

STANDARD
DESIGN AND CONSTRUCTION
SPECIFICATIONS



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2019 EDITION

TABLE OF CONTENTS

- 1. GENERAL ITEMS**
 - 1.1. Definitions
 - 1.2. Scope
- 2. DESIGN GUIDELINES**
 - 2.1. General Requirements
 - 2.2. Deliverables
 - 2.3. Easements & Separation Requirements
 - 2.4. As Built Drawings
 - 2.5. Engineer Certification Guidelines
 - 2.6. Inspection Requirements
- 2. EXCAVATION AND BACKFILLING**
 - 3.1. Scope
 - 3.2. General Requirements
 - 3.2.1. Sunshine State One Call of Florida
 - 3.3. Materials
 - 3.3.1. Backfill
 - 3.4. Execution
 - 3.4.1. Handling Water
 - 3.4.2. Excavating Trenches
 - 3.4.3. Joint Trenches
 - 3.4.4. Excavating Below Normal Grade
 - 3.4.5. Backfilling
 - 3.4.6. Compaction and Testing
 - 3.4.7. Backfill Maintenance
- 4. DEWATERING**
 - 4.1. Scope
 - 4.2. General Requirements
 - 4.3. Execution
- 5. POTABLE WATER – PIPELINES**
 - 5.1. Scope
 - 5.2. General Requirements
 - 5.3. Materials
 - 5.3.1. Poly-Vinyl Chloride (PVC)
 - 5.3.2. High Density Poly-Ethylene (HDPE)
 - 5.3.3. Ductile Iron
 - 5.3.4. Fittings
 - 5.3.5. Standard Joints
 - 5.3.6. Restrained Joints
 - 5.3.7. Service Connections
 - 5.3.8. Marking Services

- 5.3.9. Service Tubing
- 5.3.10. Ball Markers
- 5.4. Installation
- 5.5. Cleaning and Flushing
- 5.6. Field Testing
- 5.7. Disinfection
- 5.8. Warranty
- 5.9. As-Built Water Plans

6. POTABLE WATER - VALVES & FITTINGS

- 6.1. Scope
- 6.2. General Requirements
- 6.3. Materials
 - 6.3.1. Gate Valves
 - 6.3.2. Valve Joints
 - 6.3.3. Check Valves
 - 6.3.4. Cushioned Check Valves
 - 6.3.5. Hose Valves
 - 6.3.6. Taps
 - 6.3.7. Tap Hydrostatic Pressure Test
 - 6.3.8. Corporation Stops
 - 6.3.9. Curb Stops
 - 6.3.10. Ball Valves
 - 6.3.11. Valve Boxes
 - 6.3.12. Backflow Preventers
 - 6.3.13. Fire Hydrants
 - 6.3.14. Flush Points

7. SEWER – GRAVITY

- 7.1. Scope
- 7.2. General Requirements
- 7.3. Materials
 - 7.3.1. Poly-Vinyl Chloride (PVC)
 - 7.3.2. Ductile Iron
 - 7.3.3. Tapping Saddles
 - 7.3.4. Precast Concrete Manholes
 - 7.3.5. Cast Iron Manhole Frames and Covers
- 7.4. Installation
- 7.5. Cleaning & Flushing
- 7.6. Field Testing
- 7.7. Warranty
- 7.8. As-Built Sewer Plans

8. SEWER - FORCE MAINS & APPURTENANCES

- 8.1. Scope
- 8.2. General Requirements
- 8.3. Materials

- 8.3.1. Material Specifications
- 8.3.2. Poly-Vinyl Chloride (PVC)
- 8.3.3. High Density Poly-Ethylene (HDPE)
- 8.3.4. Ductile Iron
- 8.3.5. Fittings
- 8.3.6. Joints
- 8.3.7. Linings and Coatings
- 8.4. Installation
- 8.5. Cleaning & Flushing
- 8.6. Field Testing
- 8.7. Warranty

