    - a. Two man-days for installation assistance, inspection, and written certification of installation acceptability for each pumping system.
    - b. One man-day for functional testing.
    - c. One man-day for pre-startup classroom or job site training.
  - 2. Startup services and training of County's personnel shall be at such times as requested by the County.
- C. Lifting Lugs: Equipment weighing over 100 pounds shall be provided with lifting lugs.
- D. Performance Test
  - 1. The Contractor shall perform field tests on all pump, generator, and control assemblies prior to start-up inspection to ensure stations are operational and working properly. During the start-up inspection, the Contractor shall perform

field tests on all completed pump and control system assemblies to demonstrate their conformance to the Specifications to demonstrate compliance with the contract documents. A minimum of three different operating points per pump unit shall be acquired to assure pump is operating as designed. A test log shall be presented to the County upon the completion of each test that records the following:

- a. Flow, in gallons per minute.
  - b. Pump discharge pressures as measured by calibrated gauges, converted to feet of the liquid pumped and corrected to pump datum as defined by Hydraulic Institute Standards, calculated velocity heads at the discharge flanges, and total head, all tabulated in feet.
  - c. For AC motors, driving motor voltage and amperage measured for each phase and 3-phase kilowatts.
- E. Functional Test: Prior to plant startup or field performance test, all equipment described in the Pump Specification Sheets following shall be inspected for proper alignment, quiet operation, proper connection, and satisfactory performance by means of a functional test.

### 3.04 Valves

- A. Valves shall be resilient seated gate valves installed where shown on the Drawings. All valves shall be connected with flange fittings. See Valve Specification Sheet G-19.
- B. Check Valves shall be resilient seated, American series 2100, or approved equal.

### 3.05 Taps

Taps shall be made in pipe or fittings where designated, or as devices require, as indicated on the Plans. Unless otherwise indicated or directed, all taps shall include stainless steel ball valves of size consistent with the size of the line shown on the Plans.

### 3.06 Final Project Inspection

During the final inspection of the project, the Contractor will be required to demonstrate that each pump of each station can be removed from the wetwell and then replaced as specified herein.

**TABLE 1 - SUBMERSIBLE PUMPS**

Pump Station Name	*
Rated Capacity, gpm	*
Rated TDH, feet	*
Maximum Runout Head, feet	*
Maximum Capacity at Runout, gpm	*
Minimum Shutoff Head, feet	*
Motor Voltage/Phase	230/3 or 460/3
Motor Horsepower	*



bodies. If the design precludes this, containment volume of the wet well will be provided. A dry stormwater feature, with overflow, can serve as a containment.

### **1.02 Clearing**

In general, clearing shall consist of the removal and disposal of all undergrowth, brush, logs, trash and other objectionable obstructions. All materials cleared from the site shall be disposed of by the Contractor, off site. It is the intent that the entire area within the limits of the pump stations as shown on the Plans be cleared. Clearing and grubbing will be paid under the lump sum bid item for the various pump stations.

### **1.03 Disturbed Areas**

All areas that are disturbed due to direct or indirect construction operations shall be restored by the Contractor to a condition equal to or better than the condition of the area prior to operations.

### **1.04 Excavation for Pipes and Structures**

- A. General: The Contractor shall perform excavation of every description regardless of the nature of the material encountered. Trenches or foundations for pipes or structures shall be excavated to the lines, grades and elevations shown on the Plans. Trench and structure excavations shall be of sufficient size to permit the placing of pipes and forms.
- B. Overcuts: If at any point in excavating for structures, material is excavated beyond the neat lines upon or against which concrete is to be placed, the overcut shall be filled with gravel fill properly compacted, or with concrete, as directed by the County. The proposed elevations and positions for the different structures are shown on the Plans; however, the County reserves the right to make such modifications as in his opinion are necessary to carry out the intent of the Plans or Specifications. No payment will be made for overcuts or gravel fill in overcuts.
- C. Dewatering: Should lowering of groundwater be necessary for the installation of concrete structures, piping, etc., or to prevent lateral movement of material under concrete already placed, such lowering shall be accomplished by means of a well point system or other approved means to 2 feet below the bottom slab. Comprehensive plans for dewatering operations, if used, shall be submitted by the Contractor prior to installation. The floor to the wetwell shall be poured first and the wetwell sides keyed into it. The wetwell shall be ballasted to prevent vertical movement from groundwater.

## **PART 2 - PRODUCTS**

### **2.01 Topsoil**

Topsoil shall be rock over a weed barrier. Rock shall conform to FDOT No. 57

aggregate with minimum 6 inch thickness.

## **2.02 Fence**

- A. Fence Fabric shall be woven in 2 inch mesh from No. 9 gauge black vinyl coated steel wire conforming to the "Standard Specification for Zinc-Coated Steel Black Vinyl Coated Chain-Link Fence Fabric" (ASTM A392). The height of the fence fabric shall be 72 or 96 inches unless otherwise indicated on the Drawings or specified herein. The selvages shall be twisted and barbed at the top and knuckled at the bottom. Note: Wooden fence and gate materials are not to be used.
- B. Bands or Clips  
Fabric shall be connected to line posts with 6 ga. wire clips; to top with 9 ga. wire; to terminal, corner and gate-posts with 1/4-inch 3/4-inch tension bars tied with 11 ga., 1-inch wide steel bands and 3/8-inch diameter bolts and nuts; to tension wire with 11 ga. hog rings.
- C. Barbed Wire shall be No. 12-1/2 steel W.G. with four round or half-round barbs spaced 5-inches apart and shall be Class 3 conforming to "Standard Specification for Metallic-Coated Carbon Steel Barbed Wire" (ASTM A121). Three strands of barbed wire shall be placed at the top of all fencing.

- D. Posts shall be made of steel pipe (Schedule 40) of the sizes and weights given below or of other approved equivalent section. Posts shall comply with "Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures" (ASTM F1083).
1. Line posts shall have a 2-3/8 inch outside diameter and weigh 3.65 lb. per linear foot.
  2. End, corner and pull posts shall have a 2-7/8 inch outside diameter and weigh 5.79 lb. per linear foot.
  3. Gate Post for Single-Swing Gates up to 6 feet and Double-Swing Gate Openings up to 12 feet shall be 2-7/8 inches outside diameter and weigh 5.79 lb. per linear foot.
  4. Gate posts for double-swing gate openings wider than 12 feet shall be 4-inches outside diameter and weigh 9.10 lb. per linear foot.
  5. Caps
- Steel Pipe Posts shall be capped with the manufacturer's standard cap, as approved; post shall have arms projecting outward and formed with tongues or other approved means for attachment of the barbed wire.
- E. Tension Wire shall be 7 gauge, 0.177 inch minimum diameter plus or minus 0.005 inches, marcelled or crimped coil spring hard-tempered carbon steel wire. Zinc coating shall be 1.2 ounces per square foot of surface or greater.
- F. Fittings shall be wrought iron, malleable iron, or pressed steel.
- G. Gates shall be single or double-leaf, swing gates as indicated on the Drawings. They shall be of woven-wire fabric in suitable, amply braced frames. Hinges shall be of approved material and of ample strength. The gates shall be provided with suitable latches and provisions for locking, center bolts with center gate stop and automatic back stops to hold them in the open position.
- H. Gate Locking  
A County padlock shall be provided, by the County, to use with a shackle chain and shall be furnished with each gate.
- I. Fabrication  
All material used in the fence construction, except woven wire fabric hereinbefore specified, shall be galvanized with a heavy coating (not less than 2 oz. per square foot of surface area) of pure zinc spelter using the hot-dip process and be coated with black vinyl. The surface area of tubular steel shall be the area of both inside and outside surfaces.

### **2.03 Driveway Culvert**

Driveway culvert, if required for the lift station access drive, must meet the following County Regulations:

Drainage - All connections will provide for the unrestricted flow of the roadside drainage. Culverts will be of adequate size to carry all anticipated storm-water flow. The minimum culvert size is 15-inch diameter and all culverts will have mitered ends. Pipe materials may be reinforced concrete, asphalt coated corrugated steel, or double wall high density polyethylene and must meet minimum FDOT cover requirements.

### **2.04 Site Lighting**

Site lighting shall be LED type, mounted on a knock down pole.

### **2.05 Coverings**

All electrical controls shall be covered with a fixed roof to allow work on controls during heavy rain. An LED light shall be mounted under the roof and shall be activated by weather proof switch.

## **PART 3 - EXECUTION**

### **3.01 Backfill for Pipes and Structures**

- A. General: Backfill over, under and around pipes and structures shall be of select material placed and tamped and compacted in a manner and by methods that will avoid unbalanced loading, and that will not cause movement or undue strain on any pipe or structure. The fill placed against or immediately adjacent to pipes, or structures shall be built in horizontal layers not exceeding 6 inches loose and must be compacted by approved mechanical tampers. The density of each layer of material composing the backfill shall be not less than 95 percent of the relative maximum density as determined by AASHTO T 99. Each layer of backfill material which does not contain sufficient moisture to compact thoroughly shall be sprinkled and mixed with water as directed. Material containing excess moisture shall be permitted to dry out to proper consistency before compaction is attempted. No muck or unsuitable material shall be used in the backfill.

- B. Deficiency of Backfill or Fill: In the event that existing material from the excavation is insufficient to bring the pump station site to the lines and grades shown on the Plans, additional select material shall be provided by the Contractor from his own source. The select material shall be granular soil containing not more than 15 percent passing the 200 mesh sieve, except that the top 4-inches shall be topsoil as herein specified. No separate payment will be made for the additional backfill or fill required.
- C. Excess Material: After backfilling, excess material shall be removed and disposed by the Contractor off the site.
- D. Gravel: 9-inches of gravel bedding shall be placed below the Pump Station structure.

### **3.02 Surface Restoration**

All disturbed areas outside the Pump Station fence shall be grassed and shall be prepared and maintained in accordance with Section 01300. Inside the lift station fence, weed material shall be placed after final site grading and the entire area shall be covered with coarse rock.

### **3.03 Clean-Up**

After final operation tests, the interior and exterior of the station shall be cleared of all trash and debris and left in final operating condition. Final grading of the site and restoration of surfaces with grass/rock shall be in strict accordance with the applicable Plans.

END OF SECTION

## **SECTION 02580 SEWAGE FORCE MAIN SYSTEM**

### **PART 11 — GENERAL**

#### **1.01 Scope**

This Section describes products to be incorporated into force mains, pressure sewers, and accessories and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

#### **1.02 Description of Work**

- A. Extent of work is shown on the drawings.

- B. Sewage force main system work includes, but is not limited to: Piping, valves, fittings, appurtenances.
- C. Comply with the requirements of applicable sections for excavation and backfilling required in connection with sewage force main system work.
- D. Comply with requirements of applicable sections for concrete work required in connection with sewage force main system work.
- E. Force main peak hour discharge into an existing force main shall not cause an increase in velocity beyond 5 fps. If an increase occurs, developer shall participate in relief force main.

### **1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction and the applicable standards of the American Water Works Association (AWWA), American National Standards Institute (ANSI), and the American Society for Testing and Materials (ASTM), latest editions.
- B. Testing and Inspection Services
  - 1. Employ, at Contractor's expense, testing laboratory to perform necessary testing.
  - 2. It will be the responsibility of the Contractor to coordinate all testing and inspections. The Contractor shall notify the County, testing service and applicable agency inspectors 48 hours in advance of testing and inspection.
  - 3. Hydrostatic test shall be completed by the Contractor in the presence of the County.

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SEWAGE FORCE MAIN SYSTEM**

**1.04 Submittals**

- A. Prior to beginning construction, the Contractor shall submit for approval by the County, manufacturer's certifications and cut sheets for the following items: piping, valves, fittings, and appurtenances.
- B. Test Reports: Submit applicable reports directly to County from the testing service with copy to Contractor.

C.

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**SECTION 02580  
SEWAGE FORCE MAIN SYSTEM**

**D. PART 2 - PRODUCTS**

**2.01 General**

- A. All materials shall be new, unused and correctly designed. They shall be of standard first grade quality and intended for the use for which they are offered. Materials or equipment which, in the opinion of the County, are inferior or of a lower grade than indicated, specified or required, will not be accepted.
- B. HDPE pipe for force mains shall have a green stripe at third points around the pipe for its full length.
- C. PVC pipe for force mains shall be green.

**2.02 HDPE Pipe**

- A. Pipe of various sizes shall be DIPS SDR 11 Pressure Class (PC) 200 High Density Polyethylene (HDPE) Pipe, AWWA C-906 compliant, and NSF 61 Standard Listed, furnished in fifty (50) foot lengths.
- B. The HDPE pipe shall be manufactured in a plant capable of providing continuous quality control through inspection. The facility shall have the necessary testing equipment to verify that the pipe meets the requirements of AWWA C901 or C906, NSF Standard #61 and ASTM standards.
- C. Materials: Polyethylene pipe and fittings shall be made from resin meeting the requirements of the Plastic Pipe Institute as PE 3608. The resin shall meet the requirements of ASTM D 3350 with a cell classification of 345464C.
- D. All pipes shall be suitable for use as pressure conduits, listed as NSF 61 and per AWWA C906 Pressure Class (PC) 100 have a nominal burst value of three and one-half times the Working Pressure Rating (WPR) of the pipe. Peak flow water velocity of 5 ft./sec shall be used in the hydraulics engineering design.
- E. Butt Fusion Fittings: HDPE fittings shall be PE3608 HDPE, Cell Classification of 345464C as determined by ASTM D 3350, and approved for AWWA use. Butt fusion fittings shall have a manufacturing standard of ASTM D 3261.

Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans.

- F. Pipe Manufacturer's Quality Control: The pipe manufacturer shall have an on-going Quality Control program for incoming and outgoing materials. High-density polyethylene (HDPE) resins for manufacturing of pipe shall be checked

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**SECTION 02580  
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- H. for density, melt flow rate, and contamination. The manufacturer of the HDPE resin shall certify the Cell Classification as indicated above. These incoming resins shall be approved by plant Quality Control and verified to be approved by NSF before being converted to pipe. Pipe shall be checked for outside diameter, wall thickness, length, roundness, and surface finish on the inside and outside and end cut.
- G. Butt Fusion Joining: Plain end pipe and fittings shall be made using butt fusion. The butt fusion procedures shall be in accordance with the manufacturer or the PPI. The fusion equipment operator shall receive training using the recommended procedure. The Contractor shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been trained within the past twelve months. The fusion equipment shall be equipped with a Data-logger. Records of the welds (heater temperature, fusion pressure, and a graph of the fusion cycle) shall be maintained for five (5) years. Fusion beads shall not be removed.
- H. Other Joining Methods Mechanical Joining. Polyethylene pipe and fittings may be joined together using Flanges or Mechanical Joint (MJ) adapters. These fittings shall be made from PE 3608 HDPE, with a Cell Classification of 345464C as determined by ASTM D 3350. Flanged and MJ adapters shall have a manufacturing standard of ASTM D 3261. They shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All mechanical joints transitioning HDPE to another material shall be restrained using MEGALUG or an approved equal.

**2.03 Polyvinyl Chloride (PVC) Pipe**

- A. Smaller than 4-inch Pipe: All PVC pipe and fittings less than 4-inches in diameter shall be manufactured in accordance with ASTM D2241 with a standard dimension ration (SDR) of 26 rated pressure 160 psi.
- B. 4-inch through 12-inch Pipe: PVC pipe shall be manufactured in accordance with AWWA C900, latest edition. Pipe shall be pressure Class 235 and must meet dimension requirements of standard dimension ratio (DR) 18.
- C. 14-inch and Larger Pipe: PVC pipe shall be manufactured in accordance with AWWA C905, Latest Edition. Pipe shall be Pressure Class 235 and meet the dimension requirements of dimension ratio (DR) 18.
- D. Joints: Joints shall be "push-on" and shall meet all requirements of ASTM 03139 or locking type. Each bell shall be an integral wall section joint assembly using elastomeric-gasket seals. Restraining gaskets shall be Rieberlock. All gaskets shall meet all requirements for performance as specified by ASTM F477.

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**2.04 Fittings (3 inches and Larger)**

- A. General: Fittings three inches and larger shall be ductile iron manufactured in accordance with ANSI/AWWA C110/A21.10 or C153/A21.53. The minimum pressure rating for fittings shall be 250 psi.
- B. Joints: Fitting joints shall meet the specifications of the pipe joints as specified under DUCTILE IRON PIPE for the appropriate joint, push on joints, mechanical joints or flange joints.
- C. Coating: All fittings shall receive an interior lining and exterior asphaltic coating as specified under Ductile Iron Pipe. All ductile iron fittings for sewer force main and lift station shall have an interior coating manufactured by PERMOX CTF, PROTECT 401, Perma-Shield PL Series 431, or approved equal.
- D. Retainer Glands
  1. Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Glands shall be manufactured of ductile iron conforming to ASTM A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/ AWWA C153/ A21.53, latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices.
  2. The mechanical joint restraining device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1, and shall be EBAA Iron, Inc., MEGALUG Series 2000 or 19MJ00, or SIP Industries PTP Restraints (PTPVC), or approved equal.
  3. Push-on joint restraints shall be similar to EBAA Iron, Series 1900 or approved equal.
  4. Coatings: All Mechanical Joint Restraints, for Ductile or PVC Pipe, shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

**2.05 Detection Tape and Trace Wire**

Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Sanitary Sewerage Systems, Safety Green, "Caution: Sewer Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2-inches when buried less than 10-inches below the surface. Tape width shall be minimum 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be Pro-Line Safety Products Detectable Tape 2-

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inch No: 103111253 3-inch No: 103121253, or approved equal. In addition, the Contractor shall furnish and install 10 gauge coated copper tracing wire shall be Pro-Line HF-CCS-PE30 or Copperhead Superflex 1030, or approved equal

### **2.06 Anchor Couplings**

Lengths and sizes of anchor couplings shall be as shown on the Drawings. Anchor couplings shall be equal to Tyler Pipe 5-198.

### **2.07 Flange Adapter**

The flange adapter shall permit the connection of unthreaded, un-grooved, open-ended ductile iron pipe to ANSI/ASME 1316.1, Class 125 flanges. The flange adapter shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The adapter shall be a ductile iron casting incorporating a flange with extended throat, set screws and gasket. The gasket shall provide a compression seal between the adapter, the pipe and the adjacent flange. Flange adapters shall be used only in locations specifically shown on the Drawings or at the direction of the County, and in accordance with the manufacturer's recommendations. The flange adapter shall be equal to EBAA Iron "Mega Flange". Additionally, flange adapters shall be provided with 304 stainless steel harness rods of the diameter and quantity shown on the Drawings or directed by the County.

### **2.08 Gate and Tapping Valves**

#### **A. General**

1. Gate and tapping valves shall be resilient seat and shall comply with all requirements of AWWA C509 and the following supplemental requirements:
2. Valves 12-inches and smaller shall be bubble-tight at 200 psi water working pressure. Test pressure shall be twice the rated working pressure and at all times zero leakage will be maintained.
3. All valves shall be Class B gray iron body, non-rising stem, suitable for buried vertical mounting.
4. Non-rising stems shall be in full compliance with AWWA specifications with cast integral stem collar and furnished of bronze conforming to ASTM 13132 Alloy A.
5. Stem nuts shall be independent of wedge and shall be of solid bronze conforming to ASTM 1362.
6. Sealing mechanism shall be either a replaceable internally reinforced, specially contoured, molded rubber discs seat ring attached to the face of the disc with self-locking stainless steel screws or a sealing surface permanently bonded with resilient material to meet ASTM D429. Replaceable seat rings shall be designed such that sealing mechanism cannot be installed improperly.
7. Stuffing boxes shall be O-ring seal type with two rings located in the stem.