9. SEWER - NON-CLOG PUMP STATIONS

- 9.1. Scope
- 9.2. General Requirements
- 9.3. Materials
 - 9.3.1. Wet Well
 - 9.3.2. Valve Vault
 - 9.3.3. Valves & Fittings
 - 9.3.4. Submersible Non-Clog Pump
 - 9.3.5. Motor
 - 9.3.6. Pump Guide Rail
 - 9.3.7. Pump Power & Control Cables
 - 9.3.8. Pump Power & Control Panel
- 9.4. Installation
- 9.5. Field Testing
- 9.6. Warranty

10. SEWER - GRINDER PUMP STATIONS

- 10.1. Scope
- 10.2. General Requirements
- 10.3. Materials
 - 10.3.1. Wet Well
 - 10.3.2. Valve Vault
 - 10.3.3. Valves & Fittings
 - 10.3.4. Submersible Grinder Pump
 - 10.3.5. Pump Motor
 - 10.3.6. Pump Guide Rail
 - 10.3.7. Pump Power & Control Cables
 - 10.3.8. Pump Power & Control Panel
- 10.4. Installation
- 10.5. Testing
- 10.6. Warranty

APPENDIX

- A. **AS-BUILT LAYERS & LINE TYPES**
- B. **AS-BUILT SYMBOLS**
- C. **UTILITY CONTACT INFORMATION**

SECTION 1
GENERAL ITEMS

SECTION 1 – GENERAL ITEMS

1.1. DEFINITIONS

- 1.1.1. The words “REGIONAL UTILITIES” and “FLORIDA COMMUNITY SERVICES CORPORATION (DBA REGIONAL UTILITIES),” as employed herein shall collectively refer to the owner and manager of the water and sewer utility system bounded by Sandestin Golf and Beach Resort to the West, Inlet Beach to the East, the Intercoastal Waterway to the North and the Gulf of Mexico to the South.
- 1.1.2. The word "DEVELOPER," as employed herein, shall mean the owner of the project who, by way of an engineered submittal, proposes to improve a parcel or parcels of real estate by subdividing the land for the purpose of constructing habitable buildings.
- 1.1.3. The word "ENGINEER," as employed herein shall mean the licensed design professional representing DEVELOPER.
- 1.1.4. The word "CONTRACTOR," as employed herein shall mean the person, persons, partnership, company, or corporation entering into a contract for the performance of the work defined by the proposed engineered drawings.
- 1.1.5. The term “SUBCONTRACTOR” as employed herein includes only those having a direct contract with CONTRACTOR and it includes one who furnishes material worked to a special design according to the Drawings or Specifications of this work, but does not include one who merely furnishes material not so worked.
- 1.1.6. Wherever the word "MANUFACTURER" is used it refers to a person, partnership, or corporation who is furnishing material or equipment to either the OWNER, CONTRACTOR or both.
- 1.1.7. The word “OWNER,” as employed herein shall refer to DEVELOPER prior to FDEP CERTIFICATION, after which REGIONAL UTILITIES shall be referred to as OWNER.
- 1.1.8. The words “FDEP CERTIFICATION,” as employed herein shall collectively mean that in the opinion of Regional Utilities and the Florida Department of Environmental Protection (FDEP), CONTRACTOR has completed all utility construction in accordance with all Federal, State, and Local Codes and Standards as detailed on the APPROVED DRAWINGS.
- 1.1.9. The words "APPROVED DRAWINGS" shall collectively mean the project construction drawings and details provided to, and authorized for

construction by, REGIONAL UTILITIES as part of a proposed plan to improve DEVELOPER'S real estate.

1.1.10. "POINT OF SERVICE" shall mean the discharge side of the REGIONAL UTILITIES underground gate valve, prior to the double detector check valve assembly.

1.1.11. "APPROVED EQUAL" shall mean any pipe, fitting, valve, or material that may be used as a replacement to the material stated in the specifications, after which CONTRACTOR has received written approval prior to construction by REGIONAL UTILITIES for change.

1.2. SCOPE

1.2.1. The standards set forth in this document are intended to provide a basis for design and construction.

1.2.2. Applicable Federal, State and County environmental laws and regulations shall be considered concurrently with this text.

1.2.3. Any variation from these standards is to be approved in advance by REGIONAL UTILITIES General Manager or their designated representative prior to construction.

1.2.4. It is intended that the requirements of this document shall be applicable in all cases where the facilities being constructed or to be constructed shall be owned and/or operated and maintained by REGIONAL UTILITIES. These requirements shall also be applicable to those portions of facilities which shall lie within public right-of way (ROW).

1.2.5. REGIONAL UTILITIES responsibility for ownership, operation and maintenance of water mains or water services shall end at the Right of Way.

1.2.6. REGIONAL UTILITIES shall not be responsible for maintaining sewer services extending beyond the first cleanout which shall be located at the Right Of Way or utility easement.

1.2.7. REGIONAL UTILITIES shall not acquire, operate or maintain any sewage facilities that are not constructed to our standards. Responsibility for these lines and/or lift stations shall remain with DEVELOPER.

1.2.8. It shall be the responsibility of ENGINEER to verify existing line information and design the proposed utilities in accordance with REGIONAL UTILITIES standard specifications.

2019 Construction Specifications and Standard Details

- 1.2.9. ENGINEER may exceed REGIONAL UTILITIES standard specifications at their discretion.
- 1.2.10. REGIONAL UTILITIES shall review and approve all proposed plans prior to the commencement of construction in accordance with our Plan Review Procedure. REGIONAL UTILITIES Plan review Procedure may be found on our website at www.regionalutilities.net.
- 1.2.11. REGIONAL UTILITIES shall enforce the approved construction plans.
- 1.2.12. No changes shall be made to approved plans without written consent from REGIONAL UTILITIES.
- 1.2.13. While every effort shall be made to ascertain that the plans are in compliance with our standard specifications as detailed herein, REGIONAL UTILITIES reserves the right to enforce the minimum standards as required by FDEP, USACOE, FDOT, and Walton County.
- 1.2.14. No construction shall start prior to a pre-construction conference with REGIONAL UTILITIES.
- 1.2.15. It shall be the responsibility of CONTRACTOR to notify REGIONAL UTILITIES forty-eight (48) hours in advance of all field-testing and meetings.
- 1.2.16. REGIONAL UTILITIES shall not be responsible for newly constructed water and sewer lines within new subdivisions or development sites until all underground utilities are in place (i.e., electric, gas, phone, and cable television, etc.).
- 1.2.17. CONTRACTOR shall be responsible for locating and protecting newly constructed water and sewer lines until all underground utilities are in place (i.e., electric, gas, phone, and cable television).
- 1.2.18. Where reference is made in these specifications to specifications compiled by other agencies, organizations or departments, such reference is made for expediency and standardization and such specifications referred to are hereby made a part of these specifications.
- 1.2.19. Execution of specifications, construction drawings, details, and procedures must meet OSHA safety requirements. All excavation must also meet the Florida Trench Safety Act.

SECTION 2

DESIGN & INSPECTION GUIDELINES

SECTION 2 – DESIGN GUIDELINES

2.1. GENERAL REQUIREMENTS

- 2.1.1. The REGIONAL UTILITIES standards shall be followed on all plans.
- 2.1.2. One (1) CD containing an electronic (pdf file) copy of the plans shall be submitted for review.
- 2.1.3. Once the review process has been completed REGIONAL UTILITIES will require one (1) hard copy set of the signed and sealed plans and one (1) CD containing a copy of the signed and sealed approved set of plans and all documentation.
- 2.1.4. CONTRACTOR shall have on the job at all times, one set of APPROVED plans that have been stamped by REGIONAL UTILITIES at the pre-construction meeting. Any work completed to an unapproved set shall be subject to removal.
- 2.1.5. Incomplete or unchecked Construction Plans submitted to REGIONAL UTILITIES for review shall be returned to the design Engineer without review.
- 2.1.6. Construction Plans shall be prepared on 24"x36" sheets using an appropriate scale. Drawings submitted on other size sheets or on an unacceptable scale shall be returned without review.
- 2.1.7. Drawing scales shall be clearly defined and verified by way of a standard Engineer's box scale. Like scales shall be used on plan and profile drawings with corresponding grids (i.e., 1"=50' horizontal, 1"=5' vertical or 1"=40' horizontal, 1"=4' vertical). Do not interchange scales or grid count.
- 2.1.8. REGIONAL UTILITIES detail sheets are provided on our website www.regionalutilities.net for your use.
 - 2.1.8.1. Provide all applicable detail drawings.
 - 2.1.8.2. Details altered without the expressed written permission of REGIONAL UTILITIES shall not be accepted and shall be returned without review.
- 2.1.9. Clearly indicate all phase and match lines as required.
- 2.1.10. Show all elevations of crossing pipes indicating the top and bottom of the pipe to define a clear distance between pipes.