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8. Low friction torque reduction thrust bearings shall be located both above and below the stem collar.
  9. All valves shall open by turning a two- inch square operating nut counterclockwise.
  10. A11 valves shall be furnished with operating nuts, unless noted otherwise.
  11. All tapping valves shall have flange-by-mechanical joint ends.
  12. All tapping valves shall be interchangeable with other makes of tapping sleeves.
- B. Joints: Joints shall be mechanical joints and shall conform to AWWA C111, and all bolts and nuts for mechanical joints shall be high-strength, low-alloy steel in accordance with AWWA C111. All gaskets shall be for a standard mechanical joint of BUNA-S (SBR Buna) in accordance with ANSI/ AWWA C111/A21.4. All mechanical joint accessories shall be furnished with the valves.
- C. Coating: Body and cover bolts and nuts shall meet specifications ASTM A307 and be corrosion-proof. Valve interior shall have protective coating meeting AWWA C550.
- D. Approved models are:
- |                       |                                      |
|-----------------------|--------------------------------------|
| American Flow Control | Series 2500 Resilient Wedge Valve    |
| Muller Company        | A-2362-78 Resilient Wedge Gate Valve |
| AVK                   | Resilient Seated Gate Valve          |

**2.09 Tapping Sleeves**

Tapping sleeves 3-inch and larger shall have a threaded test port with plug for pressure testing on the tapping sleeves and tapping valve and shall be constructed of stainless steel, and in two halves. All tapping sleeves shall be Romac STS 420, JCM 452, TPS Triple Tap Tapping Sleeves, or approved equal. Bolts in the tapping sleeve shall be stainless steel.

**2.10 Tapping Saddles**

Tapping saddles shall be constructed of heavy, ductile iron, with the attachment straps, nuts and washers constructed of corrosion resistant alloy steel in accordance with AWWA C111. All tapping saddles shall be JCM 406, Smith-Blair 317, TPS T-3, or equal.

**2.11 Concrete**

Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. For job mixed concrete, submit the concrete mix design for approval by the County. Ready-mixed

concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM-A 615, Grade 60.

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SEWAGE FORCE MAIN SYSTEM**

**2.12 Plug Valves**

- A. Valves shall be 90 degree turn, non-lubricated, and eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.
- B. Valves shall provide drip-tight shut-off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi.
- C. Valves shall have a port area equal to at least 80 percent of the full pipe area.
- D. Bodies shall be cast-iron, conforming to ASTM A 126, Class B (carbon steel for 2-inch valves).
- E. Valve ends shall be a mechanical joint type, except where flanged or restrained joint ends are shown on the Drawings. Mechanical joint valves shall have bell ends conforming to applicable requirements of AWWA C111/ANSI A21.11. Flanged joints shall meet the requirements of ANSI B16.1, Class 125. Flanged valves with flange-to-MJ adapters shall not be acceptable in lieu of MJ valves.
- F. Valve seats shall be a raised, welded-in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be a minimum of 1/8-inch thick. Seats shall be EPDM rubber seats.
- G. The plug shall be of semi-steel, conforming to ASTM-A 126, Class B. The plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for service in sewage and sludge applications.
- H. Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C507. Bearing materials shall have a proven record of service of not less than five years.
- I. The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull-down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C504.

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J. Actuators

1. Valves for exposed service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip.
2. Actuators for buried service and valves 10-inches and larger, shall be equipped with manual operated geared actuators. Geared actuators shall be totally enclosed, oil lubricated, worm and gear type. Geared actuators shall turn in the same direction as non-geared actuators. Shaft seals shall be provided to prevent entry of dirt and water into the actuator. All shaft bearings shall be permanently lubricated bronze bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Construction of actuator housing shall be semi-steel. Gear actuators shall comply with requirements of AWWA C504.
3. Gear actuators for buried valves 10-inches and larger in diameter shall be mounted above ground on an extended bonnet.
4. Motorized actuators shall be provided where shown on the Drawings and as specified in this Section. Motorized actuators shall be Rotorq, EIM, or AUMA.
5. Valves and operators for submerged or buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. Operator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals.

K. Operators

1. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.
2. Valves, 3 through 8-inches, for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.

L. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel.

M. The exterior of all buried valves shall have a factory applied, two coat coal tar epoxy coating system. The coal tar epoxy shall be TNEMEC Tneme-Tar 46-413, Indurall Ruffstuff 2100 Coal Tar Epoxy or Kop-Coat Bitumastic No. 300-M. Each coating shall have a minimum dry film thickness of 8-10 mils.

N. All ferrous metal interior surfaces of plug valves shall be provided with a factory applied epoxy interior coating conforming to the requirements of AWWA C550. The coating shall be either TNEMEC Series 20 Pota Pox, Valspar Series 78 or Kopcoat Hi Gard Epoxy. Each coating shall have a minimum dry film thickness of 4 to 6 mils.

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0. Acceptable Manufacturers: All plug valves shall be products of a single manufacturer who must submit evidence of five years satisfactory service in sewage applications of the same design and of the sizes required. Valves shall be manufactured by DeZurik, Pratt or Val-Matic.

**2.13 Air Valves for Sewerage Service**

- A. General: Unless specifically approved by the County, combination air valves shall be installed in accordance with these Specifications. In areas of high water table, valve shall be located above ground in insulated boxes.
- B. Air Release Valves: Valves shall be automatic air release valves designed to allow escape of air under pressure and close water-tight when liquid enters the valve. Valve shall have a 1-inch NPT inlet and a maximum orifice diameter of 3/32-inch. The valve body shall be plastic, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve. ARI or an approved equal shall be used.
- C. Air VNA vacuum Valves: Valves shall be automatic air and vacuum valves designed to allow escape of air, close water-tight when liquid enters the valve, and allow air to enter in the event of a vacuum. The valve body shall be plastic, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve. The valves shall have an orifice diameter of 2-inches and NPT inlet and outlet diameters of 2 x 2-inches. ARI or an approved equal shall be used.
- D. Combination air valve shall consist of an air release valve tapped into the body of an air and vacuum valve.
- E. Single Body Valve: In lieu of D. above, a single body, double orifice, sewage combination valve may be used. Materials of construction, orifice size, venting capacity and accessories shall meet the requirements of B. and C. above.

**2.14 Check Valves**

A. Check valves shall be hinged disc type with cast iron body and low zinc bronze or bronze-fitted disc. Valves shall not slam shut on pump shutdown. Valves shall

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be equipped with a 1/2-inch stop cock at the high point of the valve for bleeding air from the line.

- B. Check valves shall be of the globe design with ANSI 125 pound flanges.
- C. Check valves shall be American Series 2100 Resilient Seated Check Valve, Valvematic "Swingflex" or approved equal.

**2.15 Valve Boxes and Extension Stems**

- A. Valve Boxes
  - 1. Unless shown otherwise on the Drawings, all valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "SEWER" cast into them. Valve boxes shall be manufactured in the United States.
  - 2. Valve boxes shall be manufactured by American Flow Control Trench Adapter and Retrofit box insert ("or approved equal").
- B. Extension Stems: Extension stems shall always be provided. Connection to the valve shall be with a wrench flush to the nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to M & H Valve, Style 3801.
  - 1. The extension stem shall be a fully adjustable valve box and extension stem system that is available in trench depths ranging from 3 feet to 20 feet. Both the valve box and the extension stem shall adjust to grade in a matter of seconds, completely eliminating the need to cut extension stems in the field. It shall be able to raise the upper pipe to the proper height and lock it into the new position.
  - 2. The extension stem product that shall be used is an AMERICAN Trench Adapter, or equivalent.

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**PART 3 - EXECUTION**

**3.01 General**

Pipe, fittings, valves and appurtenances shall be installed in accordance with the manufacturer's recommendation and the applicable sections of the codes and standards listed in the quality and assurance section of these specifications.

**3.02 Existing Utilities and Obstructions**

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the County. The Contractor shall call the Sunshine State One Call of Florida, Inc. (1-888-761-3042), as required by Florida law and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Conflict with Existing Utilities:
  - 1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed pressure main does not permit safe installation of the pressure main by the use of sheeting, shoring, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the pressure main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the County. If, in the opinion of the County, the pressure main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
  - 2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed pressure main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the pressure main. The Contractor may change the proposed grade of the pressure main to avoid vertical conflicts if the changed grade provides minimum required capacity, maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the County. If, in the opinion of the County, the pressure main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.

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- C. Water and Force Main Separation
1. Force mains should maintain a minimum 10 foot edge-to-edge separation from water mains. Where the sewer crosses a water main, an 18-inch vertical separation shall be maintained where possible. Where possible, a full joint of sewer pipe shall be centered over the water main. Any deviation shall be requested in writing to the County. If ten feet cannot be maintained, refer to Florida Administrative Code 62-555.314, which states that a minimum of six feet is acceptable.
  2. Where the force main crosses over a water main, the water main shall be encased in concrete to the first joint in each direction.
  3. No water main shall be permitted to pass through or come in contact with any part of a manhole.

**3.03 Handling Pipe**

- A. General: All material, unless otherwise directed, shall be unloaded at the job site and distributed at the site of the project by the Contractor. Materials shall be handled with care to avoid damage. In loading and unloading, pipe shall be lifted by hoists or slid or rolled on skids in such a manner as to avoid shock. Under no circumstances shall pipe be dropped. Pipe handled on skids must not be allowed to roll against pipe already on the ground. The Contractor shall be responsible for the safe handling of all materials. Damaged materials will be rejected by the County.
- B. Pipe shall be handled so as to avoid damage to the coating and lining. If, however, any part of the coating or lining is damaged by the Contractor, the repair shall be made by the Contractor at his expense in a manner satisfactory to the County before installation.
- C. Pipe shall be distributed on the site of the work parallel with and opposite or near the place it is to be laid in the trench, and with bell ends facing the directions in which the installation will proceed unless otherwise directed.

**3.04 Pipe Distribution**

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

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- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.
- F. No pipe shall be dropped or rolled off from the truck. Pipe that has been dropped or rolled from the truck will be considered damaged and will not be used.

**3.05 Installation of Pipe**

A. General

1. Upon satisfactory installation of the pipe bedding, as specified in the "Earthwork for Utilities" section of these specifications, a continuous trough for the pipe barrel and recesses for the pipe joints shall be excavated by hand digging so that when the pipe is laid in the trench true to line and grade, the pipe barrel will receive continuous uniform support and the joint will receive no pressure from the trench bottom.
2. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods.
3. All pipe, fittings, and valves shall be carefully lowered into the trench by means of derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe coatings, and lining. Under no circumstances shall pipe or accessories be dropped, dumped or rolled into the trench from finished ground level.
4. The gasket material for the joint shall be properly positioned before the pipe is lowered into the trench. The joining of the pipe shall proceed in accordance with the manufacturer's recommendations.
5. Watertight plugs shall be installed in open ends of the pipe at all times when pipe laying is not in progress. At no time shall trench water be permitted to enter pipe.
6. Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Wherever it is necessary to cut gray or ductile cast iron pipe which is equipped with a push-joint type bell end, the cut end of the pipe shall be adequately beveled so

as to prevent the edge of the cut pipe from cutting or tearing the gasket as the plain end is inserted into the bell of the adjoining pipe or fitting.

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All field-cut pipe shall be beveled by the Contractor and the pipe "short" shall be used as part of the pipeline construction.

7. Whenever necessary to deflect pipe after proper homing from a straight line, either in the vertical or horizontal plane to avoid obstructions, the maximum allowable deflection shall be in accordance with the pipe manufacturer's recommendations. Only after the pipe has been properly homed will it be allowed to deflect.
8. No pipe shall be laid in water or when the trench conditions or the weather is unsuitable for such work.
9. All sewer Force Mains shall be located a minimum of 30 inches below grade and 36 inches below top of pavement. Any pipe which is disturbed or found to be defective after laying shall be removed and relaid or replaced.
10. Prior to connecting new work to existing lines or appurtenances, the Contractor shall verify location and elevation of existing connection point and notify County of any conflicts or discrepancies.

**B. Joints (DIP)**

1. Before laying the pipe, all lumps, blisters, and excess coal tar coating shall be removed from the bell and plain ends of each length of pipe. The pipe ends shall then be wire brushed and wiped until clean and dry. Where mechanical joints or push-on joints are specified, oil and grease also shall be removed. Pipe ends shall be kept clean until joints are made. The plain end of pipe for mechanical joints shall be lubricated with a soapy solution before installing the gaskets.
2. In making up the push-on type joint, the gasket shall be placed in the socket per manufacturer's recommendation. A thin film of lubricant (approved by the pipe manufacturer) shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe. The plain end of the pipe to be entered shall be thoroughly cleaned and placed in alignment with the bell of the pipe to which it is to be joined. The joint shall be made by exerting sufficient force on the entering pipe so that the plain end is moved past the gasket until it seats as per manufacturer's recommendation.
3. Backhoe buckets or excavation equipment are not to be applied directly to the pipe.
4. Mechanical joints shall be assembled in accordance with AWWA Standards. Mechanical joints shall be centered in the bells. Soapy water shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, the bolts inserted, and the nuts tightened by hand.
5. The bolts shall be tightened on opposite sides of the pipes by means of a torque wrench in such a manner that the gland shall be brought up evenly into the joint. The following range of bolt torques shall be applied:

<u>Bolt Size (Inches)</u>	<u>Range of Torque</u>
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¾-inch Diameter	85 to 95 ft.-lbs.
1-inch Diameter	95 to 100 ft.-lbs.

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6. If effective seal is not obtained at a maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.
7. If a joint is defective, it shall be cut out and entirely replaced or, if approved by the County, it may be repaired by a suitable clamp.

**3.06 Installation of Fittings**

- A. Fittings shall be handled with care to avoid damage. All fittings shall be loaded and unloaded by lifting, and under no circumstances shall fittings be dropped, skidded, or rolled. Under no circumstances shall fittings be placed against pipe or other fittings in such a manner that damage could result. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior lining of fittings. If any part of the fittings' coating or lining is damaged by the Contractor, the repair or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the County before installing. Fittings shall also be stored at all times in a safe manner to prevent damage and kept free of dirt, mud, or other foreign matter. All fitting gaskets shall be stored and placed in a cool location out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis.
- B. Fittings shall be set and joined to the pipe in a manner specified previously for joint assembly. When conditions warrant, fittings should be provided with special support trussing and blocking.

**3.07 Anchorage of Bends, Tees and Plugs**

- A. General: Adequate precautions shall be taken to prevent the separation of joints at bends, tees and plugged ends.
- B. Retainer glands shall be installed in accordance with manufacturer's recommendations.
- C. Thrust Blocking
  - 1. Where reaction or thrust blocking is required, it shall be of concrete of a mix not leaner than one cement, two and one-half sand, five stone, having a compressive strength of not less than 3,000 pounds per square inch after 28 days and shall have a minimum curing time of three days. The poured concrete shall be left exposed for a minimum of 24 hours before backfilling, but not more than 48 hours. Before concrete thrust blocks are covered, Contractor will have the County inspect the installation. Concrete thrust blocking shall not cover bolts or prevent access in such a way to prevent bolt removal or effect repair.

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2. Blocking shall be placed between undisturbed earth and the fitting to be anchored; the area of bearing on pipe and on ground in each instance shall be that shown in the Construction Details. The blocking shall, unless otherwise directed, be so placed that the pipe and fitting joints will be accessible for repair.
3. Concrete shall not cover pipe or bolts.

**3.08 Installation of Valves**

- A. Resilient seat gate valves shall be located no more than 500 feet apart in commercial, industrial and high-density residential areas and no more than 1000 feet in all other areas. Valves shall be spaced to isolate a maximum of 40 single-family residential lots. A minimum of two valves per tee, and three valves per 4-way cross, shall be required to isolate and maintain adequate service. Valves shall be placed at branch lines and located at the end of all water main extensions except at looped cul-de-sacs.
- B. General: Valves shall be handled with care to avoid damage. All valves shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded or rolled. Valves shall not be placed, under any circumstances, against pipe or other fittings in such a manner that damage could result. Slings, hooks or tongs used for lifting shall be padded in such a manner as to prevent damage. If any part of the valve coating and lining is damaged by the Contractor, the repair or replacement shall be made by the Contractor at his expense in a manner satisfactory to the County before installing. Valves shall also be stored at all times in a safe manner to prevent damage and kept free of dirt, mud or other foreign matter. All valve gaskets shall be stored and placed in a cool location out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis.
- C. Gate valves shall be set and joined to new pipe in the manner previously specified for cleaning, laying and joining pipe.
- D. Valve Boxes: Cast iron valve boxes shall be firmly supported and maintained centered and plumb over the operating nut of the valve by the Contractor with box cover flush with the surface of the finished pavement or at such other level as may be directed. All valve boxes set in non-paved areas shall have concrete pads poured around the top section of the valve box. The pad shall be a 24 inch square pad and shall be centered on the valve box. All sewer valve covers shall be painted safety green as defined by the American Public Works Association (APWA) uniform color code for utility systems. All valve covers

shall be cast with the word SEWER. A welder shall burn the number of turns to open/close the valve, into the cover.

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- E. The Contractor shall provide a Carsonite Utility Markers or approved equivalent with U.V. resistant decal for each valve installed. Valve decal shall be stamped "CAUTION SEWAGE VALVE".

**3.09 Installation of Taps**

- A. General: All drilling and tapping equipment used and material supplied to make taps will be in accordance with AWWA Standards.
- B. After the tapping sleeve and valve have been installed and before the tap is made, the sleeve will be tested to ensure a watertight joint. A test plug will be provided in the sleeve and after the sleeve has been installed it will be filled with water and the pressure increased between 150 psi and 190 psi. All leaking joints will be repaired to the satisfaction of the County at the Contractor's expense.
- C. All pipe coupons removed as a result of taps to any pipeline shall be retained for presentation to the County.

**3.10 Detection Tape and Trace Wire**

- A. Provide detection tape and trace wire for all water mains.
- B. Detection tape shall be located 18-inches above the crown of the pipe.
- C. Trace wire shall not be wrapped around the pipe.
- D. Trace wire shall be laid parallel to the 12 o'clock position of the main with at least 6-inches of separation.
- E. Trace wire shall be looped into each valve box and pulled out a minimum of two feet from the top of the valve box.

**3.11 Testing and Inspection Requirements**

The Contractor shall coordinate all testing and inspections with the Owner. The Contractor shall notify the County and applicable agency inspectors 48 hours in advance of testing and inspections.

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SEWAGE FORCE MAIN SYSTEM**

**3.12 Hydrostatic Test**

- A. Hydrostatic Test: A hydrostatic test shall be performed on all mains and fittings for a minimum of two hours at 100 psi in accordance with AWWA Manual of Water Supply Practices M23. Test shall occur at any convenient time upon backfill of lines and after all piping has been thoroughly cleaned and flushed to clear the lines of all foreign matter. Prior to test, allow adequate curing time for reaction blocking.
- B. Gages and Recorders: The Contractor shall, upon request of the County, furnish certified test data for pressure gauges and recorders used on hydrostatic test equipment. At the option of the County, flow meters and/ or pressure gauges used for hydrostatic testing shall be equipped by the Contractor with approved strip or round chart recorders. Tests shall be made in sections not exceeding one-half mile.
- C. Each valved section of pipe to be tested shall be slowly filled with water and a test pump shall be installed at the low point of the section being tested. All air in the line will be expelled before applying specified test pressure. To accomplish this, taps will be made, if necessary, at the point of highest elevation and afterward tightly stopped with tapered brass plugs, all at the Contractor's expense.
- D. After installation and filling of the line as specified, the Contractor will pump the line to a pressure greater than 100 psi. At no time shall the test or line pressure exceed 140 psi. If required by the County, pump test equipment shall be equipped with pressure relief valves pre-set to 140 psi.
- E. Throughout the duration of the test, the Contractor is required to maintain a minimum pressure in excess of 100 psi. The Contractor is advised that, should the line pressure fall to or below 100 psi at any time during the two hour test, the test will be considered invalid and a retest in accordance with this procedure will be required. Therefore, it is advisable to pump water into the line as the line pressure approaches 100 psi. The test will be conducted with a pressure variation of not more than 5 psi for the duration of the test.
- F. At the end of the two hour test period, the Contractor will be required to pump the pipe lines back up to the highest pressure obtained during the duration of the test period. If chart records are required for the hydrostatic test, the Contractor shall furnish flow and/ or pressure charts as a condition of concluding the test.

G. The allowable leakage, as specified below, will be defined as any volume of water required to maintain a minimum pressure in excess of 100 psi during the duration of the test period plus that volume of water required at the conclusion n

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- I. of the test to bring the line pressure back up to the highest pressure obtained during the duration of the test period.

Two Hour Hydrostatic Test Allowable Leakage (Gallons) for 100 LF or 5 Joints  
Allowable Leakage for AWWA PVC Pipe

Nominal pipe size (in.)	Average Pressure/Leakage (Gallons) Test	
	100 PSI	150 PSI
4"	0.027	0.033
6"	0.041	0.050
8"	0.054	0.066
10"	0.068	0.083
12"	0.081	0.099

- H. Leakage detection at mechanical joints shall be stopped by tightening the gland (not to exceed required torque) and leaking at slip joints shall be cut out and entirely replaced or, if approved by the County, it may be repaired by a suitable clamp. Any cracked or defective pipes, fittings or valves discovered as a result of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall then be repeated until satisfactory.
- I. The Contractor is warned that pressure testing against existing "end-of-line" valves is done at his own risk. Failure of these valves to hold test pressure will not relieve the Contractor of the pressure testing nor will it entitle him to any additional compensation for the extra work performed..

END OF SECTION

END OF SECTION 02580

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**SECTION 02600  
RECLAIMED WATER and ACCESSORIES**

**PART 1 - GENERAL**

**1.01 Scope**

- A. This Section describes products to be incorporated into the Reclaimed Water Mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. It is the intent of these specifications to provide information supplemental to the contents of the construction drawings on the quality of materials, execution, measurement, etc. These specifications are general in nature and may contain products and requirements which are not applicable to the project. Discrepancies between these specifications and the construction drawings, either imagined or real, shall be brought to the attention of the County for clarification.
- C. General: Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.
- D. All Reclaimed lines and equipment shall be painted per FDEP, Pantone Purple 522-C using light stable colorants and marked "RECLAIMED".

**1.02 Description of Work**

- A. Extent of work is shown on the drawings.
- B. Reclaimed Water System work includes, but is not limited to, Reclaimed Water Mains, valves, service connections and appurtenances.
- C. Comply with the requirements of applicable sections for excavation and backfilling required in connection with reclaimed water system work.
- D. Comply with requirements of Paragraph 2.13 of this section for concrete work required in connection with reclaimed water system work.
- E. Contractor is advised that existing reclaimed water mains may be of various pipe materials, including asbestos cement. The Contractor shall be responsible for protection of existing reclaimed water mains during construction and shall be responsible for repairing any pipes damaged during construction. Repair sections

shall be PVC or ductile iron. The Contractor shall comply with all work site, air emission, solid waste, and personal safety and

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**SECTION 02600**  
**RECLAIMED WATER and ACCESSORIES**

- G. protection regulations as related to the excavation, exposure, cutting, handling, containment and disposal of existing reclaimed water main pipe material.
  
- F. The removal, encapsulation or enclosure, storage and disposal of pipe materials containing asbestos shall be in accordance with Sections 455.301 through 455.309 of the Florida State Statutes; American Water Works Association Manual of Water Supply Practices No. M16 "Work Practices for Asbestos — Cement Pipe"; 29 CFR 1910.19; 29 CFR 1926.1101, Appendix F; Asbestos NESHAP (40 CFR 61, Subpart M); 40 CFR 763, Appendix E; and all other industry and regulatory requirements.

**1.03 Quality Assurance**

- A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction and the applicable standards of the American Water Works Association (AWWA).
- B. Testing and Inspection Service
  - 1. Employ, at Contractor's expense, testing laboratory to perform bacteriological testing of reclaimed water mains.
  - 2. It will be the responsibility of the Contractor to coordinate all testing, flushing, and inspections. The Contractor shall notify the County, testing service, and applicable agency inspectors 48 hours in advance of testing, flushing, and inspections.
  - 3. Hydrostatic test shall be completed by the Contractor in the presence of the County or County's representative.
- C. The manufacturer shall provide written certification to the County that all products furnished comply with all applicable requirements of these Specifications.

**1.04 Submittals**

- A. Prior to construction commencing, the Contractor shall submit for approval by the County manufacturer's certifications and cut sheets for the following items:
  - 1. Reclaimed and Flushing Hydrant Assemblies (Purple in Color)
  - 2. Valves
  - 3. Reclaimed Water Main Pipe
  - 4. Fittings
  - 5. Reclaimed Water Services
  - 6. Reclaimed Water meters
  - 7. Tapping sleeves
  - 8. Air release valves
  - 9. Other appurtenances

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**SECTION 02600**  
**RECLAIMED WATER and ACCESSORIES**

- B. Qualifications: If requested by the County, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.
- C. Test Reports: Submit Bacteriological Test Reports directly to the County from the testing services with copy to Contractor.

**1.05 Existing Utilities and Obstructions**

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the County. The Contractor shall call the Sunshine State One Call of Florida, Inc. (1-888-761-3042), as required by Florida Law and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Conflict with Existing Utilities
  - 1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed reclaimed water main does not permit safe installation of the reclaimed water main by the use of sheeting, shoring, tie-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the reclaimed water main to avoid horizontal conflicts, if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements, and after a written request to, and subsequent approval by the County. If, in the opinion of the County, the reclaimed water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.
  - 2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed reclaimed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the reclaimed water main. The Contractor may change the proposed grade of the reclaimed water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the County. If, in the opinion of the County, the reclaimed water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order.

C. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or

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other obstructions.

- D. Reclaimed Water Main Separation Requirements (See Utilities Standard Detail G-14)
1. Reclaimed Water mains constructed in Bay County Rights-of-Way shall be laid to provide a minimum horizontal distance of at least three feet between the outside of the reclaimed water main and the outside of any existing or proposed vacuum-type sanitary sewer, storm sewer, storm water force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the reclaimed water main and the outside of any existing or proposed gravity-type sanitary sewer, pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the reclaimed water main and all parts of any existing or proposed "on-site sewage treatment and disposal system". If ten feet cannot be maintained, refer to Florida Administrative Code 62-555.314, which states that a minimum of six feet is acceptable.
  2. Reclaimed Water Mains constructed in Bay County Right-of way, that will cross any existing or proposed gravity-type sanitary sewer, vacuum-type sanitary sewer, or storm sewer, will be laid so the outside of the reclaimed water main is at least 6-inches above the other pipeline or at least 12-inches below the other pipeline. Reclaimed water Mains that will cross any existing or proposed pressure-type sanitary sewer, wastewater or storm water force main, or pipeline conveying reclaimed water will be laid so the outside of the reclaimed water main is at least 12-inches above or below the other pipeline.
  3. At the utility crossings described above, one full length of reclaimed water main pipe will be centered above or below the other pipeline so the reclaimed water main joints will be as far as possible from the other pipeline or the pipes will be arranged so that all reclaimed water main joints are at least 3 feet from all joints in vacuum-type sanitary sewers, storm sewers, or storm water force mains, and at least six feet from all joints in gravity or pressure-type sanitary sewers, wastewater force mains, or pipelines conveying reclaimed water.

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**PART 2 - PRODUCTS**

**2.01 General**

All materials shall be new and unused. They shall be of standard, first grade quality and intended for the use for which they are offered. Materials or equipment which, in the opinion of the County, are inferior or of a lower grade than indicated, specified, or required will not be accepted.

**2.02 Reclaimed Water Mains**

A. Ductile Iron Pipe (DIP)

1. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipes, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipes shall be Pressure Class 250 and have corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings.
2. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with an asphaltic outside coating per AWWA C151
3. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.
4. Joints: Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111. Restrained joints shall be American "FLEX-RING" or "LOK-RING", or U.S. Pipe "TR FLEX" or "HP LOK". No field welding of restrained joint pipe will be permitted. Restraining gasket joints shall be assembled with American Fast-Grip gaskets or US Pipe FIELD LOK gasket.
5. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets may be ring type or full face type. The gasket for a standard push-on or mechanical joint, shall be of BUNA-5, vulcanized styrene rubber (SBR) and in accordance with AWWA C111.
6. Bolts and Nuts
  - a. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

- b. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.
- c. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.

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7. Mechanical joint glands shall be ductile iron.
8. Thrust collars and mid-span restraints shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.
9. Ductile iron pipe shall be encased in V-Bio polyethylene film where shown on the Drawings. V-Bio polyethylene film shall have a minimum thickness of 8 mils and shall meet the requirements of AWWA C105.
10. Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
11. Ductile iron pipe exterior shall have continuous blue stripe if applied during manufacturing, the stripe is parallel that runs parallel to the axis of the pipe, that is located at no greater than 90 degree intervals around the circumference of the pipe, and that will remain intact during and after pipe installation. If tape or paint is used to stripe pipe during installation of the pipe, the tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and that is located along the top of the pipe.

**B. Polyvinyl Chloride (PVC) Pipe**

1. Smaller than 4-inch Pipe: All PVC pipe and fittings less than 4-inches in diameter shall be manufactured in accordance with ASTM D2241, with a standard dimension ratio (DR) of 21, rated pressure 200 psi, and bear the National Sanitation Foundation Seal for reclaimed water pipe.
2. 4-inch through 12-inch Pipe: PVC pipe shall be manufactured in accordance with AWWA C900, latest edition. Pipe shall be pressure class 235 and must meet dimension requirements of dimension ratio (DR) 18 and shall bear the National Sanitation Foundation seal for reclaimed water pipe.
3. 14-inch and Larger Pipe: PVC pipe shall be manufactured in accordance with AWWA, C905, and latest edition. Pipe shall be pressure class 235 and must meet dimension requirements of dimension ratio (DR) 18 and shall bear the National Sanitation Foundation seal for reclaimed water.
4. Joints: Joints shall be "push-on" and shall meet all requirements of ASTM D3139. Each bell shall be an integral wall section joint assembly using elastomeric gasket seals. All gaskets shall meet all requirements for performance as specified by ASTM F477.
5. Pipe Marking: All pipe shall be marked as prescribed in ASTM D2241 (e.g., nominal pipe size, type of plastic pipe material, pipe dimension ratio, pressure rating, ASTM specification designation number, manufacturer's name and code), and the National Sanitation Foundation Seal for reclaimed water.
6. PVC Pipe for reclaimed water lines shall be Pantone Purple 522-C.
7. Acceptance will be on the basis of the County's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards, including the National

Sanitation Foundation. Additionally, each piece of pipe shall be stamped "NSF Approved".

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8. Fusible PVC 4-inch through 24-inch shall be DIPS DR18 C900-C905.

C. High Density Polyethylene Pipe (HDPE): All reclaimed water main pipe sizes 4-inch through 24-inch shall be DIPS DR11 (200 psi).

**2.03 Fittings (3-inch and Larger)**

A. General: Fittings 3-inches and larger shall be ductile iron manufactured in accordance with ANSI/ AWWA C110/A21.10 or C153/A21.53. The minimum pressure rating for fittings shall be 250 psi.

B. Coating: All fittings furnished with bituminous outside coating and shall be cement mortar lined and coated in accordance with AWWA C104.

C. Anchoring Devices

1. All anchoring devices shall be suitable for use with mechanical joint fittings meeting AWWA C110 and/or AWWA C111.
2. All anchoring devices shall be constructed of ductile iron (at least ASTM A536 Grade 70-50-05) and manufactured in accordance with AWWA C110 and/or C111.
3. All anchoring devices shall have a sufficient number of set screws so as to properly restrain various fittings or pipes at the rated pressure without the need for additional thrust restraint.

D. Retainer Glands

1. Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Glands shall be manufactured of ductile iron conforming to ASTM A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/AWWA C153/A21.53, latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices.
2. Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or Star Pipe Products Star-Grip Series 3000.
3. Retainer glands for polyvinyl chloride pipe shall be Megalug Series 2000 PV, as manufactured by EBAA Iron, Inc or Star Pipe Products Stargrip Series 4000.

E. Push-on Restraints

1. Push-on joint restraints shall be Fast-Grip Gasket by American Ductile Iron Pipe Co., or equal.
2. Bell harness restraints shall be Megalug Series 2500 by EBBA Iron or equal.

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**2.04 Gate Valves**

- A. Resilient seat gate valves shall be located no more than 500 feet apart in commercial, industrial and high-density residential areas and no more than 1000 feet in all other areas. Valves shall be spaced to isolate a maximum of 40 single-family residential lots. A minimum of two valves per tee, and three valves per 4-way cross, shall be required to isolate and maintain adequate service. Valves shall be placed at branch lines and located at the end of all reclaimed water main extensions except at looped cul-de-sacs.
- B. Smaller than 2-inches in Diameter: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded type. Valves shall have a minimum 200 psi working pressure for reclaimed water (125 psi working pressure for steam). Valves shall be made in the USA Gate valves shall be full port Crane No. 428 (threaded), Apollo Brass ball valve full port (threaded), or approved equal.
- C. 2-inches through 36-inches in Diameter: Gate valves shall be resilient seat wedge encapsulated with EPDM rubber type conforming to the requirements of AWWA C509 or AWWA C515 rated for 200 psi working pressure.
1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
  2. The valve gate shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the reclaimed water working pressure when installed with the line flow in either direction.
  3. All internal and exterior ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the reclaimed water and shall conform to AWWA C550.
  4. Stem nuts shall be independent of wedge and shall be of solid bronze conforming to ASTM B62.

5. All valves shall open by turning a two-inch square operating nut counterclockwise.
  
6. Gate Valve: Joints shall be mechanical joints and shall conform to AWWA C111, and all bolts and nuts for mechanical joints shall be high-strength, low-alloy steel in accordance with AWWA C111. All gaskets shall be for a standard mechanical joint of BUNA-S (SBR Buna) in accordance with

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8. ANSI/AWWA C111/A21.4. All mechanical joint accessories shall be furnished with the valves.
7. All tapping valves shall have flange-by-mechanical joint ends.
8. All valves shall be furnished with operating nuts.
9. One operating wrench will be provided for each five valves furnished; at least one wrench shall be supplied.
10. All tapping valves shall be interchangeable with other makes of tapping sleeves.
11. For horizontal installation, all tapping valves 16-inch and larger must have bevel gearing and pipe plug on bottom of valve bottom side to install nipple and ball valve for flushing.
12. Approved models are:
  - a. American Flow Control Series 2500 Resilient Wedge Valve.
  - b. M & H C515
  - c. Mueller Company A-2362-78 Resilient Wedge Gate Valve with Aqua Grip.
  - d. AVK Resilient Seated Gate Valve Series 65, J & S Valves C515, or approved equal.
  - e. All tapping valves 16-inch and larger will be determined by the County on a case by case basis for meeting operational requirements.

**2.05 Butterfly Valves (3-Inch and Larger)**

- A. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.
- B. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be ASTM A 276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. The valve shall have an EPDM seat.
- C. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of reclaimed water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

**D. Actuators**

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.
2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
3. Valve actuators shall be capable of withstanding a minimum of 450 foot
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- 5. pounds of input torque in either the open or closed position without damage.
- E. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.
- F. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 150.
- G. Butterfly valves shall be manufactured by Mueller, M & H Valve, DeZurik, Val-Matic, or Pratt.

**2.06 Tapping Sleeves**

- A. General: Tapping sleeves shall be full circle, constructed of stainless steel and in two halves. Tapping sleeve flange can be stainless steel or carbon steel.
- B. Tapping Sleeves 3-inch or larger shall have a  $\frac{3}{4}$ -inch threaded test port with a plug for pressure testing on the tapping sleeves & tap valves. All tapping sleeves 3-inch through 24-inch shall be Romac STS420 or JMC452, or approved equal. Any tapping sleeve 30-inch or larger will be reviewed on a case by case basis and requires approval from the County
- C. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve.

**2.07 Tapping Saddles**

General: Tapping saddles shall be constructed of heavy gray cast iron or ductile iron, with the attachment straps, nuts, and washers constructed of corrosion-resistant, alloy steel in accordance with AWWA C111. All tapping saddles shall be Smith Blair #317, JCM406, TPS T-3, or approved equal. Tapping saddles 3-inch and larger shall have a  $\frac{3}{4}$ -inch threaded test port with plug for pressure testing on the tapping saddle and the tap valve.

**2.08 Fire Hydrant**

- A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5<sup>1</sup>/<sub>4</sub> -inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and
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- D. inexpensive restoration without digging or cutting off the reclaimed water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2%-inch hose connections and one 4%-inch pumper connection, all with National Standard threads and each equipped with cap and non-kinking chain.
- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.
- J. Minimum depth of bury shall be 3% feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.
- K. All outside surfaces of the barrel above grade shall be painted with enamel equal to Koppers Glamortex 501 in color orange
- L. Hydrants shall be traffic model and shall be East Jordan 5CD250, American Flow Control B-84-B, M & H Valve 129, or approved equal.

M. Placements of fire hydrants:

Residential area: Spacing shall be every 500 feet

Rural area: Spacing shall be every 1,000 feet, or determined on a case by case basis.

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**2.09 Valve Boxes and Extension Stems**

- A. Valve boxes shall be provided for all buried valves. Valve boxes shall be one complete assembled unit composed of the valve box and extension stem. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable trench depths.
- B. Covers shall have "RECLAIMED WATER VALVE" or "RECLAIMED WATER" cast into them. Valve boxes shall be manufactured in the United States.
- C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1000 ft-lb without failure. Valve box shall be equal to American's trench adapter.
- D. Valve box collars shall be poured in place concrete (see detail G-19).

**2.10 Valve Markers**

The Contractor shall provide a Carsonite Utility Markers or approved equivalent with U.V. resistant decal for each valve installed. Valve decal shall be stamped "CAUTION RECLAIMED WATER VALVE".

**2.11 Hydrant Tees**

Hydrant tees shall be equal to ACIPCO A10180, SIP Industries, U.S. Pipe U-592, or approved equal.

**2.12 Anchor Couplings**

Lengths and sizes shall be as shown on the Drawings. Anchor couplings shall be equal to ACIPCO A 10895, SIP Industries, U.S. Pipe U-591, or approved equal.

**2.13 Concrete**

Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. For job mixed concrete, submit the concrete mix design for approval by the County. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60. The thrust box shall not be poured over bolts or in such a way as to prevent bolt removal.

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**2.14 Detection Tape and Trace Wire**

Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Reclaimed Water Systems, Safety Precaution Purple, "Caution: Reclaimed Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2-inches when buried less than 10-inches below the surface. Tape width shall be minimum 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be Pro-Line Safety Products Detectable Tape 2-inch No: 103111253 3-inch No: 103121253, or approved equal. In addition, the Contractor shall furnish and install 10 gauge coated copper tracing wire shall be Pro-Line HF-CCS-PE30 or Copperhead Superflex 1030, or approved equal.

**2.15 Flushing Devices and Equipment**

- A. Flushing Post Hydrants shall be M & H Style 33, Eclipse No. 2 Post Hydrant, or approved equal.
- B. Bacteriological Sampling Stations shall be Eclipse 88-SS, Gil Industry Sample Station, or approved equal.
- C. Automatic Auto Flushers shall be Kupferle Eclipse No. 9400, Mueller Hydro-Guard HG-1, or approved equal.

**2.16 Reclaimed Water Services**

- A. It is the intent of these Specifications that the reclaimed water service connections shall duplicate those presently provided by the County in order to be compatible with their service maintenance procedures. All materials shall be NSF 61 "Approved".
- B. All materials installed under this Section shall have the approval of the NSF for reclaimed water services.
- C. Residential Service:
  - 1. Contractor will install reclaimed water service lines between the reclaimed water main and existing right-of-way, terminating at the right-of-way with a curb stop. The service line curb stop and tracing wire must be stubbed out of the ground 3 feet and attached to a stake that will remain until reclaimed water meters are installed. Reclaimed water service separations between

storm sewer and sanitary sewer shall be the same as for reclaimed water mains.