2019 Construction Specifications and Standard Details

- 2.1.11. All sewer data, including manhole invert and rim elevations, shall be defined on the plan sheets.
- 2.1.12. Profiles are required for all gravity sewers.
 - 2.1.12.1. Sewer profiles shall show all storm drain and water lines crossings and specify all special treatments as may be required by FDEP codes.
- 2.1.13. Roadway cross sections are required every 100-feet that show the elevations of all proposed utilities.
 - 2.1.13.1. Proposed gravity sewer mains shall not be at the same elevation as proposed storm water lines.
- 2.1.14. All pressurized pipelines shall be placed in right-of-way/utility easements unless approved in writing by REGIONAL UTILITIES General Manager or their designated representative.
- 2.1.15. All service line sizes shall be shown on the plan sheets.
- 2.1.16. All water and sewer lines shall include detail of the line diameter, material type and slope.
- 2.1.17. Specify details for all connections to existing facilities, including double valves, as required.
- 2.1.18. Identify the number of stories and dwelling units; show zero lot lines with driveway location (if applicable).
- 2.1.19. All street names, lot and block numbers shall be as shown on proposed drawings.
- 2.1.20. Finished floor elevations must be specified at least one foot above the crown of the road and clearly shown on the plan drawings.
- 2.1.21. After REGIONAL UTILITIES approval, all revisions shall be noted in revision block.
- 2.1.22. Drawings shall be georeferenced to the US State Plan Coordinate System, NAD 83, Florida State Planes, North Zone, US Foot, and must contain two referenced, labeled points tied to the State Plan Coordinate System.

2.2. DELIVERABLES

- 2.2.1. All CAD files shall be delivered on a single compact disc in AutoCAD format.

2.2.2. All deliverables shall be labeled with the File Name, Company Name, Contact Name, and Phone Number.

2.2.3. A Transmittal letter restating this information along with a statement requesting an as-built review shall accompany the disk.

2.2.4. Any additional drawing files used as an external reference within the submitted drawing file shall also be included with the submitted project. Any projects which have an external reference attached and not included shall not be accepted.

2.2.5. **FILE NAMING AND REVISIONS**

2.2.5.1. File names shall correspond exactly to the subdivision or project name and shall be consistent from one version to the next.

2.2.5.2. The file name shall contain the project name and the revision date in YYYYMMDD format as part of the name.

2.3. **EASEMENTS & SEPARATION REQUIREMENTS**

2.3.1. Easements shall allow unhindered access to all facilities and mains.

2.3.2. A ten (10) foot easement shall be required in areas adjacent and parallel to rights of way.

2.3.3. A twelve (12) foot easement shall be required for single line areas where zoning or other legal requirements would ensure that structures are not placed within ten (10) feet of facilities.

2.3.4. A twelve (12) foot wide easement, dedicated solely to REGIONAL UTILITIES, shall be required to provide vehicular access to all pump stations located within a development.

2.3.5. A twenty (20) foot easement shall be required for a line that runs down the side property line of a single-family lot or through areas not typically accessible (buffer zones, green areas, lakeside easements, golf courses, etc.).

2.3.5.1. Easements of 20-foot width are required to ensure that neither structures, nor trees, shrubs, etc., are placed closer than (10) feet to a facility or main.

2.3.5.2. Proposed facilities are not to be constructed in areas that are to be landscaped.

- 2.3.5.3. If REGIONAL UTILITIES determines that there is no alternative, plantings with non-aggressive rooting systems may be placed within five (5) feet of a facility or main provided that there is at least four (4) feet of cover is provided.
- 2.3.6. A HOLD HARMLESS AGREEMENT is to be provided for REGIONAL UTILITIES in such a case, relieving REGIONAL UTILITIES from any responsibility for damages due to REGIONAL UTILITIES maintenance or construction work within the easement.
- 2.3.7. Wider easements may be required for deeper runs per REGIONAL UTILITIES discretion.
- 2.3.8. A perpendicular distance of no less than ten (10) linear feet (in plan) shall be required for separation between any and all sewer and water utilities.
- 2.3.9. A perpendicular distance of no less than six (6) linear feet (in plan) shall be required for separation between any and all sewer/water utilities and underground electric utilities.
- 2.3.10. A perpendicular distance of no less than six (6) linear feet (in plan) shall be required for separation between any and all sewer/water utilities and underground natural gas utilities.
- 2.3.11. Deviations from these requirements shall be considered on a case-by-case basis, at the sole discretion of REGIONAL UTILITIES General Manager or their designated representative, and no less than minimum FDEP standards.

2.4. AS-BUILT DRAWINGS

- 2.4.1. All as-built plans submitted to Regional Utilities shall be provided on Compact Disc in AutoCAD format in addition to the standard signed and sealed hard copies.
- 2.4.2. Drawings shall be georeferenced to the US State Plan Coordinate System, NAD 83, Florida State Planes, North Zone, US Foot, and must contain two referenced, labeled points tied to the State Plan Coordinate System.
- 2.4.3. All features depicted in the as-built drawings must be surveyed after construction, to verify accuracy. Regional Utilities shall randomly spot check to ensure accuracy. Water system features must be surveyed to an accuracy of ≤ 0.3 foot. Sewer system features must be surveyed to an accuracy of ≤ 0.5 foot.

- 2.4.4. Regional Utilities shall provide a template drawing available for downloading on its web site at www.regionalutilities.net.
- 2.4.5. Do not use computer-generated scales that cannot be read with a standard Engineer's box scale.
- 2.4.6. Show profile grade between manholes.
 - 2.4.6.1. Manhole inverts and top elevations.
- 2.4.7. Special detail drawings covering installation to meet field conditions.
- 2.4.8. Use appropriate symbols for natural ground, compacted earth and pavement.
- 2.4.9. **LAYERING**
 - 2.4.9.1. Layer names must appear exactly as in Appendix A.
 - 2.4.9.2. All required layers listed in Regional Utilities approved CAD layers shall only contain the associated described features. For example, the BOUND-PROJECT layer shall contain only the project boundary line.
 - 2.4.9.3. All required layers shall be present in the drawing except for features that do not pertain to a particular project.
 - 2.4.9.4. All layers shall be clearly differentiated from one another. For example: two layers having the names WATER-MAIN and WATER-MAINS shall not exist in the same drawing.
 - 2.4.9.5. All text shall appear on separate layers from the layers they annotate. For example, text describing a water main shall be on the WATER-MAIN-TXT layer and not on the WATER-MAIN layer.
 - 2.4.9.6. Leaders and dimensions shall be placed on the appropriate text layer and not the feature layer. All Dimensions shall be associative. Exploded dimensions shall not be accepted.
 - 2.4.9.7. All layers shall conform to the proper geometry type (line (polyline), polygon, text, insert) as shown on Appendix A.
 - 2.4.9.8. All polygon type features shall be completely closed. Lines may need to be duplicated on more than one layer to be correctly drawn as a polygon.

- 2.4.9.9. Gravity Sewer lines and Force Mains shall be drawn as polylines and broken only at changes in pipe type, valves, tees, crosses, manholes and reducers.
- 2.4.9.10. All valves shall be labeled with coordinates and referenced to road centerlines, power and/or utility poles, phone boxes, or any other existing permanent above ground structure. All dimensions for valve references shall be on the appropriate Valve-Txt layer.
- 2.4.9.11. Water lines shall be drawn as polylines and broken only at changes in pipe type, valves, tees, crosses and reducers.
- 2.4.9.12. Pipe end points shall be snapped together at endpoints.
- 2.4.9.13. “End-of-line” caps shall be drawn to differentiate end-of-lines from lines that extend beyond the extent of the drawing. “End-of-line” caps shall be drawn for lines that are to be permanently capped when the job is complete, not for lines that are temporarily capped pending inspection.