2. Tubing: Reclaimed water service tubing shall be polyethylene Class 200, SDR9 manufactured in accordance with AWWA C902. All service tubing shall be 1-inch or larger.

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3. Curb Stop shall be B43-342W-G-NL ball valve as manufactured by Ford Meter Box Company, Inc. or approved equal. Curb stop shall have wings for locking the valve in the closed position.
4. Corporation Stop shall be Ford F1000-G-NL, or approved equal.
5. Gate Valve: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for reclaimed water (125 psi working pressure for steam). Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).
6. Fittings shall be manufactured of brass, cast with full port of full open valve and machined in accordance with AWWA C800.
7. Service Saddle shall be Smith Blair 317, JCM 406, or approved equal.
8. Meter Box:
  - a. Meter boxes shall be plastic or polymer concrete. Material shall meet or exceed the following:
    - i. Tensile Strength: 3,400 psi (ASTM D 638).
    - ii. Flexural Modulus: 191,000 psi (ASTM D 790).
    - iii. Impact Strength, Izod: 0.6 feet 16/inch (ASTM D 256).
    - iv. Deflection Temperatures: 200 degrees F (ASTM D 648).
  - b. Plastic meter boxes shall be equal to Ametek, Plymouth Products Division or Brooks Products, Inc.
  - c. Traffic rated polymer concrete meter boxes for driveways, roads and sidewalks shall be equal to Glasmaster Tuff Box Series.
  - d. Meter box shall be fitted with a plastic solid cover.
  - e. Minimum dimensions shall be 10-3/4 x 16-inches top and 18-1/2 x 13-1/4-inches at bottom and 18-inches deep.
9. Reclaimed Water meters are not to be furnished; however, the reclaimed water meter connection must be compatible with the reclaimed water meters currently used by the County.
10. Backflow Preventers: Shall be furnished and installed by Contractor/Developer and be owned and maintained by Customer. Backflow preventer shall be Reduced Pressure Zone Type (RPZ).
  - a. Backflow preventers shall be rated for operation with inlet reclaimed water pressures up to 175 psig and reclaimed water temperatures up to 140-1/2 degrees F. Backflow preventers shall be tested and certified in accordance with ASSE 1013 and AWWA C506 and C511.
  - a. Provide with bronze body construction, rubber check valve and relief valve assemblies, and Clecon check seats.
  - b. Provide bronze ball body valve test cocks.

- c. Provide bronze body strainer on the inlet of each backflow preventer.
- d. Acceptable Manufacturers: Watts Series 909, Wilkins, Hersey.
- e. Residential dual check valve backflow preventers shall be Apollo dual check valve 4ALF-355-48 or approved equal. .
- f. Refer to Bay County Cross Connection Control Program for more information on back flow prevention.

11. Trace wire shall be Number 10, coated Pro-Line HF-CCS-PE30,  
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Copperhead Superflex 1030, or approved equal. Wire connectors shall be TL-LUG-SS, or approved equal.

**D. Commercial Service:**

1. A commercial service shall be constructed similar to a reclaimed water main or residential service base on the size requirement. Regardless of size, a commercial service shall include a backflow preventer.
2. Provide isolation valves on the inlet and outlet of each backflow preventer for maintenance. These valves shall be quarter turn, full port, and resilient seated, bronze ball valves.

**2.17 Check Valve Vaults, Meter Vaults 3-inch and Larger, and Air Release Vaults**

- A. All vault walls shall be made of precast concrete sections. The top and bottom sections shall also be precast unless shown otherwise or approved by the Engineer.
- B. All coarse aggregate shall be made from 100 percent calcareous rocks. The contractor shall furnish manufacturer's certificate stating the type of aggregate used in the manufacture of the valve vault.
- C. The materials shall conform to the following standards:
  1. Concrete shall be 4000 psi using ASTM C150 Type 2 cement.
  2. Wire mesh shall conform to ASTM A185.
  3. Reinforcing rods shall be ASTM A615 grade 60.
- D. The top slab shall be cast with a locking access hatch in place. Access hatch shall be as specified on the drawings.
- E. Check valve and air release vaults can have one locking access hatch. Meter vaults 3-inch and larger must have a two piece locking access hatch. (Refer to W-9)

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**PART 3 — EXECUTION**

**3.01 Handling Pipe**

- A. General: All material, unless otherwise directed, shall be unloaded at the job site and distributed at the site of the project by the Contractor. Materials shall be handled with care to avoid damage. In loading and unloading, pipe shall be lifted by hoists or slid or rolled on skids in such a manner as to avoid shock. Under no circumstances shall pipe be dropped. Pipe handled on skids must not be allowed to roll against pipe already on the ground. The Contractor shall be responsible for the safe handling of all materials. Damaged materials will be rejected by the County.
- B. Pipe shall be handled so as to avoid damage to the coating and lining. If, however, any part of the coating or lining is damaged by the Contractor, the repair shall be made by the Contractor at his expense in a manner satisfactory to the County before installation.
- C. Pipe shall be distributed on the site of the work parallel with and opposite or near the place it is to be laid in the trench, and with bell ends facing the directions in which the installation will proceed unless otherwise directed.
- D. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- E. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- F. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- G. No distributed pipe shall be placed inside drainage ditches.

- H. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

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**3.02 Installation of Pipe**

- A. General: Upon satisfactory installation of the pipe bedding, as specified in the "Earthwork for Utilities" section of these specifications, a continuous trough for the pipe barrel and recesses for the pipe joints shall be excavated by hand digging so that, when the pipe is laid in the trench true to line and grade, the pipe barrel will receive continuous, uniform support, and the joint will receive no pressure from the trench bottom.
- B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods.
- C. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench, piece by piece, by means of hoisting apparatus, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to pipe, pipe coating, and pipe lining. Under no circumstances shall pipe or accessories be dropped, dumped or rolled into the trench from finished ground level.
- D. The gasket material for each joint shall be properly positioned before the pipe is lowered into the trench. The joining of the pipe shall proceed in accordance with the manufacturer's requirements.
- E. Watertight plugs shall be installed in the open ends of the pipe at all times when pipe laying is not in progress. At no time shall trench reclaimed water be permitted to enter pipe.
- F. Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Wherever it is necessary to cut gray or ductile cast iron pipe which is equipped with a push-on joint type bell end, the cut end of the pipe shall be adequately beveled so as to prevent the edge of the cut pipe from cutting or tearing the gasket as the plain end is inserted into the bell of the adjoining pipe or fitting. All field-cut pipe shall be beveled by the Contractor, and the pipe "short" shall be used as part of the pipeline construction.
- G. Whenever necessary to deflect pipe after proper homing from a straight line, either in the vertical or horizontal plane to avoid obstructions, the maximum allowable deflection shall be in accordance with the following:

Push-on Joint Pipe

<u>Size</u>	<u>Maximum Deflection</u>
4-inch thru 12-inch	$\frac{3}{4}$ -inch per foot
16-inch thru 36-inch	$\frac{1}{2}$ -inch per foot

Only after the pipe has been properly homed will it be allowed to deflect.

H. No pipe shall be laid in reclaimed water or when the trench conditions or the weather is unsuitable for such work.

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- I. All reclaimed water lines and services shall be located a minimum of 36-inches below grade unless noted otherwise on the drawings.
- J. Any pipe which is disturbed or found to be defective after laying shall be removed and re-laid or replaced.
- K. Prior to connecting new work to existing lines or appurtenances, the Contractor shall verify location and elevation of existing connection point and notify County of any conflicts or discrepancies.
- L. Joints:
  - 1. Before laying the pipe, all lumps, blisters, and excess asphaltic coating shall be removed from the bell and plain ends of each length of pipe. The pipe ends shall then be wire brushed and wiped until clean and dry. Where mechanical joints or push-on joints are specified, oil and grease also shall be removed. Pipe ends shall be kept clean until joints are made. The plain end of pipe for mechanical joints shall be lubricated with an approved pipe lubricant before installing the gaskets.
  - 2. In making up the push-on type joint, the gasket shall be placed in the socket per manufacturer's recommendation. A thin film of lubricant (approved by the pipe manufacturer) shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe. The plain end of the pipe to be entered shall be thoroughly cleaned and placed in alignment with the bell of the pipe to which it is to be joined. The joint shall be made by exerting sufficient force on the entering pipe so that the plain end is moved past the gasket until it seats as per manufacturer's recommendation.
    - a. Pipe lubricant shall be JTM Ease-on Pipe Joint Lubricant and meet NSF/ANSI standard 61, or equal.
    - b. Shall be brushed over the gasket and the plain end of the pipe for push on joints and mechanical joints, where needed.
  - 3. Backhoe buckets or excavation equipment are not to be applied directly to the pipe.
  - 4. Mechanical joints shall be assembled in accordance with AWWA Standards. Mechanical joints shall be centered in the bells. An approved pipe lubricant shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, the bolts inserted, and the nuts tightened by hand.

5. The bolts shall be tightened on opposite sides of the pipes by means of a torque wrench in such a manner that the gland shall be brought up evenly into the joint. The following range of bolt torques shall be applied:

<u>Bolt Size (Inches)</u>	<u>Range of Torque</u>
$\frac{3}{4}$ -inch Diameter	5 to 95 ft.-lbs.
1-inch Diameter	95 to 100 ft.-lbs.

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6. If effective seal is not obtained at a maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.
  7. If a joint is defective, it shall be cut out and entirely replaced or, if permission is given by the County, it may be repaired by a suitable clamp.
- M. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave un-joined pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the County.
- N. V-Bio Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the County. Installation shall be at locations shown on the Drawings.
- O. Conflict with Existing Utilities
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed reclaimed water main does not permit safe installation of the reclaimed water main by the use of sheeting, shoring, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the reclaimed water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the County. If, in the opinion of the County, the reclaimed water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order. Separation of reclaimed water, reclaimed water, storm and sewer systems shall comply with FDEP regulations and Standard Drawings.
  2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed reclaimed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the reclaimed water main. The Contractor may change the proposed grade of the reclaimed water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the County. If, in the opinion of the County, the reclaimed water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the County will direct the Contractor to

relocate the utility as part of the Contract with the costs of such relocation being paid for as part of a change order. Separation of reclaimed water,

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4. reclaimed water, storm and sewer systems shall comply with FDEP regulations and STANDARD DRAWINGS.
- P. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- E. Reclaimed water Main Separation Requirements (See Utilities Standard Detail G-14)
1. Reclaimed water mains constructed in Bay County Rights-of-way shall be laid to provide a minimum horizontal distance of at least three feet between the outside of the reclaimed water main and the outside of any existing or proposed vacuum-type sanitary sewer, storm sewer, storm water force main, or pipeline conveying reclaimed water. A horizontal distance of at least 10 feet shall be provided between the outside of the reclaimed water main and the outside of any existing or proposed gravity-type sanitary sewer, pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water. A horizontal distance of at least ten feet shall be provided between the outside of the reclaimed water main and all parts of any existing or proposed "on-site sewage treatment and disposal system."
  2. Reclaimed water mains constructed in Bay county Right-of way, that will cross any existing or proposed gravity- or vacuum-type sanitary sewer or storm sewer will be laid so the outside of the reclaimed water main is at least six inches above the other pipeline or at least 12-inches below the other pipeline. Reclaimed water mains that will cross any existing or proposed pressure-type sanitary sewer, wastewater or storm water force main, or pipeline conveying reclaimed water will be laid so the outside of the reclaimed water main is at least 12-inches above or below the other pipeline.
  3. At the utility crossings described above, one full length of reclaimed water main pipe will be centered above or below the other pipeline so the reclaimed water main joints will be as far as possible from the other pipeline or the pipes will be arranged so that all reclaimed water main joints are at least three feet from all joints in vacuum-type sanitary sewers, storm sewers, or storm water force mains, and at least six feet from all joints in gravity or pressure-type sanitary sewers, wastewater force mains, or pipelines conveying reclaimed water.

**3.03 Installation of Fittings, Valves and Taps**

- A. Fittings shall be handled with care to avoid damage. All fittings shall be loaded and unloaded by lifting, and under no circumstances shall fittings be dropped, skidded, or rolled. Under no circumstances shall fittings be placed against pipe or other fittings in such a manner that damage could result. Slings, hooks, or

tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior lining of fittings. If any part of the fittings' coating or lining is damaged by the Contractor, the repair or replacement shall be

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made by the Contractor at his expense and in a manner satisfactory to the County before installing. Fittings shall also be stored at all times in a safe manner to prevent damage and kept free of dirt, mud, or other foreign matter. All fitting gaskets shall be stored and placed in a cool location out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis.

- B. Fittings shall be set and joined to the pipe in a manner specified previously for joint assembly. When conditions warrant, fittings should be provided with special support trussing and blocking. Buried valves that are 12-inches and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
- C. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the County. Valves shall be closed before being installed.
- D. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 60-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the County.
- E. All valve boxes set in non-paved areas shall have concrete pads poured around the top section of the valve box. The pad shall be a 24-inch square and shall be centered on the valve box. All reclaimed water valve covers shall be painted safety blue as prescribed by the American Public Works Association (APWA) uniform color code for utility systems. All valve covers shall be cast with the word RECLAIMED WATER. A 2-inch monument will be set on the North East corner of each 24-inch poured square pad of the valve box indicating the valve size, type, and number of turns required.

- F. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
- G. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Drawings or directed by the County, valve markers shall be

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installed 6 inches inside the right of way or easement. Raised pavement markers (RPM's) shall be provided and installed along the appropriate roadway centerline for each in-line valve on County owned right-of-way. RPM's for in-line valves shall be Type I, two-way, and white in color.

- H. Blow-Offs: Blow-offs shall not be connected to any sewer or submerged in any stream or be installed in any other manner that will permit back-siphoning of contaminated reclaimed water.
- I. The valve and valve box shall be installed so reclaimed water department personnel can insert a valve key through the valve box and completely open and close the valve.

**3.04 Connections to Reclaimed Water Mains**

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Location: Before laying pipe, locate the points of connection to existing reclaimed water mains and uncover as necessary for the County to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing reclaimed water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of the County.
- D. Testing: The County must be present for the pressure test of the tapping saddle and tapping valve before the tap is allowed. Test shall be done through the saddle and the test machine or the saddle and tap valve.
- E. Tapping Saddles and Tapping Sleeves
  1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted. The coupon shall be delivered to the County.
  2. Prior to attaching the saddle or sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
  3. Before performing field machine cut, the reclaimed water tightness of the saddle or sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with reclaimed water. Then using a hydro-static hand pump, pump to a pressure of 150 psi to insure all air is expelled. No leakage shall be permitted for a period of thirty minutes.
  4. After attaching the saddle or sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to reclaimed water shall be swabbed or sprayed with a one percent hypochlorite solution.

F. Connections and Repairs: Where connections or repairs are required,

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Contractor shall only use solid sleeves and provide all materials and labor necessary to make the connection or repair to the existing pipeline, excluding service lines 2-inch or smaller.

**3.05 Installation of Fire Hydrants (See Utilities Standard Detail W-2)**

- A. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the County.
- B. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway, except that hydrants having two-hose nozzles 90 degrees apart shall be set with each nozzle facing the roadway at an angle of 45 degrees.
- C. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12-inches above the ground or as directed by the County.
- D. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve located adjacent to the main. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by first wrapping the weep hole/drain hole with a felt/mesh material that will allow the hydrant to drain. Then place coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.
- E. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.
- F. Hydrants shall be located as shown on the Drawings or as directed by the County. In the case of hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.
- G. Raised pavement markers (RPM's) shall be provided and installed along the appropriate roadway centerline for each fire hydrant on County owned right-of-way. RPM's for inline valves shall be Type I, two-way, and blue in color.

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**3.06 Thrust Restraint**

- A. Retainer Glands: Provide retainer glands at all points where hydraulic thrust may develop and on fire hydrants and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly; the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
  
- B. Thrust Collars: Concrete collars shall be constructed as shown on the Drawings. The welded-on collar shall be attached to the pipe by the pipe manufacturer. Filter fabric shall be installed between the thrust collar and the adjacent soil.
  
- C. Concrete Blocking:
  - 1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings. Filter fabric shall be installed between the concrete blocking and the adjacent soil.
  - 2. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the County. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.
  
- D. Cement Slabs: All 12-inch and larger tap valves will be supported by a poured cement slab. Slab size and thickness to be determined on a case by case basis by engineer and the County.

**3.07 Detection Tape and Trace Wire**

- A. Provide detection tape and trace wire for all reclaimed water mains.
  
- B. Detection tape shall be located 18-inches above the crown of the pipe.
  
- C. Trace wire shall not be wrapped around the pipe.
  
- D. Trace wire shall be laid parallel to the 12 o'clock position of the main with at least 6-inches of separation.
  
- E. Trace wire shall be looped into each valve box and pulled out a minimum of two feet from the top of the valve box.

**3.08 Reclaim Water Service Connections**

- A. Reclaim water service connections shall be installed to the properties adjacent to the reclaimed water transmission mains both to the same side of the roadway (Short Side Service) and to the opposite side of the roadway (Long Side Service) as directed by the County.

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- B. Reclaimed water service connections installed under roadway shall be pulled through a casing. Casings shall be installed through a bored hole approximately equal in diameter to the external diameter of the casing. Minimum cover under roadway shall be four feet. At other locations, minimum cover shall be two feet.
- C. Installation shall conform to the details for reclaimed water service connections appearing schematically on the Drawings. Contractor shall provide any and all appurtenant work required to provide the intended reclaimed water service connections.
- D. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter, to the new copper service line, or the existing private service line, shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.
- E. Backflow preventers shall be provided on all reclaimed services. Please refer to Paragraph 2.16(C)10 for further backflow specifications.
- F. GPS coordinates shall be provided for each service connection and lateral.

**3.09 Testing, Flushing and Inspection Requirements**

It will be the responsibility of the Contractor to coordinate all testing, flushing and inspections. The Contractor shall notify the County and applicable agency inspectors 48 hours in advance of testing, flushing and inspections.

**3.10 Hydrostatic Test**

- A. All sections of the reclaimed main subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. All tests shall be in the presence of the County.
- C. Each segment of reclaimed main between main valves shall be tested individually.
- D. Test Preparation
  1. Flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats.
  2. Partially operate valves and hydrants to clean out seats.

3. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipes, valves and appurtenances will be pressure tested.
4. Before applying test pressure, air shall be completely expelled from the
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6. pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with reclaimed as necessary to supplement automatic air valves. Corporation stops shall be constructed as detailed on the Drawings with a meter box.
  5. Fill pipeline slowly with reclaimed. Provide a suitable pump with an accurate reclaimed meter to pump the line to the specified pressure.
  6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
  7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: Test the pipeline at 150 psi or 1.5 times the operating pressure, whichever is greater, measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration (at least two hours). Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation not greater than 5 psi.
- F. Leakage
1. Leakage shall be defined as the sum of the quantity of reclaimed that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration. Leakage shall be the total cumulative amount measured on a reclaimed meter.
  2. The County assumes no responsibility for leakage occurring through existing valves.
- G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD A(P)}{133,200}$$

Where: L = allowable leakage, in gallons per hour  
S = length of pipe tested, in feet  
D = nominal diameter of the pipe, in inches  
P = average test pressure during the leakage test, in pounds per square inch (gauge)

As determined under Section 4 of AWWA C600.

Allowable leakage at various pressures and pipe sizes is shown in the Table below (from AWWA C600 — Table 4.A) for 1000' of Pipe: \*

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Avg.	Pipe Diameter (inches)												
Average Pressure (PSI)	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98
125	<b>0.23</b>	<b>0.30</b>	<b>0.45</b>	<b>0.60</b>	<b>0.76</b>	0.91 <sub>11</sub>	1.06	1.21	<b>1.36</b>	<b>1.51</b>	<b>1.81</b>	2.27	2.72
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43

\*If the reclaimed main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

- H. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.
- I. Re-Testing: Any alterations made to pipeline performed after initial testing shall be re-tested and passed again, regardless of initial test results.
- J. Notification: Bay County shall be notified 24-hours in advance prior to Contractor performing pressure and leakage testing.

**3.11 Trace Wire Continuity Test**

Prior to acceptance of pressure pipe by the County, the Contractor shall demonstrate that the locator tracer wire functions properly. During the tracer wire testing, the Contractor shall also demonstrate that the wire is connected to all services at meter boxes, hydrants, backflow preventers, butterfly valves, wastewater plug valves, tapping valves, air release valves, and blow-off valves. The Contractor shall use one of several commercially available utility locating instruments to energize and trace the locator wire for continuity. Direct signal locate method shall directly apply the current from the transmitter to the tracer wire and the signal shall be detected and followed with a receiver. Submit to the County Inspector for approval the method and equipment to be used. Testing of the locator wire shall be done prior to or concurrent with the hydrostatic pressure test.

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**3. 12 Disinfecting Pipeline**

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated reclaimed water.
- C. Chlorination
  - 1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated reclaimed for 24 hours.
  - 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.
  - 3. After 24 hours, all samples of reclaimed water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.
- D. Disposal of Chlorinated Reclaimed water: Reduce chlorine residual of disinfection reclaimed water to less than one milligram per liter if discharged directly to a body of reclaimed water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat reclaimed water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.
- E. Bacteriological Testing
  - 1. After final flushing and prior to DEP approval and the reclaimed water main being placed into service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Florida Department of Environmental Protection.
  - 2. The Contractor shall give Bay County Utilities 48-hour written notice of the planned bacteriological testing to facilitate public notification, if required. A County representative must be present when bacteriological samples and free and total chlorine residual are taken. Immediately after samples are taken, the Contractor will be responsible for delivering the samples to the Laboratory for testing. The bacteriological samples shall be analyzed for both coliform and non-coliform growth. Testing shall be performed by a laboratory certified by the State of Florida and approved by the County.
  - 3. All sampling and testing costs shall be paid for by the Contractor prior to final acceptance.
  - 4. Re-chlorinate lines until required results are obtained.

5. All testing must follow FDEP 62-555.900 guidelines.

END OF SECTION 02400

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**SECTION 02710  
JACK AND BORE CASINGS**

**PART 1 — GENERAL**

**1.01 Scope**

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to jack and bore casings and to properly complete pipeline construction as described herein and/or shown on the Drawings.
- B. General: Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. If requested by the County, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

**1.02 Submittals**

- A. Submit shop drawings, product data and experience.
- B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:
  - 1. Shop drawings for casing pipe showing sizes and connection details.
  - 2. Casing Spacers.
- C. Experience Submittals: Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall

provide evidence of experience as required by the General Conditions. A minimum of five continuous years of experience in steel casing jack and bore construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review by the County.

**1.03 Storage and Protections**

All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the County.

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**SECTION 02710  
JACK AND BORE CASINGS**

**PART 2 - PRODUCTS**

**2.01 Materials and Construction**

- A. Casing for Pipe Greater than 3 Inches in Diameter
1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A 36.
  2. The thicknesses of casing shown in the tables below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the County.
  3. The diameters of casing shown in the tables below and shown on the drawings are minimum. Larger casings, with the County's approval, may be provided at no additional cost to the County, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.
  4. Casing Sizes:

<b>UNDER RAILROADS</b>			
Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness (inches)	
		Coated	Uncoated
6	18	0.250	0.282
8	20	0.250	0.313
10	22	0.281	0.344
12	24	0.312	0.375

<b>UNDER HIGHWAYS</b>		
Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness (inches)
6	18	0.250
8	20	0.250
10	22	0.250

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12	24	0.250
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JACK AND BORE CASINGS**

B. Casing for Pipe Less than or equal to 3 Inches in Diameter Casing shall be polyvinyl chloride pipe which has a minimum wall thickness equal to Schedule 80.

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company or Advanced Products & Systems, Inc.
2. Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware shall be Pipeline Seal and Insulator, Inc.

D. Carrier Pipe: Carrier pipes shall meet requirements as specified in these Specifications.

**2.02 Equipment**

A cutting head shall be attached to a continuous auger mounted inside the casing pipe..

**PART 3 - EXECUTION**

**3.01 General**

A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation by the Bidder or Contractor must be approved by the appropriate authority having jurisdiction over the site.

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JACK AND BORE CASINGS**

- B. Casing construction shall be performed so as not to interfere with, interrupt or endanger roadway or railroad rail surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the County.
  
- C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.
  
- D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to the County. Due to restrictive right-of-way and construction easements, jacking and boring casing lengths less than the nominal 20 foot length may be necessary.
  
- E. Road Crossings
  - 1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the road right-of-way.
  - 2. Work along or across the County rights-of-way shall be subject to inspection by the County staff.
  - 3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.
  - 4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the jurisdictional agency.
  - 5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.

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**JACK AND BORE CASINGS**

F. Railroad Crossings

1. The Contractor shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.
2. Additional insurance is required for each railroad crossing. The Contractor shall furnish the Railroad Owner with such additional insurance as may be needed, cost of the same shall be borne by the Contractor. It shall be the Contractor's responsibility to ascertain insurance requirements and to furnish documentation that applicable insurance has been obtained.
3. All work on the Railroad right-of-way, including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.
4. If, in the opinion of the Railroad, it becomes necessary to provide flagging protection, watchmen or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall coordinate such work and shall reimburse the Railroad, in cash, for such services, in accordance with accounting procedures agreed on by the Contractor and affected Railroad before construction is started.

**3.02 Groundwater Control**

- A. The Contractor shall control the groundwater throughout the installation of the casing.
- B. Means and methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the County immediately and take such action as necessary to maintain safe conditions and prevent damage.
- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24 hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements specified in the Erosion Control Section of these Specifications.

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**3.03 Safety**

- A. Provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.
- B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over the site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.
- C. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons".

**3.04 Jacking and Boring**

- A. Bore Pit
  - 1. Conduct jacking and boring operations from a bore pit excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the bore pit on the downstream end of the bore.
  - 2. The bore pit shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore bore pit properly on all sides. Bore pit sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.
  - 3. The bottom of the bore pit shall be firm and unyielding to form an adequate foundation upon which to work. In the event the bore pit bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the County
- B. Jacking Rails and Frame
  - 1. Set jacking rails to proper line and grade within the bore pit. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
  - 2. Place backing between the heels of jacking rails and the rear of the bore pit. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

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**JACK AND BORE CASINGS**

- C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wet boring.
- D. Auger the hole and jack the casing through the soil simultaneously.
- E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
- F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
- G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.
- H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the County, or removed and replaced at Contractor's own expense.
- I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.
- J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
- K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
- M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the

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- P. sheeting, shoring and bracing shall be removed from the job site unless approved otherwise by the County. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.
- O. Requirements for trench excavation, all classes and type of excavation, the removal of rock, muck, and debris, the excavation of all working pits and backfill are identified in Section titled "Earthwork for Utilities" herein.
- P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
- Q. Grout backfill shall be used for unused holes or abandoned pipes.

**3.05 Ventilation and Air Quality**

Provide, operate and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

**3.06 Rock Excavation**

- A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the County, cannot be removed through the casing, the County may authorize the Contractor to complete the crossing by a method established in a change order.
- B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing at no additional cost to the County.

**3.07 Installation and Pipe**

- A. After installation of the casing is complete, and has been accepted by the County, install the carrier pipe in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.
- C. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing

spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 9 to 10 foot intervals.

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JACK AND BORE CASINGS**

- D. Close the ends of the casing with seal ends made from one-piece synthetic rubber especially formulated for sealing casing/carrier pipe. GPT BOA Tape, or a grout foam fill for annular space may also be used.

END OF SECTION

END OF SECTION 2710

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**SECTION 02720  
HORIZONTAL DIRECTIONAL DRILLING**

**PART 1 GENERAL**

**1.01 Scope**

- A. The work to be performed under this section of the contract will be the construction of various diameters by horizontal directional drilling.
- B. Horizontal Directional Drilling is defined as: A construction method consisting of drilling a small diameter pilot hole within the designed tolerances for radius requirements, followed by enlargement of the hole to accommodate the product line.
- C. The Contractor will furnish all labor, equipment, materials and supplies and will perform all work necessary to provide County with a complete, finished directional drill installation.
- D. The proposed alignment, length, profile and grade to which the pipe shall be installed are noted on the applicable drawings. This profile indicates the minimum grade to which the pipe will be installed.

**1.02 Quality Assurance**

- A. The requirements set forth in this Specification specify a wide range of procedural precautions necessary to insure that the basic, essential aspects of a proper directional drilling installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this Specification.
- B. Adherence to the specifications contained herein, or the County's approval of any aspect of any directional drilling operation covered by this Specification, shall in no way relieve the Contractor of its ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

- C. The Contractor shall employ experienced personnel to operate the directional drilling equipment and the position monitoring and steering equipment.
- D. The Contractor shall use certified pipe welders. These individuals shall be made available prior to construction for certification testing and qualifications. Welders shall be certified prior to commencement of pipe welding operations.

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**SECTION 02720  
HORIZONTAL DIRECTIONAL DRILLING**

**1.03 Submittals**

Prior to beginning work, the Contractor shall submit to the County five (5) copies of a report of schedules, calculations, procedures and any supplemental subsurface soil condition investigations performed by the Contractor along the path of the proposed crossing. The report will insure that the subsurface conditions are known to the Contractor and that his proposed crossing procedure is based on factual information. If the subsurface conditions are known to the Contractor by previous work or geotechnical studies done in the immediate area, the information shall be recorded in the report along with any additional geotechnical studies performed by the Contractor.

The report shall include the following:

1. Contractor shall submit detailed design calculations for several representative loading conditions for the proposed crossing. If requested by the County, the Contractor shall submit calculations to support the design of any particular location of pipe anywhere along the length of the crossing at no additional cost to the County.
  - a. Design calculations shall be presented in a neat, readable format, with all figures, values and units included to facilitate ease of verification.
  - b. Calculations shall be submitted to demonstrate that the pipe thickness design is sufficient to meet all design criteria specified.
    - i. Calculations shall address the following loading conditions: Pre-installation - Hoop and longitudinal stress during low pressure air test, spanning stress with pipe full of water and supported on installation rollers, and maximum roller/ support spacing.
    - ii. Installation/ Post-Installation - Longitudinal stress from pulling force; bending stress at point of entry and in final position; external stresses from drilling fluid, overburden, and highway or other loads being crossed.
    - iii. Post-Installation/In-Service - Hoop and longitudinal stress during hydrostatic test; internal working and surge pressure; buckling with internal vacuum.
  - c. The Contractor shall also perform and submit to the County, fluid's pressure versus overburden strength calculations. These calculations shall be performed to determine minimum acceptable cover requirements and prevent drilling fluids breakout to the ground surface.
  - d. All calculations shall bear the seal of a Florida Certified Professional Engineer.
2. A list of equipment and procedures expected to be used for the directional drill installation, including special equipment and materials required for various soil conditions anticipated.
3. Time schedule for completing the directional drill installation, including any delays due to anticipated soil conditions.
4. A plan and profile drawing of the same horizontal and vertical scale as the contract drawing showing the proposed crossing configuration including entry

and exit angles, radius of curvature and entry and exit points, including proposed equipment set-up, material layout, and construction staging areas.

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**SECTION 02720**  
**HORIZONTAL DIRECTIONAL DRILLING 1.04 Job**  
**Conditions**

- A. Planned night time work is expressly prohibited and will not be allowed unless prior approval granted by the County and all regulatory agencies having jurisdiction.
- B. All operations shall be accomplished during daylight hours and shall not begin after the hour established as the latest starting time that will allow completion during daylight hours. The Contractor shall provide a Work Plan submittal indicating its proposed hours of operation and length of workweek. All work plans shall be subject to compliance with all applicable regulatory requirements for construction activities and any off site impacts.
- C. There shall be no directional drilling work performed on Fridays unless otherwise approved by the County and all regulatory agencies having jurisdiction.

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**SECTION 02720  
HORIZONTAL DIRECTIONAL DRILLING**

**PART 2 - PRODUCTS**

**2.01 Equipment**

- A. General: All equipment for the directional drill installation shall have the capacity, stability, and necessary safety features required to fully comply with the specifications and requirements of this section without showing evidence of undue stress or failure. It shall be the responsibility of the Contractor to assure that the equipment to be used in the directional drill installation is in sound operating condition. Backup equipment shall be required in the event of an equipment breakdown and where the condition of the equipment to be used indicates that routine component replacement or repair will likely be necessary during the directional drill installation.
- B. Directional Drilling System: The directional drilling system shall consist of over the road transportable field power unit, mud-mixing and recycling unit, a trailer or carriage-mounted drill unit, and all other support accessory vehicles and equipment. All system components shall be in sound operating condition with no broken welds, excessively worn parts, badly bent, or otherwise misaligned components. All drill pipe, reamers, pull back heads, swivels, drill heads and collars, pipe cradles, pipe rollers, ropes, cables, clamps, and other non-mechanical but essential items shall be in sound condition and replaced immediately when need is apparent. The equipment must be capable of drilling the specified length in a single bore.
1. Mud-Mixing and Recycle Units: The mud-mixing and recycle unit shall be a self-contained system designed to provide a supply of high-pressure bentonite based cutting fluid to the drill unit. It shall contain a fluid storage tank and a complete bentonite and drilling fluid additive(s) mixing system. The cutting fluid is to be mixed on site. The cutting fluid shall be formulated for this specific project and anticipated conditions. It shall permit changes to be made to the bentonite and drilling fluid additive(s) concentrations during drilling in response to changing soil conditions. The field power unit shall contain the power-taken off-driven high pressure cutting fluid pumping system. The recycle units shall be of a capacity to minimize the production of new cutting fluid and maximize the reuse and recirculation of original cutting fluid produced.

2. Directional Drill System

- a. A carriage-mounted version of the drill system shall include a thrust frame. Both the trailer-mounted and carriage-mounted drill system shall be designed to rotate and push 10-foot (3-meter) minimum hollow drill sections into the tunnel being created by the boring head. The drill sections shall be made of a high strength S-grade steel that permits them to bend to a 30-foot (9-meter) radius without yielding. Drill end fittings shall permit rapid makeup of the drill sections while meeting the torque, pressure and axial load requirements of the system. The boring head itself shall be capable of housing a probe used by the Magnetic Guidance System (MGS) to determine tool depth and location from

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**SECTION 02720  
HORIZONTAL DIRECTIONAL DRILLING**

- surface and to orient the head for steering. The MGS shall have a minimum accuracy of plus or minus two percent of the vertical depth.
- b. The drilling equipment may be fitted with a permanent alarm system capable of detecting an electric current. The system will have an audible alarm to warn the operator when the drill head nears electrified cables. The drilling equipment shall be grounded, protected, and operated in accordance with manufacturer's requirements for electric strike safety.
  - c. The control console shall contain a calibrated display of inclination, azimuth, tool face location, mud pump rates, and torque pressures. The downhole steering system accuracy shall be plus or minus one percent of the horizontal bore length.
3. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the County prior to commencement of the work. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the pipe placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular condition of the project. Water sluicing methods, jetting with compressed air, or boring or tunneling devices with vibrating type heads that do not provide positive control of the line and grade shall not be allowed.
- C. Spoils Equipment: The cutting fluid removal system shall include a self-contained vacuum truck which has sufficient vacuum and tank capacity to remove excess cutting fluid mixture and cuttings from the project site as required or directed by the County.
1. The Contractor shall be responsible for the offsite disposal of all surplus cutting fluid mixture, cuttings, soil and debris generated by the project. The surplus materials shall be removed, hauled and disposed in accordance with all regulatory agencies having jurisdiction.
- D. Magnetic Guidance System: A Magnetic Guidance System (MGS) probe and tracker shall be used to identify the location of the drill head during the drilling operation. The tracker shall be capable of tracking at all depths up to one hundred feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The tracker shall be accurate to  $\pm 2\%$  of the vertical depth of the borehole at sensing position at depths to one hundred feet. Ferrous materials shall not influence or affect the MGS readings or accuracy.
1. Components: The Contractor shall supply all components and materials to install, operate, and maintain the MGS. This shall include, but not be limited to the following:
    - a. MGS Probe and Interface
    - b. Computer, Printer, and Software

- c. DC Power Source, Current Control Box, and Coil/Tracking Wire.
- 2. The Magnetic Guidance System (MGS) shall be a Tensor TruTracker MGS, or other licensed and approved wire guidance system, and shall be set up

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HORIZONTAL DIRECTIONAL DRILLING**

and operated by personnel experienced with this system. "Walk-over" tracking systems shall not be used, except as approved by the County. Contractor shall provide County with current calibration certification of MGS in accordance with manufacturer's specifications.

- E. If equipment breakdown or other unforeseen stoppages occur and forward motion of the directional cutting head is halted at any time other than for reasons planned in advance (addition of drill stems, etc.), the boring path shall be filled with a proper bentonite solution immediately, or as directed by the County.
- F. The boring tool shall have steering capability and have an electronic tool detection system. The position of the tool during operation shall be capable of being determined accurately, horizontally within 1% of the horizontal distance of the borehole and vertically within 2% of the vertical depths of the borehole. The boring tool shall have a nominal steering radius of 9 meters (30 feet).

**2.02 Pipe**

- A. Pipe of various sizes (4-inch to 36-inch) shall be DIPS DR11 Pressure Class (PC) 200 High Density Polyethylene (HDPE) Pipe, AWWA C906 compliant, NSF 61 Standard Listed, furnished in fifty (50) foot lengths or longer. Pipe larger than 36 inches will be determined by Bay County on a case by case basis for meeting operational requirements.
- B. HDPE piping shall have stripes applied to the pipe wall. Stripes shall be parallel to the axis of the pipe, continuous, and be located at no greater than 90 degree intervals around the outside of the pipe. Stripes for water pipe shall be blue, stripes for sewer shall be green, and stripes for reclaimed water lines shall be purple.
- C. Fusible PVC Pipe of various sizes (4 inch to 24 inch) shall be DIPS DR18 Fusible C905. 30-inch and larger will be determined by Bay County on a case by case basis for meeting operational requirements.
- D. Joints of pipe segments shall be butt-welded flush to the outside diameter of the pipe.

**2.03 Polyethylene Mechanical Joint Adapters**

- A. Mechanical connections of HDPE pipe to ductile iron or PVC piping, mechanical joint fittings, or valves shall be through a self-restraining, fusible mechanical joint adapter. Restraints shall be used when connecting a HDPE pipe to a different material.

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HORIZONTAL DIRECTIONAL DRILLING**

- B. Adapter shall include an integral, internal stainless steel insert.
- C. Adapter shall be of the same SDR as the pipe.

**2.04 Drilling Fluids**

- A. A mixture of Bentonite drilling clay, project specific cutting fluid additives, and potable water is to be used as the cutting fluid (MUD) and over ream hole filler for the directional drill installation. The drilling fluid mixture used shall have the following minimum viscosities as measured by a Marsh Funnel:
  - 1. Rock Clay                      60 sec.
  - 2. Hard Clay                      40 sec.
  - 3. Soft Clay                      45 sec.
  - 4. Sandy Clay                    90 sec.
  - 5. Stable Sand                    120 sec.
  - 6. Loose Sand                    150 sec.
  - 7. Wet Sand                      150 sec.
- B. These viscosities may be varied to best fit the soil conditions encountered as recommended by the drilling mud and fluid additive manufacturer, and as approved by the County.
- C. Where sandy or granular materials are encountered, a cement slurry or polymer supplement shall be considered for added strength and stability of the bore and over ream hole.
- D. No chemicals or polymer surfactant shall be used in the drilling fluid without written consent of the County, and after a determination is made that the chemicals to be added are not harmful nor corrosive to the facility and are environmentally safe.
- E. Contractor to provide County and have on site at all times the Material Safety Data Sheets (MSDS) for all drilling compounds and chemicals.