2.4.10. SYMBOLS

- 2.4.10.1. Symbols shall be standardized according to examples provided in the Regional Utilities As-built Template file. The following “point” features shall be symbolized using the standard Regional Utilities Symbols and inserted as blocks:

- ✓ End of line Cap
- ✓ Fire Hydrant
- ✓ Flush Hydrant
- ✓ Manhole
- ✓ Meter
- ✓ Reducer
- ✓ Tees
- ✓ Valve
- ✓ Cleanout
- ✓ Lift station

*See Appendix B

2.4.11. ANNOTATION

- 2.4.11.1. All water and sewer lines shall include detail of the line diameter, material type and slope.

2019 Construction Specifications and Standard Details

2.4.11.2. All addresses and lot numbers shall not be shown with special characters such as *, #, “, etc.

2.4.11.3. All required text shall be single line text.

2.4.12. FILE NAMING AND REVISIONS

2.4.12.1. File names shall correspond exactly to the subdivision or project name and shall be consistent from one version to the next.

2.4.12.2. The file name shall contain the project name and the revision date in YYMMDD format as part of the name.

2.5. ENGINEER CERTIFICATION GUIDELINES

2.5.1. The ENGINEER shall submit to REGIONAL UTILITIES the following certifications and status reports when the project is ready to be certified:

2.5.1.1. Written certification that all materials being used for the project meet the latest version of REGIONAL UTILITIES' Standard Design and Construction Specifications, as well as all ASTM, AWWA, ANSI standards.

2.5.1.2. Fusion equipment operator certification. Refer to section 5.3.2.

2.5.1.2.1. Fusion equipment Data Logger records. Refer to section 5.3.2.

2.5.1.3. Inspection reports from gravity sewer camera inspections, outlining needed repairs and or certifying the line meets Regional's specifications.

2.6. INSPECTION REQUIREMENTS

2.6.1. CONTRACTOR shall be responsible for getting all property corners and right of ways staked prior to final inspection.

SECTION 3

EXCAVATION AND BACKFILLING

SECTION 3 – EXCAVATION AND BACKFILLING

3.1. SCOPE

- 3.1.1. The work under this section includes the excavation to designated elevations for (where applicable) all structures, trenching for underground piping, stockpiling of materials suitable for backfill, placing and compacting backfill, including granular backfill where shown on the drawings and specified hereinafter.
- 3.1.2. Excavation, dewatering, sheeting, and bracing required shall be carried out so as to prevent undermining or disturbing foundations of any existing structure or work, and so that all work may be accomplished and inspected in the dry.
- 3.1.3. The extent of excavation open at any one time shall be held to a minimum consistent with normal and orderly prosecution of the work.

3.2. GENERAL REQUIREMENTS

3.2.1. SUNSHINE STATE ONE CALL OF FLORIDA

- 3.2.1.1. Sunshine State One Call (SSOCOF) is a not for profit corporation which began with the 1993 adoption of the "*Underground Facility Damage Prevention and Safety Act*," Chapter 556, Florida Statutes. Its main purpose is to assist with the prevention of damage to underground facilities.
- 3.2.1.2. Excavators throughout Florida are responsible for notifying SSOCOF of their proposed excavations so that SSOCOF can notify all members with underground facilities near the excavation site.
- 3.2.1.3. SSOCOF may be notified by contacting (800) 432-4770.
- 3.2.1.4. Excavators without a valid locate ticket for any project that involves digging run the risk of paying fines levied by SSOCOF and lost revenues from their job site being shut down until they have a valid locate ticket and have waited the required two full business days before digging.

3.3. MATERIALS

3.3.1. BACKFILL

- 3.3.1.1. CONTRACTOR shall furnish, place, and compact granular backfill as specified hereinafter, in excavation below normal grade, as pipe

bedding material, in other locations as indicated on the drawings, or as specified, and where ordered by REGIONAL UTILITIES or Engineer for miscellaneous granular backfill.

- 3.3.1.2. Granular backfill consist of well-graded crushed stone or crushed gravel meeting the requirements of ASTM Designation C-33-, Gradation 67 (3/4 inch to no. 4). Air-cooled blast furnace slag, alone or in combination with crushed stone and/or crushed gravel conforming to ASTM Designation C-33-, requirements may also be used.
- 3.3.1.3. In lieu of the above-specified granular material for backfill and bedding, CONTRACTOR when so authorized by REGIONAL UTILITIES may use a good grade AASHTO Class A-3 sand, meeting County Ordinance 2005-24 and free of organic or other unsuitable material in quantities which would render the sand unsuitable for bedding use.
- 3.3.1.4. Unsuitable materials for backfill shall include pile foundations, concrete, railroad ties, debris, organic material, etc.
- 3.3.1.5. All backfill shall be placed in uniform horizontal layers. "Ramping," that is pushing backfill material down a ramp into excavated areas, shall not be permitted unless authorized in writing by the REGIONAL UTILITIES General Manager or their designated representative.
- 3.3.1.6. Grade and line stakes shall be protected.
- 3.3.1.7. Benchmarks and other reference points shall be carefully maintained and, if disturbed or destroyed, shall replace as directed.

3.4. EXECUTION

3.4.1. HANDLING WATER

- 3.4.1.1. CONTRACTOR shall provide ample means and device with which to immediately remove and dispose of all water entering trench and structure excavations and shall keep said excavations acceptably dry, until the structures to be built therein are completed.
- 3.4.1.2. All water pumped in or drained from the work shall be disposed of in a suitable manner without damage to sewer, pavement, pipes, electrical conduits, or any other work or property.
- 3.4.1.3. Drainage shall be adequate. No pipe shall be laid in water and no water shall be allowed to rise above the bottom of any pipe while it is being jointed, except as otherwise permitted in writing.

- 3.4.1.4. No masonry shall be placed in water and no water shall be allowed to rise over masonry until the concrete or mortar has attained its initial set, nor shall water be allowed to run over completed masonry for four days.
- 3.4.1.5. At no time shall water be allowed to rise as so to set up unequal pressures in the structures until the concrete or mortar has set at least 24 hours and also until any danger of floatation has been removed.
- 3.4.1.6. Dewatering, if required, shall be continued during construction to keep the groundwater below the level of the backfill at all times until the backfill is completed.

3.4.2. **EXCAVATING TRENCHES**

- 3.4.2.1. All excavation for piping shall be open cut and tunneling shall not be permitted unless specifically called for on the plans.
- 3.4.2.2. Trench sides shall be approximately vertical between an elevation of one foot above the top of the pipe and the bottom of trench; otherwise, trench sides shall be as vertical as possible or as required to meet safety regulations.
- 3.4.2.3. CONTRACTOR shall excavate the pipe trench by hand where excavation by machinery would endanger existing utilities, or structures which otherwise might be saved by use of hand excavation.
- 3.4.2.4. Trench width shall be as narrow as practicable and shall not be widened by scraping or loosening material from the sides.
 - 3.4.2.4.1. At no time shall the trench width within one (1) foot of the top of pipe exceed the external pipe diameter by more than twelve inches on either side.
- 3.4.2.5. Except where granular or concrete bedding is to be used, mechanical excavation shall be stopped above the final invert grade elevation and the remaining material hand excavated so that the pipe may be laid on a firm, undisturbed, native earth bed.
- 3.4.2.6. Bell holes shall be dug to permit the entire straight barrel of the pipe to rest on the trench bottom. Boulders or loose rocks, which might bear against the pipe, shall not be permitted in the trench bottom or backfill.
- 3.4.2.7. Where materials unsuitable for backfill such as muck, mud or other unstable material are excavated within the limits of excavation shown

on the drawings, the unsuitable material shall be removed from the job site and disposed of by CONTRACTOR. Suitable class A-3 sand or selected backfill shall replace the unsuitable backfill and be compacted to minimum of 98% Modified Proctor Density.

- 3.4.2.8. Excavation in rock (if present) shall be made at least six inches below the finished grade of the pipe and the resultant over-excavation shall be filled and compacted with suitable material as approved by REGIONAL UTILITIES. No section of pipe shall rest directly on rock or concrete.

3.4.3. JOINT TRENCHES

- 3.4.3.1. Joint Trench construction shall not be allowed without specific written consent on a per project basis.
- 3.4.3.2. In all cases, water and sewer lines must be a minimum of 6 foot horizontal and 1.5 foot vertical from any electrical, communications, or gas lines.
- 3.4.3.3. ELECTRICAL MUST BE BELOW THE WATER/SEWER LINES.
- 3.4.3.4. In cases where 1.5-foot vertical cannot be met an 8-foot separation shall be required.