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HORIZONTAL DIRECTIONAL DRILLING**

**PART 3 - EXECUTION**

**3.01 Personnel Requirements**

- A. A competent and experienced supervisor representing the Drilling Contractor shall be present at all times during actual operations. A responsible representative, who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Directional Pilot Hole, over reaming and pullback operations.
- B. The Contractor shall have a sufficient number of competent workers on the job at all times to insure the Directional drill installation is made in a timely and satisfactory manner. Adequate personnel for carrying out all phases of the actual Directional drill installation operation must be on the job site at the beginning of work.
- C. HDPE pipe thermal butt fusion welding to be completed by a welder certified by the manufacturer of the pipe or pipe welding equipment.
- D. The County must be notified 48 hours in advance of starting each phase of the work. The Directional drill installation shall not begin until the County is present at the job site and agrees that proper preparations for the operation have been made. The County's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract.
- E. If the Contractor fails to begin the Directional drill installation at the agreed time, the County will establish the next mutually convenient time to begin. To avoid undue hardship of either party, reasonable and mutual cooperation should be exercised where starting times are concerned. If one party fails to meet the agreed schedule, the other party is expected to consider a delayed start if the installation cannot be completed during daylight hours.

**3.02 Delivery, Storage, and Handling**

- A. Transport, store and handle pipe segments so as to avoid damaging the surfaces, protective coatings, edges and corners, and to prevent excessive stresses.
- B. Handle pipe by lifting using nylon slings or other non-metallic contact means. Use of lifting eyelets is not permitted.

- C. Use supports as needed when storing pipe segments to avoid damage. Store pipe in accordance with the manufacturer's written recommendations.

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**3.03 Installation**

- A. The Contractor shall be responsible for providing a FDOT Maintenance of Traffic (MOT) Plan to the County and local traffic law enforcement agency for review. The MOT Plan shall show the location of all barricades, signs, devices and alternate routes for local traffic and pedestrian safety. Erection of the appropriate safety and warning devices in accordance with the USDOT/ FHWA Manual on Uniform Traffic Control Devices (MUTCD) shall be completed prior to beginning work and maintained until all construction is completed and the site restored.
- B. All excavation for entry and recovery pits and any other excavation necessitated by the Directional drill installation shall be in accordance with the Earthwork for Utility section of the specifications. All excavations shall comply with the requirements of the Occupational Health and Safety Administration.
- C. The cost of restoring pavement, curb, sidewalk, driveways, lawns, storm drains, etc., and other landscaped facilities shall be borne by the Contractor unless otherwise noted.
- D. The following is a general outline of steps for the directional drill installation operation:
  - 1. Contractor shall clear the right-of-way and temporary work space as shown on the drawings. Contractor to install and maintain all soil erosion and sediment control devices, until project completion with approved permanent site stabilization.
  - 2. Contractor shall haul, string, assemble restrained pipe, joint air test and hydrostatically test the pipeline in one section, unless otherwise approved by County. The Contractor shall provide adequate site security and shall be responsible for the integrity of the pipe until after the pullback, final test of the pipeline, and acceptance of the work by the County.
    - a. All assembled pipe sections shall be securely plugged at the end of each work day. The pipe interior is to be protected at all times against dirt, dust, drilling mud, pipe cuttings, debris, animal access, and other sources of contamination.
  - 3. Contractor shall provide adequate support rollers for the pipeline during pullback of the pipe string into the pre-drilled hole. The rollers and cradles shall be of a type that will prevent damage to the pipe and will be of sufficient number, as recommended by pipe manufacturer, to prevent over stressing due to sag bends during the pullback procedure. The pipe shall be supported at all times, including pullback, to maintain a stress free arc which

limits pipe bending and internal hoop stresses to within manufacturer's limits.

- a. Pipe which is not properly protected and supported and shows indications of excessive stressing, gouges, cuts, abrasions or other damage which may affect the operational performance intended for the pipe, as recommended by pipe manufacturer, shall be removed from the site and replaced at no additional cost as directed by the County.

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4. Contractor will mobilize the drilling equipment, erect the rig, drill a pilot hole, enlarge the hole as necessary to a minimum diameter of 1.5 (may be less, based on Department of Transportation permit requirements) times the nominal diameter of the pipe, and pullback the prefabricated pipe length under the crossing.
  - a. Prior to beginning the Pilot Hole over reaming, the Contractor shall furnish an as-built plan and profile of the actual crossing to the County confirming the installation is in compliance with the Contract Documents.
5. Contractor will supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Mud pits are to be protected at all times against unauthorized access and be stabilized at all times against surface water runoff and containment berm failure. Contractor will pump, haul and dispose any drill cuttings and excess drill fluids in a manner consistent with the local and state regulations at no additional cost to the County.
6. The bore pipe will be pulled back in one continuous section and Contractor must utilize a swivel to minimize the rotation of the product pipe during pullback. Swivel shall utilize lubricated internal bearings which are fully protected from external contamination and over lubrication. Contractor must demonstrate swivel operation prior to pullback.
  - a. If pipe flotation is experienced during pullback, Contractor shall use potable water and disinfect all piping and hoses used for water addition to the HDPE to counter the pipe flotation during pullback.
  - b. During pullback, the Contractor shall maintain records for submission to County indicating job, date, time, constant pipe footage progress, mud flow rates, pulling forces required and torque readings. Contractor shall also record the pull head location for each length of drill stem pipe on the record drawings. During pullback, the Contractor shall use a #10 tracer wire for future locating needs.
7. County shall have access at all times to any measuring or gauging devices used for the horizontal directional drill installation, as well as any drilling logs maintained by the Contractor.
8. In the event that the Contractor must abandon the drill hole before completion, the Contractor will seal the borehole with neat cement grout starting at the low point or end of the drill hole and redrill, at no extra cost to County.

**3.04 Pipeline Alignment and Profile Tolerances**

- A. Ground entry and exit angles shall be as identified in the boring plan.
- B. Minimum bending radius of the installed pipeline shall be based on no more than 72% of the manufacturer's specified minimum yield strength of the pipe.

- C. The actual exit point shall be no more than 1 foot left or right of the alignment for the proposed exit point.
  
- D. Contractor shall limit the longitudinal pull on the pipe to not exceed pipe
  
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- F. manufacturer's recommended bending/pulling bending/pulling force in force of the pipe, unless otherwise approved by the pipe manufacturer or its authorized representative. Contractor will continuously monitor and record the longitudinal pulling forces during pipeline pullback.
- E. Variation from the above parameters shall not be permitted without authorization of the County.

**3.05 Field Quality Control**

- A. The newly installed pipes shall be flushed with potable water to remove any sediment, solids and/ or foreign material prior to any in place testing. County's representative to be notified 48 hours prior to flushing.
- B. Hydrostatic Test (In-place pipe - After Pipe Pullback)
  - 1. Testing, flushing and disinfection and disposal of highly chlorinated water shall be in accordance with Section ASTM F2164 "Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure."
    - a. Prior to pipeline disinfection, the pipe shall be thoroughly cleaned of all internal debris, fluids, and all other material by flushing and/or use of uncoated polyfoam pipeline swabs/pigs.
  - 2. Fill the pipe with potable water and after all free air is removed from the test section; raise the pressure at a steady rate to 150 psi as measured at the lowest point. The pressure in the section shall be measured with calibrated pressure gauges at each end of the pipe section.
    - a. Once test pressure is attained and holds for four hours, reduce pressure by 10 PSI and monitor pressure for one hour for any deviation; if no deviation occurs, a passing test is indicated. No retesting of the HDPE shall take place for eight hours, minimum, after pipe has been depressurized due to an unsuccessful pressure test.
  - 3. Immediately following the pressure test, the results shall be furnished to the County. Leaking pipes that cannot be repaired to meet pressure test are to be filled with concrete, removed, or otherwise placed out of service.

**3.06 Use of Existing Water Systems**

All use of existing water systems during construction by the Contractor shall be with the approval and direction of the system Owner and its representatives. The Contractor shall be responsible for all permits, fees, temporary meter rental/ provisions, temporary backflow preventer rental/ provision and other water utility requirements for supplying water during construction. The Contractor shall use the existing water system only at locations, times and conditions as set forth by the system owner or its representatives.

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**3.07 Record Drawings**

- A. The MGS pullback data shall be recorded at every pilot hole drill stem length during the actual crossing operation. The Contractor shall furnish record plan and profile drawings, on the same horizontal and vertical control datum shown on the contract documents, based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation.
- B. The record drawings shall be generated using AutoCAD, and provided on a DVD-ROM disc. Two hard copies of the approved record drawings shall be furnished to the County.

**3.08 Cleanup and Restoration**

Perform restoration as the work progresses and after completion. Do not delay restoration work. Complete restoration no later than 30 days after the pipe is in place.

**3.09 Drilling Underneath Water Bodies**

- A. Place double rows of silt fence between all drilling operations and any areas that could be damaged, wetlands, or other waterways.
- B. Berms, liners, turbidity curtains, and other measures shall be used in order to contain any hydraulic or drilling fluid spills.
- C. Fuel may not be stored in containers greater than 25 gallons within 200 feet of any waterway or wetlands.
- D. Contractor shall adhere to all applicable local, state, and federal environmental regulations.

END OF SECTION

END OF SECTION 02720

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**PART 1 - GENERAL**

**1.01 Scope**

- A. The work to be performed under this Section shall consist of removing and replacing existing pavement, sidewalks and curbs in paved areas where such have been removed for construction of water mains, fire hydrants and all other reclaimed water, sewer and utility appurtenances and structures.
- B. All paved street or other paved areas cut by these operations shall be repaired and repaved in a workmanlike manner as shown or specified. All work shall be in accordance with Florida State Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, unless noted otherwise herein or on the Plans.
- C. Right of Way permits are required from the Bay County Public Works Department.

**1.02 Submittals**

Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphaltic concrete producer and the Contractor.

**1.03 Conditions**

- A. Weather Limitations
  - 1. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.
  - 2. Construct prime and tack coats, and asphaltic courses only when atmospheric temperature in the shade is above 50 degrees F, when the underlying base is dry and when weather is not rainy.
  - 3. Place base course when air temperature is above 35 degrees F and rising.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

## **PART 2 - PRODUCTS**

### **2.01 Materials and Construction**

- A. All material shall conform to the applicable sections of the Florida Department of Transportation (FDOT) Standard Specification for Road and Bridge Construction (latest edition). Types of replacement materials shall be as shown on the Drawings.
  
- B. Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty Contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

## **PART 3 - EXECUTION**

### **3.01 Removing Pavement**

- A. Remove existing pavement as necessary for installing the pipe line and appurtenances.
- B. In areas where pavement will be removed or overlaid, the Contractor shall locate existing valves, and manholes, and shall document the location. The documentation shall include two measurements from the valve or manhole to permanent object such as a tree, fire hydrant, house corner or similar. It is the intent to provide a means to locate the valves and manholes so that they can be located and brought to grade following paving.
- C. Prior to excavation in paved streets or other paved areas, the pavement shall be cut along straight and perpendicular lines. Just prior to repaving, jagged edges shall be squared and cut to a string line so that the patch will present a neat appearance.
- D. Centerline stripes or other pavement markings which existed prior to the start of construction shall be replaced. No separate payment will be made for stripping or marking unless shown otherwise in the proposal.
- E. The paved surface of the replacement shall be finished flush with the existing pavement and shall conform to the existing street contour.
- F. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
- G. Damage to Traffic Signal Loops: Any pavement removal which will include removal of traffic signal loops embedded in the pavement shall be coordinated with the Traffic Engineering Department having jurisdiction over the traffic signal five days prior to pavement removal.
- H. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
- I. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

### 3.02 Replacing Pavement

- A. Pavement shall be replaced as soon as practical after all testing is completed and underground construction is approved. In no case shall an area remain unpaved for more than 14 days after the original surface was removed. Should completion of testing and approval preclude final paving within 30 days, temporary asphaltic concrete patching shall be installed and maintained until pavement can be replaced in accordance with the standard detail drawing.
- B. During backfilling and compaction of the backfill, arrange to have the subgrade material verified and tested. The subgrade shall meet the requirements for Type B stabilization.
- C. Temporary trench backfill along streets and driveways shall include 6-inches of lime rock base, crushed stone or cherty clay as a temporary surfacing of the trenches, or asphalt as directed by the County. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the pavement is replaced. All temporary surfacing not meeting the requirements for the pavement (including base) shall be removed.
- D. Replace driveways, sidewalks and curbs with the same material as exist, to nearest existing undisturbed construction joint and to the same dimensions as those existing.
- E. Where the paved surface is to be replaced, the temporary surface and backfill material shall be removed to the depth and width as required to replace the pavement in accordance with the Standard Detail Drawings. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
- F. Pavement Resurfacing (asphalt overlay)
  - 1. Certain areas to be resurfaced may be specified or noted on the Drawings. Where pavement to be resurfaced has been damaged with potholes, the Contractor shall remove all existing loose pavement material and backfill with compacted Bituminous Plant Mix Base, as specified, to the level of the existing pavement. After all pipe line installations are complete and existing pavement has been removed and replaced along the trench route, apply tack coat and surface course as specified.
  - 2. Resurfacing limits shall be perpendicular to the road centerline. The limits of resurfacing shall be 10 feet beyond the edge of the pavement replacement on the main road being resurfaced, and to the point of tangency of the pavement on the side streets.

- G. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by the County.
- H. Traffic Signal Loops: The replacement or repair of all traffic signal loops removed or damaged during the removal and replacement of pavement shall be coordinated by the Contractor with the Traffic Engineering Department having jurisdiction over each traffic signal. The Contractor shall be responsible for payment of all fees associated with replacement or repair of traffic signal loops.

### **3.03 Sidewalk and Curb Replacement**

#### **A. Construction**

1. All concrete sidewalks and curbs shall be replaced in accordance with the FDOT standard specifications for Road and Bridge Construction, unless modified herein.
  2. Forms for sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.
  3. Forms for curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plain surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.
  4. Securely hold forms in place true to the lines and grades to match existing.
  5. Wood forms may be used on sharp turns and for special sections, as approved by the County. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.
  6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
- B. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances to match existing.
- C. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.

D. The subgrade shall be at a depth equal to the thickness of the concrete, plus two inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material.

E. Joint for Curbs

1. Joints shall be constructed to match existing and as specified. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.
3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2 inches deep.

F. Expansion joints shall be required to replace any removed expansion joints. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.

G. Finishing

1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius to match existing.
3. Finish edges with an approved finishing tool having a 1/4-inch radius.
4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.

H. Driveway and Sidewalk Ramp Openings

1. Provide driveway openings of the widths and at the locations to match existing and as directed by the County.
2. Provide sidewalk ramp openings to match existing, in conformance with the applicable regulations and as directed by the County.

- I. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor, at no additional expense to the County.

### **3.04 Maintenance**

The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the County. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

### **3.05 Supervision and Approval**

- A. Pavement restoration shall meet the requirements of the agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
- B. Obtain the County's approval of restoration of pavement, such as private roads and drives that are not the responsibility of an agency.
- C. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded and warranty periods, promptly restore or repair defects.
- D. If replacement of the asphalt surface is required to repair defect, the entire lane shall be replaced for a distance that extends 10 feet beyond the limits of the defected area.

### **3.06 Cleaning**

The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition. Surplus material and debris shall be disposed of by the Contractor at an off-site location in accordance with the local, State and Federal Agency requirements.

END OF SECTION

SECTION 13000  
INSTRUMENTATION AND CONTROL SYSTEM

## PART 1 - GENERAL

### 1.04 SCOPE OF WORK

- A. This Section covers work related to the furnishing, installation supervision, and testing of the various field elements and panels to be supplied with the (Process Control and Instrumentation System) PICS. This work is to be included in the lump sum price for the PICS as provided through the PICS supplier in accordance with these specifications.
- B. Furnish all instrumentation and controls hereinafter specified to perform the intended function. Work shall include all labor, materials, and equipment, performance of all work necessary to complete the manufacturer, to make factory tests, to prepare and load for shipment, to deliver to the site, to provide programming, calibration, installation supervision, system start-up, services and incidentals required as shown on the Standard Drawings WW-16- 19.
- C. All equipment, materials, programming and services hereinafter termed "the system", shall be by the PICS supplier who, with the contractor, shall coordinate and have responsibility for interconnecting with equipment being installed.
- D. Auxiliary and accessory devices necessary for system operation or performance such as transducers or relays to interface with existing equipment or equipment provided under other sections of this Specification shall be included whether specified or not.
- E. The PICS shall be furnished by the local representative of or a manufacturer certified integrator of the system controller / remote terminal unit who shall provide all of the services, equipment and appurtenances required to achieve a fully integrated and operational system. To facilitate the owner's future operation and maintenance, products shall be of the same major instrumentation manufacturer with panel mounted devices of the same type and model as far as possible.
- F. Substitutions on functions or equipment specified will not be acceptable. In order to ensure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various sub-systems and the establishment of minimums with regard to ranges and accuracy, strict compliance with the above requirements shall be maintained. In order to ensure compatibility between all equipment, it shall be the responsibility of the PICS supplier hereunder to coordinate all interface requirements with existing equipment and with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.

### 1.05 SUBMITTALS

- A. Materials and Shop Drawings:
  - 1. Furnish, as prescribed under the General Requirements, Shop Drawings covering the items included under this section or work.
  - 2. Submit Shop Drawings at one time, as a package, for complete interface checking. Partial submittals will not be accepted. However, a separate

submittal for the field instruments and the control panels will be allowed.

3. Specifically, include the following information:
    - a. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments.
    - b. Individual data sheets for all components of the field instruments and control panels to supplement the above information by citing all specific features for each specific component (e.g., scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.
    - c. Catalog information on all miscellaneous electrical and mechanical devices furnished under this section.
    - d. Shop drawings and catalog material for all control panels and enclosures. Include panel elevation (front, side, interior), construction shop drawings, schedules, and sizing, calculations.
    - e. Panel wiring diagrams of all control panels. Diagrams shall be complete electrical wiring diagrams showing all components and all auxiliary devices such as relays, alarms, fuses, lights, fans, heaters, etc. All wires and terminals shall be numbered on the diagrams, and line cross references shall be labeled. Include wiring interface to I/O of the PLCs. Include on the drawings, a tag number to identify each component, referenced to a component identification list.
    - f. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme. Coordinate the electrical interconnect wiring diagram with Electrical Contractor.
    - g. Installation details for all field mounted devices and panels to show conformance with those shown on the Drawings.
    - h. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.
  4. Submit a list of manufacturer's recommended spare parts and expendables to be supplied with the field instruments and control panels.
- B. Operating and Maintenance Manuals: For each field device and panel mounted control device provided, assemble the fully updated approved submittal information plus all available service manuals for the devices in binders with identifying tabs and data sheets.

1.06 WARRANTY AND GUARANTEES

- A. The PICS supplier shall furnish to the Owner a written one year guarantee commencing with final acceptance, that all equipment and parts thereof, material and/or workmanship for the field elements, instruments, and control panels are of top quality and free from defects.

PART 2 - PRODUCTS

2.05 GENERAL

- A. Products must conform to the latest Bay County Standard Drawings Bill of Material. In the event a bill of material listed item is no longer offered by the manufacturer alternate items will be acceptable but must be noted in submittal documents.

2.06 CONTROL PANELS

- A. PICS Control Panels: Provide the control panels shown on the standard drawings.
5. Corrosion Control: Protect all panels from internal corrosion by the use of corrosion inhibiting vapor capsules, Hoffman, model A-HCI, or equal. Provide sealed panels with combination drain/breathers, Crouse-Hinds model ECD18; or equal.
  6. Temperature Control: Provide panels mounted in outdoor or unheated areas with thermostatically controlled space heaters to maintain internal temperatures above dew point. Provide outdoor panels with integral sun shields.
  7. Construction: All panels shall be manufactured items, Hoffman Engineering, or equal. Minimum metal thickness shall be 14 gauge. Provide stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion. When required, provide removable lifting rings and fill plugs to replace rings after installation.
  8. Electrical:
    - a. Provide a main circuit breaker and branch circuit breaker for each branch circuit as required to distribute power within each panel from the main power feed. Make provisions for bottom feeder conduit entry and provide terminal board for termination of all wiring. Provide access to the breakers when the panel door is open. The following rules apply for actual circuit wiring:
      - 1) No more than 20 devices on any single circuit.
      - 2) Do not group multiple units of parallel operations on the same board circuit.
      - 3) Do not exceed an amp capacity of 12 amps for any branch

circuit.

- 4) Panel (or site) lighting, receptacles, heaters, controls, telemetry, and fans shall be on a separate branch circuit.
- b. The panel manufacturer shall design, furnish and install all interior wiring within the control panels and furnish complete wiring diagrams showing the electrical circuits inside the panel and interconnections between the panel and the external instruments and components. Identify and number all terminals and wires. Attach numbered tags to each panel wire for identification. Inside each panel, provide a copy of the panel wiring diagram. No power shall be applied until the PICS supplier has approved the installation.
- c. Wiring within panels shall meet the following requirements:
- 1) Discrete wiring shall be 300 volt, type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.
  - 2) Power wiring shall be 300 volt type, stranded copper No. 14 AWG size, for 120V service.
  - 3) Analog signal wiring shall be 300 volt, stranded copper in twisted shielded pairs, no smaller than No. 16 AWG.
  - 4) Restrain wiring with plastic ties or ducts. Hinge wiring shall be secured at each end with bend area protected with a plastic sleeve.
- d. All relays shall be the compact, general purpose, plug in type. Contacts shall be rated for not less than 10 amperes at 120V. Provide relays with status lights. Time delay relays shall have integral adjustment knob and rangeability of at least 10:1. All relays shall have permanent, legible identification.
- e. Terminal blocks shall meet the following requirements:
- 1) Provide the greater of 20 percent of all connected terminals or four unused spare terminals for each type supplied.
  - 2) Provide terminal blocks for DC and analog signals separate from AC circuit terminal blocks.
  - 3) Screw type terminal connections shall be locking, fork-tongue or ring-tongue lugs crimped with proper sized anvil. Terminate no more than two plugs per terminal with no more than one wire per lug.
  - 4) Compression clamp terminal connections shall be stripped

and prepared per manufacturer's recommendations.

- 5) Use of aluminum connectors shall not be permitted without prior approval of the Engineer. Connectors shall be either copper or steel.
  - 6) Terminate data highway and other communications cable connections per manufacturer's recommendations, located near the bottom of the panel at the point of entrance to the panel.
- f. Provide power supplies as required to power instruments of circuits requiring DC power. Convert 120V AC to DC power of appropriate voltage, voltage regulation, and ripple control to operate within equipment tolerances. DC power supplies shall be of the linear type and design to eliminate switching RFI. Output over voltage and over current protection devices shall be provided.
  - g. Provide, when shown on the wiring diagrams, the indicated control panels with an internal, hand switch controlled, 10-watt L.E.D. light and a 120V, 1 amp, duplex receptacle.
  - h. Provide all panels with an isolated copper grounding buss to ground all signal and shield connections. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices.
  - i. For 480V panels, provide a 120V dry type control transformer for the panel control and other 120V circuits. Transformers shall be sized to meet higher service rating than actually applied and shall be provided with fused primary and secondary.
  - j. Install surge suppression devices so that they may be easily identified and replaced. A permanent I.D. # or nameplate shall be affixed to each device.

## 2.07 MATERIALS AND EQUIPMENT

- A. The following are the component specifications for specific devices identified on the standard drawings and bill of material and instrumentation listed as a field device.
  1. Alarm, Audible Horn:
    - a. Provide audible horn that generates a loud audible alarm when activated by 115V AC power. The horn shall surface mount remotely as noted, suitable for outdoor use.
    - b. Outdoor units with sealed conduit entry, shall be Ronon Model 350W, or equal.

2. Alarm, Visual Beacon:
  - a. Warning lights shall be flashing type units that produce 360 degree beams of colored light. Flashing light shall be 60 to 80 flashes per minute. Unit shall be a solid state strobe source. Light color shall be red and unit shall have simple technique for re-lamping. Units shall be suitable for remote mounting, as note, and shall operate on 120V AC power, unless otherwise notes or shown. Housing shall be weatherproof, suitable for use in outdoor environments without other protection. General purpose units shall be Benjamin Electric Manufacturing, Series KL-4000; or equal.
  
- B. The following are the general components descriptions for the miscellaneous components of the PICS that are required to implement the various control functions of the field elements and control panels that are not specifically identified on the drawings:
  1. System Controller / Remote Terminal Unit
    - a. The System Controller shall be DIN Rail mountable as shown on the standard drawings.
    - b. A 7" Touch Screen Operator Interface Unit shall be provided and mounted in the swing out door of the control panel.
    - c. Cellular IOT communications devices shall be provided. Sites shall be tested to assure connectivity to the cellular network.
    - d. Make/Model:
      1. Hydralink Control Unit.
      2. No equal.
    - e. Service. The PICS system supplier shall offer full factory support of the installed system through the use of factory-trained employees. The Owner shall have 24 hour per day access to service personnel through a pager and/or cell phone.
  
  2. Submersible Level Transmitter
    - a. The submersible level transmitter shall provide reliable, continuous level monitoring of liquids in the pump station. Basis of design is Blue Ribbon Model Birdcage.
    - b. The transmitter shall provide high-accuracy level measurements for hazardous locations. Housing shall be 316L stainless steel construction and hydrophobic breather vent.
    - c. The transducer shall be compatible with the Hydralink controllers,

from a basic system for high/low alarm or simple pump control.

3. Level Float Switch, Suspended:
  - a. Units shall be direct acting float type level switches consisting of a mercury switch enclosed in a float connected to a two conductor, combination support and signal cable. The entire assembly shall be watertight and impact resistant. Floats shall be formed of a chemical resistant plastic material. Cable shall be rugged and flexible with heavy neoprene or PVC jacket. The actuation/deactuation differential shall not exceed 1 inch. The switch shall be rated at 5 amperes at 120 volts. Provide each float with 40 feet of cable.
  - b. Units shall be supplied with integral weight assemblies for stabilization and positive operation of suspended units. Units shall be Consolidated Electric Co., Model LS; Anchor Scientific, Inc., Model Roto-Float Type S; or approved equal
4. Force Main Pressure Transmitter (if required)
  - a. The pressure transmitter shall provide reliable, continuous pressure monitoring of liquids in the station force main. Basis of design is Blue Ribbon Model 311.
  - b. The unit shall be stainless steel housed with ¼" MPT integral in the design.
  - c. Pressure shall be 0-100 PSI with 4-20mA output.
  - d. Integral cable shall be outdoor rated 15' in length.
  - e. The unit shall be couple with a Stainless-Steel isolation diaphragm pre-mounted by the manufacturer with ½" MPT connection to the process fluid.
5. Magnetic Flow Meter (if required)
  - a. See construction notes as detailed on the Standard Drawings.
6. Combustible Gas Detector (if required)
  - a. Continuous gas monitoring with relay output for system alarm.
  - b. Per latest Bay County Standards specification.

## 2.08 SPARE PARTS

- A. Obtain from the manufacturer(s) and provide the recommended critical spare parts as part of the work. The spare parts are the property of the Owner.
- B. All system spare parts and expendables, as required for a period of one year, shall be

included.

END OF SECTION

## **PART 1- GENERAL**

### **1.01 Scope**

The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.

The requirements of Section 1 and Section 2 apply to all work hereunder and are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

### **1.02 Definitions**

Provide: Furnish, install, and connect.

Product Data: Catalog cuts and descriptive literature.

Shop Drawings: Factory prepared specific to the installation.

Low Voltage: 0 — 600 volts.

Indicated: Shown on the Drawings.

Noted: Indicated or specified elsewhere.

### **1.03 Local Conditions**

- A. Power will be supplied by the utility company overhead distribution system for the equipment. Verify and comply with all power company requirements for metering. Make necessary arrangements with the power company for temporary service requirements.
- B. Verify and comply with all requirements of the local telephone company concerning the complete telephone system to the control panel dialer.

### **1.04 Quality Assurance**

- A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.
  
- B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies.
  
- C. Industry Standards: Standards organizations and their abbreviations, as used herein, are as follows. Applicable date for industry standards is that in effect on the date of advertisement of the Project.
  - 1. American National Standards Institute (ANSI)
  - 2. American Society for Testing and Materials (ASTM)
  - 3. Federal Specifications (FS)
  - 4. Institute of Electrical and Electronics (IEEE)
  - 5. Insulated Cable Engineers Association (ICEA)
  - 6. National Electrical Manufacturers Association (NEMA)
  - 7. National Fire Protection Association (NFPA)
  - 8. Underwriters Laboratories, Inc. (UL)

### **1.05 Submittals**

- A. Make all submittals in accordance with the General Requirements. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittals will be returned with stamped approval.
  
- B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned, and stamped approval is not required prior to installation.
  
- C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

### **1.06 Record Drawings**

- A. Furnish record drawings in accordance with the General Requirements. Record drawings consist of submittal data as listed above, operation and maintenance data, AutoCad drawings, and As-Built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.

- B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) located in a hinged metal cabinet in the main electrical room and shall include:
1. Title page with project name; installing contractor's name, address and telephone number; date of installation and warranty period.
  2. Index sheet.
  3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.
- C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.
- D. Submit the results of any tests required in the individual equipment sections.

#### **1.07 Delivery, Storage and Handling**

- A. Ship products to the job site in their original packaging. Receive and store products in suitable manner to prevent damage or deterioration. Keep equipment upright at all times.
- B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

## **PART 2 - PRODUCTS**

### **2.01 Materials**

Provide only new products of the manufacturer's latest design.

### **2.02 Substitutions**

Where the words "equal to" follow or precede the listed acceptable manufacturers, equal products of other manufacturers are acceptable and request for substitution may be made during submittal stage.

## **PART 3 - PRODUCTS**

### **3.01 Installation**

- A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.
- B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the County's consideration.
- C. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

### **3.02 Certification and Tests**

- A. Prior to request for final review, test all systems and repair or replace all defective work. Submit with request for final review, written certification that all electrical systems are complete and operational.
- B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.
- C. After final review and acceptance, turn over to the County all keys for electrical equipment locks. Present to the County or the County's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION

**SECTION 16050**  
**BASIC ELECTRICAL MATERIAL AND METHODS**

**PART 1 - GENERAL**

**1.01 Scope**

This Section includes basic materials and methods to all Sections of Division 16.

**1.02 Submittals**

Submit product data.

16050-1

**SECTION 16050**  
**BASIC ELECTRICAL MATERIAL AND METHODS**

**PART 2 - PRODUCTS**

**2.01 Fuses**

- A. Provide circuit breakers in lieu of fuses except for specific code or equipment requirements as pre-approved by the Owner
- B. Fuses: Current limiting, non-renewable type, rated 200,000 AIC, with rejection feature; Class J for ratings 600 amp below and Class L for ratings 601 amp and above.
- C. Acceptable Manufacturers: Bussmann, Chase-Shawmut, or Littelfuse.

**2.02 Supporting Devices**

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.

**2.03 Electrical Identification**

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Wire and Cable Markers: Plastic, split sleeve or tubing type.

16050-2

**SECTION 16050**  
**BASIC ELECTRICAL MATERIAL AND METHODS**

**PART 3 - EXECUTION**

**3.01 Fuses**

- A. Circuit breakers are required in lieu of fuses, therefore this paragraph applies only to pre-approved fusible or existing fusible devices.
- B. Equip all fusible devices with fuses. Replace all blown fuses up to final acceptance of the Project. At the completion of the Project, turn over to the Owner spare fuses for each type and size installed; six each for ratings 60 amps and below, and three each for ratings above 60 amps.

**3.02 Supporting Devices**

- A. Fasten hangar rods, support stands, conduit clamps, etc. to building structure using expansion anchors or beam clamps.
- B. Do not fasten supports to piping, ductwork, mechanical equipment or conduit. Do not use powder actuated fastening devices. Do not drill structural steel members.

**3.03 Electrical Identification**

Provide nameplates for all switchboards, panel boards, transformers, disconnect switches, individual motor starters and other items of electrical distribution equipment. Engrave with the equipment identification as indicated; and the voltage, current and interrupting rating. Attach nameplates with screws, rivets or two-part epoxy glue for NEMA 4X enclosure; adhesives are not acceptable.

END OF SECTION

END OF SECTION

16050-3

**PART 1- GENERAL**

**1.01 Scope**

- A. PVC coated rigid metal conduit and fittings.
- B. Liquid tight flexible metal conduit and fittings.
- C. Non-metallic conduit and fittings.

**1.02 Submittals**

Do not submit equipment specified in this Section.

**PART 2 - PRODUCTS**

**2.01 Acceptable Manufacturers**

- A. Conduit: Allied, Republic, Triangle or Wheatland.
- B. PVC Coated Conduit and Fittings: Permacote, Robroy or Occidental.
- C. PVC Conduit: Amoco, Carton or CertainTeed.
- D. Flexible Conduit: Anaconda, Thomas & Betts, Electric Flex or Triangle.
- E. Fittings: Appleton, Crouse-Hinds, Oz or Thomas & Betts.
- F. Substitutions: Products equal to those listed.

**2.02 PVC Coated Rigid Metal Conduit and Fittings**

- A. Rigid Steel Conduit: UL 6; ANSI C80.1; hot dip galvanized; minimum size 3/4-inch.
- B. PVC Coated Conduit: NEMA RN-1; galvanized rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating,

treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.

- C. Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit. Where PVC coated conduits are indicated all couplings, fittings, conduit bodies, pipe straps, U bolts, beam clamps, flex connections and other accessories shall have factory applied PVC coating. Use PVC coated hubs for connection of coated conduits — locknuts are not acceptable.

### **2.03 Liquid tight Flexible Conduit and Fittings**

- A. Conduit: UL listed liquid tight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch. Exception: Where connected to devices with manufacturer supplied 1/2 or 3/8- inch hubs, match conduit size to hub size.

- B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring. Where PVC coated conduits are indicated, provide PVC coated fittings for

flex connections.

### **2.04 Rigid Nonmetallic Conduit and Fittings**

- A. Conduit: NEMA TC-2; Schedule 40 PVC.

- B. Fittings and Conduit Bodies: NEMA TC-3.

## SECTION 16111 CONDUIT

### **PART 3 - EXECUTION**

#### **3.01 Conduit Schedule**

- A. Except as noted, use only PVC coated rigid steel conduits.
- B. Use liquid tight flexible steel conduit for connections to vibrating equipment.
- C. Encase PVC or rigid conduits in duct bank where indicated on the Drawings, or use PVC coated conduit not encased in concrete.
- D. Rigid nonmetallic conduit may be used for underground, concrete encased duct banks and in or below slab on grade. Exception: Use rigid steel or IMC conduit for analog signal circuits; 4 to 20 mA and AC or DC signals less than 25 volts.
- E. Where PVC conduit is indicated, make a transition to rigid steel below grade or slab and continue above with rigid steel conduit.

#### **3.02 Conduit Arrangement and Support**

Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one-hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

#### **3.03 Conduit Installation**

- A. Cut conduit square using a saw or pipe cutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.
- B. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LD" or similar fittings to permit a straight pull from either direction.
- C. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.
- D. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- E. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

- F. Provide a 100 pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.
- G. Provide watertight seals for thruwall or floor seals for poured concrete, equal to OZ type WSK or FSK. Seal duct bank and underground conduit entry with General Electric or Dow silicone sealant.
- H. Provide silicone sealant equal to Dow or General Electric for conduit entry in outlet boxes and equipment enclosures (all conduit ends except pull boxes and fittings) for the wetwell.
- I. Protect conduit threads from rust and damage during construction. Paint exposed threads.
- J. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
- K. PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch.

### **3.04 Underground Duct Bank Installation**

- A. Install top of duct bank minimum 18 inches below finished grade with plastic warning tape 12 inches below finished grade.
- B. Install conduit with minimum grade of 4 inches per 100 feet.
- C. Stagger conduit joints in concrete encasement 6 inches minimum.
- D. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than four feet on centers to provide conduit spacing as indicated. Securely anchor conduit to prevent movement during concrete placement.
- E. Construct duct bank with 3,000 psi concrete.

END OF SECTION

## **PART 1 - GENERAL**

### **1.01 Scope**

- A. Building wire.
- B. Cable.
- C. Wiring connections and terminations.

### **1.02 Submittals**

Submit product data.

## **PART 2 - PRODUCTS**

### **2.01 Acceptable Manufacturers**

- A. Low Voltage Conductors: Equal to Aetna, American, Cablec, Continental, Okonite, Pirelli, Southwire or Triangle.
- B. Signal Circuit Conductors: Equal to Belden, Continental, Dekoron or Penn.
- C. Low Voltage Connectors: Equal to Burndy, Thomas & Betts, Ideal or OZ.
- D. Pulling Compounds: Equal to Ideal Yellow 77, Electro Y-ER-EAS, Minerallac 100 or Burndy Slikon.
- E. Wire and Cable Markers: Plastic, split sleeve or tubing type, equal to Brady Type XC or T & B Type SM.

### **2.02 Building Wire**

- A. Thermoplastic Insulated Building Wire: NEMA WC-5
- B. Feeder and Branch Circuits: Single conductor; 98 percent conductivity copper; 75/90 degrees C; 600 volt PVC insulated with nylon jacket; type THWWTHHN. Minimum size #12 AWG.
- C. Control Circuits: Same as specified above for feeder and branch circuits, except minimum size #14 AWG.

**2.03 Remote Control and Signal Cable**

Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 600 volt polyethylene insulation; twisted pair or three conductor construction; 100 percent coverage aluminum polyester shield; #18 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

**PART 3 EXECUTION**

**3.01 General Wiring Methods**

- A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.
- B. Use 10 AWG conductor for 20 amperes, 120 volt branch circuit home runs longer than 75 feet, and for 20 amperes, 277 volt branch circuit home runs longer than 200 feet.
- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use wire markers at all terminals and connections. Color code power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

- E. For conductors #8 AWG and larger color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.
- F. Neatly train and lace wiring inside boxes, equipment and panel boards. Support to prevent conductor movement under fault conditions.

**3.02 Wiring Installations in Raceways**

- A. Unless otherwise indicated, install all conductors in conduit.
- B. Pull all conductors into a raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricant for all pulls. Do not exceed the manufacturer's pulling tension.
- C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

### **3.03 Wiring Connections and Terminations**

- A. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.
- B. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.
- C. Use mechanical connectors for low voltage splices, taps, fixture and motor connections. Exception: Square thread helical spring plastic cap (wire nut) type connectors are acceptable for solid conductor splices and taps.
- D. Use insulated throat, spade type crimp on connectors for strap screw device terminals. Exception: Receptacle back wiring provisions may be used for terminating solid conductors.
- E. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

### **3.04 Field Quality Control**

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Continuity Tests: ring all conductors for continuity and replace any open conductors.
- D. Low Voltage Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 2 megohms to ground.

END OF SECTION

## **PART 1 - GENERAL**

### **1.01 Scope**

- A. Outlet boxes.
- B. Pull and junction boxes.

### **1.02 Submittals**

Do not submit equipment specified in this Section.

## **PART 2 - PRODUCTS**

### **2.01 Acceptable Manufacturers**

Boxes shall be equal to Appleton, Crouse Hinds, Raco, or Steel City.

### **2.02 Outlet Boxes**

Cast Boxes: Cast ferrous alloy with galvanized or cadmium finish, deep type, gasketed cover, threaded hubs.

### **2.03 Pull and Junction Boxes**

- A. Cast Metal Boxes: NEMA 4X. Provide flat-flanged type for surface mounting and outside flange recessed corner type for underground use. Boxes for sidewalk or other traffic areas to have appropriate duty cover with non-skid finish.
- B. Corrosion Resistant Boxes: UL 508 Type 4X non-metallic fiberglass reinforced polyester, gasketed screw cover. For boxes larger than 12-inches in any dimension provide hinge on one side and trunk latches on the other three sides. Equal to Crouse Hinds Krydon Type NJB or Type 304 stainless steel equal to Hoffman Bulletin A-51.

## **PART 3 - EXECUTION**

### **3.01 Coordination of Box Locations**

- A. Provide boxes as shown on Drawings, and as required for splices, taps, wire pulling, and equipment connections.
- B. Box locations shown on the Drawings are approximate unless dimensioned. Verify box locations prior to rough-in. Coordinate mounting heights and locations of outlet mounted above counters, benches, backsplashes, and other furnishings. Locate outlet boxes to permit handicap access per ANSI A117.1. Any outlet may be relocated by up to 10 feet before it is permanently installed without incurring additional cost.

### **3.02 Installation**

- A. Support boxes independently of conduit.

- B. Use multiple-gang boxes where more than one device is mounted together; so not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- C. Unless otherwise noted, use only cast outlet boxes.
- D. Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum bending radius for the conductors.
- E. Use PVC coated boxes wherever PVC coated conduit is indicated.
- F. Label cover of junction boxes with circuit numbers of conductors in the box.

END OF SECTION

## **PART 1 – GENERAL**

### **1.01 Scope**

The work specified in this Section consists of providing, maintaining and removing temporary and permanent erosion and sedimentation controls.

- A. Land disturbance activity requiring a County Development Order will not commence until the order is approved.
- B. Basic Principles
  - 1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition
  - 2. Minimize the disturbed area and duration of exposure to erosion elements.
  - 3. Stabilize disturbed areas immediately.
  - 4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.
  - 5. Retain sediment on site that was generated on site.
  - 6. Minimize encroachment upon watercourses.
- C. Temporary Erosion and Sedimentation Control; In general, temporary erosion and sedimentation control procedures shall be directed toward:
  - 1. Preventing soil erosion at the source.
  - 2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.
  - 3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.
- D. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

### **1.02 Description of Work (For projects that disturb one acre or less)**

- A. The work of this section consists of the necessary erosion control and environmental protection measures required to control erosion and provide environmental protection on the project and areas outside the limits of the project, so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project, damage to work on the project, and to satisfy the specific or general conditions of applicable permits and regulations. The need for temporary erosion control and environmental protection shall be considered as an anticipated condition of construction for compliance with

state and federal laws and it is the Contractor's responsibility for providing the necessary solutions as part of these contract documents.

- B. Erosion control work includes, but is not limited to, the following:
  - 1. Temporary erosion control
  - 2. Permanent erosion control
  
- C. Environmental protection work includes, but is not limited to, the following:
  - 1. Staked hay bales
  - 2. Sediment control fence
  - 3. Sedimentation basins
  - 4. Turbidity barriers
  - 5. Temporary gravel construction entrance

### **1.03 Description of work (For projects that disturb more than one acre)**

- A. Construction activities associated with this project will disturb more than one acre of land. The Contractor shall obtain coverage under a NPDES Stormwater Permit and implement appropriate pollution prevention techniques to minimize erosion and sedimentation and properly manage stormwater. The Florida Department of Environmental Protection adopted under Rule 62621.300(4), *F.AC.*, the General Permit for Stormwater Discharge from Large and Small Construction Activities (CGP). The CGP requires:
  - 1. A CGP Notice of Intent (NOI) [DEP Form 62-621.300(4)(b)] must be submitted to DEP. There is an application fee for the NOI.
  - 2. A Notice of Termination (NOT) [DEP Form 62-621.300(6)] must be submitted to DEP to discontinue permit coverage. A NOT may be submitted only when the site meets the eligibility requirements for termination specified in the CGP.
  
- B. The Stormwater Pollution Prevention Plan (SWPPP) must be developed and implemented to be in compliance with the permit. The Plan must include the following:
  - 1. A site evaluation of how and where pollutants may be mobilized by stormwater.
  - 2. A site plan for managing stormwater runoff.
  - 3. Identification of appropriate erosion and sediment controls and Stormwater Best Management Practices (BMPs) to reduce erosion, sedimentation, and stormwater pollution.
  - 4. A maintenance and inspection schedule.
  - 5. A record keeping process.
  - 6. Identification of stormwater exit areas.

C. A copy of the SWPPP must be available at the immediate site of the construction activity. Best Management Practices (BMPs) must be identified to fit the specific project. Both structural and non-structural controls will be applicable. Some of the commonly used controls are:

1. Structural Controls:

- Retention Ponds: Permanent structures designed to allow time for sediments to settle and water to infiltrate the ground.
- Temporary Sediment Basins: Structures designed to detain sediment-laden runoff from disturbed areas long enough for sediments to settle out and control the release of stormwater.
- Entrance/Exit Controls: Temporary controls, such as gravel, used to stabilize the entrances/exits to the site to reduce the amount of soils transported onto paved roads by vehicles (known as "track-out").
- Silt Fencing: A temporary erosion and sediment control used to prevent dirt from entering waterways before bare soil is stabilized with vegetation.
- Berms: A temporary erosion and sediment control that physically prevents polluted runoff from entering nearby storm drain inlets and waters.

2. Non-Structural Controls:

- Stabilization: Techniques such as sodding, seeding/ mulching, and stone cover, which reduce the erosion of exposed soils and steep grades.
- Phased Construction: Scheduling construction to occur during the dry season or to minimize the amount of land cleared at any one time.
- Good Housekeeping: Techniques such as oil and fuel containment, spill prevention and clean-up, and street sweeping of "tracked-out" soils, which help prevent the contamination of stormwater runoff.

D. Detailed information and guidance for SWPPP development and for compliance inspections is available at the following web sites:

<http://www.dep.state.fl.us/water/stormwater/npdes/construction3.htm>

<http://www.flondadep.org/water/nonpoint/erosion.htm>

## 1.04 Quality Assurance

A. Codes and Standards: Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.

1. Comply with the provisions of the following codes and standards (latest edition), except as shown or specified:

- a. "Standard Specifications for Road and Bridge Construction," Florida Department of Transportation, latest edition. Herein specified or shown on the plans as "Section XXX, FDOT Standard Specifications."
- b. "Roadway and Traffic Design Standards", Florida Department of Transportation, latest edition. Herein specified as "FDOT Standard Index No. XXX."
- c. "American Society for Testing and Materials (ASTM) Publications" as follows:
  - D123 Standard Terminology Relating to Textiles
  - D1683 Standard Test Method for Failure in Sewn Seams of Woven Apparel Fabrics
  - D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  - D3786 Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
  - D3787 Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test
  - D4439 Standard Terminology for Geosynthetics
  - D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
  - D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
  - D5141 Standard Test Method for Determining Filtering Efficiency and Flow Rate of the Filtration Component of a Sediment Retention Device

B. Certification: The Contractor shall be responsible for providing the required material certifications prior to construction. Failure to provide certification may result in rejection of the material and replacement at no cost to the County.

### **1.05 Submittals**

Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements. When test requirements are specified, the Contractor shall supply results performed by a certified testing laboratory.

## **PART 2 — MATERIALS**

### **2.01 Temporary Erosion Control (Vegetation and Coverings)**

- A. General: Temporary erosion control features shall consist of, but not be limited to, temporary grassing, temporary sodding, temporary mulching, sandbagging, artificial coverings, berms, and baled hay or straw.
- B. Temporary Grassing: Grassing shall be as specified in Section 01300 except as modified herein. Perennial grass seed may be omitted if permanent erosion control will be placed prior to death of annual grass.
- C. Temporary Sod: Sod shall be as specified in Section 01200.
- D. Temporary Mulch: Mulch shall be as specified in Section 01300.
- E. Sandbagging: Sandbagging shall consist of furnishing and placing sandbags in configurations, so as to control erosion and siltation.
- F. Artificial Coverings: This work shall consist of furnishing and applying fiber mats, netting, plastic sheeting, or other approved covering to the earth surfaces.
- G. Baled Hay or Straw: This work shall consist of construction of baled hay or straw dams to protect against downstream accumulations of silt. The baled hay or straw dams shall be constructed in accordance with the details shown in the construction drawings.

### **2.02 Temporary Erosion Control (Silt Fences and Turbidity Barriers)**

- A. General: Temporary erosion control features shall consist of, but not be limited to, silt fences, floating turbidity barriers, and staked turbidity barriers. The work shall consist of furnishing, installing, maintaining, and removing temporary fences and barriers in accordance with the manufacturer's recommendations, these specifications, and the standard details. Turbidity barriers in waters of the state may be either floating or staked types or any combinations of types that will suit site conditions and meet erosion control and water quality requirements. The barrier type(s) will be at the Contractor's option unless otherwise specified in the plans.
- B. Silt Fence: Silt fence or sediment control fence shall consist of a geotextile fabric attached to posts. The geotextile fabric shall be a woven or non-woven

fabric as specified herein. The silt fence shall be constructed in accordance with the standard details.

- C. **Staked Turbidity Barrier:** In addition to the requirements for a temporary silt fence contained herein, the fabric used for staked turbidity barrier shall have a double stitched hem at the top of the fabric into which has been sewn a braided nylon cord with a minimum diameter of 1/8 inch running the full length of that section of fabric. Supports for staked turbidity barriers shall be a minimum length of three feet seasoned two-inch by four-inch wood, 2.5 inch minimum diameter wood, or steel at least 1.33 pounds per linear foot.
- D. **Floating Turbidity Barrier:** Floating turbidity barrier shall be in accordance with the details shown. The type barrier used will be such as to minimize dispersion of turbid waters from the construction site. Alternate materials may be approved provided that compliance with applicable permit conditions and State water quality standards are maintained.

**2.03 Geotextiles**

- A. **Filter Fabric:** The geotextile fabric shall be a woven or non-woven fabric consisting of long-chain polymeric filaments or yarns such as polypropylene, polyethylene, polyester, polyamides, or polyvinyl chloride formed into a stable network such that the filaments or yarns retain their relative position to each other. The base plastic shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration from ultraviolet light, heat exposure, and commonly encountered chemicals. The edges of the fabric shall be salvaged or otherwise finished to prevent the outer yarn from pulling away from the fabric.
- B. The fabric shall conform to the following physical requirements:

<u>PROPERTIES</u>	<u>TEST METHOD</u>	<u>ACCEPTABLE VALUES</u>
Seam Strength	ASTM D1683	120 lbs. (min)
Mullen Burst	ASTM D3786	200 psi strength (min)
Puncture Strength	ASTM D3787	60 lbs. (min)
Trapezoidal Tear	ASTM D4533	50 lbs. strength (min)
Grab Tensile	ASTM D4632	120 lbs. strength (min)
Elongation (max)	ASTM D4632	25%
Filtration	ASTM D5141	75% efficiency (min)
Slurry Flow Rate	ASTM D5141	0.3 gpm/ sf (min)

- C. **Seams:** The seams of the fabric shall be sewn with thread of a material meeting the chemical requirements for the fabric. The minimum seam strength shall comply with the property requirements contained herein.

D. Shipment and Storage: During shipment and periods of storage, the geotextile shall be protected from direct sunlight, ultraviolet rays, and temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, and debris. Stockpiled materials shall be kept covered at all times.

#### **2.04 Construction Exit Stone**

Use sound, tough, durable stone resistant to the action of air and water. Slabby or shally pieces will not be acceptable. Aggregate size shall conform to FDOT No. 1 Coarse Aggregate (1.5 to 3.5-inch stone).

#### **2.05 Rip Rap**

Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shally pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Rip Rap shall have less than 66 percent wear when tested in accordance with AASHTO T-96. Unless shown or specified otherwise, stone rip rap shall meet the requirements of the National Stone Association (NSA) Classification No. R-6. At least 35 percent of the mass shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip Rap shall be contained within wire baskets to minimize washout.

## **PART 3 - EXECUTION**

### **3.01 Execution**

#### **A. General**

1. The installation of temporary erosion control features shall be coordinated with the construction of the permanent erosion control features to the extent necessary to assure effective and continuous control of erosion and water pollution throughout the life of the contract.
2. The Contractor shall take sufficient precautions to prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments, with fuels, oils, bitumens, calcium chloride, or other harmful materials. Also, the operations shall be conducted and scheduled so as to avoid pollution or siltation of such streams, etc.
3. Except as necessary for construction, excavated material shall not be deposited in rivers, streams, canals, or impoundments, or in a position close enough thereto to be washed away by high water or runoff.
4. Where de-watering methods are used, the water shall be treated by one or more of the following methods prior to discharge off-site or into environmentally sensitive areas: pumping into grassed swales or appropriate vegetated areas, sediment basins, or confined by an appropriate enclosure such as siltation curtains when other methods are not considered appropriate. The contractor shall be responsible for obtaining and complying with permits required for de-watering.
5. The Contractor shall not disturb lands or waters outside the limits of construction, except as may be found necessary and authorized by the County.
6. The locations of and methods of operation in all detention areas, excavation areas, stockpile areas, and disposal areas shall be such that erosion during and after completion of the work will not likely result in detrimental conditions, siltation, or water pollution.

#### **B. Limitation of Exposure or Erodible Earth**

1. The Contractor shall limit the surface areas of unprotected erodible earth exposed by clearing and grubbing, excavation, or filling operations and shall provide immediate permanent or temporary erosion or pollution control measures to prevent contamination of any river, stream, lake, tidal water, reservoir, canal, or other impoundment or to prevent detrimental effects on property outside the project and damage to the project. The limitation of area in which excavation and filling operations may be underway shall be commensurate with the contractor's capability and progress in keeping the finish grading, grassing, sodding, and other such

permanent erosion control measures current in accordance with the accepted schedule.

2. Under no conditions shall the surface area or erodible earth exposed by clearing and grubbing operations or by excavation and filling operations exceed one-half acre without specific prior approval by the County. This limitation applies separately to clearing and grubbing operations and excavation and filling operations.
3. The County may increase or decrease the amount of surface area allowed to be exposed at any one time, on the basis of his analysis of conditions on the project.
4. Permanent erosion control features shall be incorporated into the project at the earliest practical time. Temporary erosion control features will be used to control erosion prior to the time it is practical to construct permanent control features or to provide immediate temporary control of erosion that develops during normal construction operations, but is not associated with permanent erosion control features on the project. In no case shall exposure of erodible earth be for more than five days without erosion control features being implemented.
5. Temporary erosion control features may be authorized for use in controlling erosion in areas where staged construction or other conditions not under the control of the Contractor preclude completion of a section of work in a continuous manner and in areas where construction operations which must be performed subsequently will cause damage to permanent erosion control features constructed.
6. When the item of Topsoil or Muck Blanket is included in the contract, the rate of construction of these items may be limited by the availability of topsoil or muck from the normal grading operations. The existence of this condition will be considered as precluding completion of a section or roadway in a continuous manner, and use of temporary erosion control features will be used in areas so affected.
7. The Contractor shall schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposed, uncompleted construction to the elements shall be as short as practicable.
8. Clearing and grubbing shall be so scheduled and performed that grading or utility construction operations can follow immediately thereafter, and grading operations shall be so scheduled and performed that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

### **3.02 Temporary Erosion Control (Vegetation and Coverings)**

Temporary vegetative erosion control features shall be installed in accordance with Section 01300. Temporary coverings shall be installed in accordance with the manufacturer's recommendations.

### **3.03 Temporary Erosion Control (Silt Fences and Turbidity Barriers)**

A. Temporary Silt Fence: Temporary silt fence shall be erected at locations as shown on the plans, as dictated by the SWPPP, as approved by the County, or as required to prevent erosion. The filter fabric shall be reinforced with wire fence, when required. If required, the wire reinforcement shall be installed so that the filter fabric is on the upstream side of the fence, and both the wire fence and the filter fabric are on the upstream side of the posts. Posts shall be uniformly installed with approximately 20 degrees inclination toward the potential silt load (upstream) area. The silt fence shall be maintained in an effective condition at all times while in use.

B. Filter fabric shall be secured to the post or fence by suitable staples, tie wire, or hog rings in such a manner as to prevent tearing of the fabric. The bottom of the filter fabric shall be entrenched into the ground a minimum of eight inches to prevent water from flowing under the fence. Filter fabric shall be spliced together only at support posts with a minimum of six-inch overlap and securely sealed.

C. Staked Turbidity Barrier: Staked turbidity barrier shall be securely fastened to wood or steel supports which are spaced at maximum intervals of six feet and driven a minimum of 12 inches into the ground. A minimum of three supports shall be used. The bottom of the fabric shall be entrenched into the existing ground a minimum of eight inches. The staked turbidity barrier shall be a minimum of 15 inches in height and shall not exceed 18 inches in height.

D. The support line sewn in the top hem of the filter fabric shall be used at each post location to secure the fabric to the post at an appropriate height.

E. Staked turbidity barriers shall be installed across ditch lines and at temporary locations as shown on the plans or approved by the County where continuous construction activities change the natural contour and drainage runoff.

F. Posts in staked turbidity barriers shall be installed in the vertical position unless otherwise directed by the County.

G. Floating Turbidity Barrier: This work shall consist of the installation and removal of floating turbidity barriers to contain silt and other deleterious materials that may occur as the result of dredging, filling, or other construction activities in waters of the State. The type of barrier used will be installed in accordance with the details contained in the plans, or, when details are not shown, in accordance with the SWPPP, or as approved by the County. Alternate methods may be approved provided that compliance with applicable permit conditions and State water quality standards are maintained.

H. All temporary erosion control features and devices shall be removed and disposed by the Contractor when permanent erosion control features and devices (e.g., grassing, sodding, etc.) have reached the point of final acceptance.

I. Refer to the standard drawing of this manual for additional details.

### **3.04 Rip Rap**

A. Unless shown otherwise on the Drawings and/or approved Erosion Control Plan, rip rap shall be placed where ordered by the County. Carefully compact backfill and place rip rap in wire baskets to prevent subsequent settlement and erosion.

B. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers.

C. Placement of Filter Fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be on or within 3 inches of the centerline of the overlap. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during construction. The fabric shall be protected at all times during constructions from clogging due to clay, silts, chemicals or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the County

D. Placement of Rip Rap: The rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Rip rap shall be placed with its top elevation conforming to the natural slope of the stream bank and stream bottom. Stone rip rap shall be dumped into place to form a uniform surface and to the thickness specified on the Drawings. The thickness tolerance for the course shall be -6 inches and

+12 inches. If the Drawings or Bid do not specify a thickness, the rip rap stone shall be placed to a thickness of not less than 12 inches.

### **3.05 Inspection and Maintenance**

A. General: The Contractor shall, at his expense, provide routine maintenance of permanent and temporary erosion control features until the project is completed and accepted. The Contractor shall inspect all erosion and sediment control facilities within 24 hours of a 1/4 inch rain or greater or a minimum of once weekly. Any deficiencies shall be immediately corrected by the Contractor.

B. Silt Fences and Turbidity Barriers: The Contractor shall make a daily review of the location of silt fences and turbidity barriers to ensure that the silt fence or turbidity barriers are properly located for effectiveness and contain no breaches. Where deficiencies exist, additional silt fences or turbidity barriers shall be installed as directed.

C. Sediment deposits shall be removed when the deposit reaches approximately one-half of the volume capacity of the temporary silt fence or turbidity barrier as directed. Any sediment deposits remaining in place after the temporary silt fence or turbidity barrier is no longer required shall be dressed to conform to the finished grade, prepared and finished.

D. Inspections shall be made by qualified inspectors using Chapter 8 of the Florida Stormwater, Erosion and Sedimentation Control Inspection Manual.

Referenced manual can be downloaded from:  
<http://www.floridadep.org/water/nonpoint/erosion.htm>. All inspections shall be formally documented using the forms contained in the Appendix to this section of the specifications.

END OF SECTION

Section 01100  
Erosion Control and Environmental Protection