3.4.4. EXCAVATING BELOW NORMAL GRADE

- 3.4.4.1. In the event CONTRACTOR through error or carelessness excavates below the elevation required, CONTRACTOR shall at his own expense, backfill with selected granular backfill as hereinafter specified and compact to obtain suitable bedding as specified.
- 3.4.4.2. In the event unstable or unsuitable bedding material is encountered at or below the limits of excavation noted on the drawings, such material shall be removed and replaced with suitable compacted granular backfill material.

3.4.5. BACKFILLING

- 3.4.5.1. Attention is called to the various testing requirements of the particular pipe to be installed as specified under the pipe sections of these specifications.

- 3.4.5.2. Contractor shall be responsible for obtaining the necessary inspections before, during and after backfilling and shall re-excavate, refill, and re-perform all such related work to obtain satisfactory test results.
- 3.4.5.3. Backfill shall be placed and compacted under the pipe haunches in uniform layers so as not to exceed six inches in depth on either side. Each layer shall be placed, then carefully and uniformly tamped, so as to eliminate the possibility of lateral displacement. The remainder of the backfill material shall then be placed in layers not exceed twelve inches (compacted thickness) and tamped to a compaction as specified hereinafter.
- 3.4.5.4. Whenever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the surface of the ground.
- 3.4.5.5. Backfilling shall be carefully performed and surface restored to the elevation shown on the plans. In unpaved areas the surface of trenches shall conform and be equal in quality, character, and materials to the surface immediately prior to making the excavation.
- 3.4.5.6. Compaction shall be in accordance with the compaction requirements of this section. Fill material shall be within 2 % of optimum moisture content at time of compaction.
- 3.4.5.7. Where wet conditions are such that dewatering by normal pumping methods would not be effective, the procedure outlined below may be used when specifically authorized by REGIONAL UTILITIES in writing and noted in the job diary. In such specifically authorized cases, backfill material used below the elevation at which mechanical tampers would be effective shall be of the AA STHO A-3 soil classification.
 - 3.4.5.7.1. After the pipe is bedded properly, the A-3 material shall be placed, and rammed and compacted under the pipe haunches by the use of timbers or hand tampers. Hand tamping shall continue during the placing of the backfill until such time that the backfill has reached an acceptable elevation for mechanical tamping.
 - 3.4.5.7.2. The mechanical tamping shall be done in such a manner and to such an extent as to transfer the compacting force into the previously hand-tamped fill.
- 3.4.5.8. If CONTRACTOR has compaction equipment with which the required density can be obtained in thicker lifts than permitted above and upon

satisfactory evidence that the proposed equipment shall produce work equal in quality to that produced by the specified method, REGIONAL UTILITIES and ENGINEER may permit placement of granular material of soil groups A-1, A-2, or A-3 in lifts up to a maximum of three foot compacted thickness.

3.4.5.9. CONTRACTOR shall be required to furnish equipment and labor to excavate and backfill test pits to be dug for the performance of density tests.

3.4.5.10. Use of thick lift compaction shall not be allowed for the first stage backfilling (up to one foot above top of pipe.).

3.4.6. **COMPACTION AND TESTING**

3.4.6.1. Backfill material up to a level of one foot over the top of the pipe or bottom of structures shall be placed in layers not to exceed six inches compacted thickness and compacted to 95% of its maximum density within +/- 2% of optimum moisture content as determined by the Laboratory Modified Proctor Tests.

3.4.6.2. In areas of roadways or traffic areas, backfill material of one foot over the top of pipe and bottom of structures shall be placed in layers not to exceed 12 inches compacted thickness and compacted to 98% of its maximum density within +/- 2% of optimum moisture content as determined by the Laboratory Modified Proctor Test.

3.4.6.3. Compaction by water jetting or puddling shall not be permitted in roadways or other traffic areas.

3.4.6.4. On areas outside of roadways and outside of traffic areas, backfill material above one foot over the top of the pipe and above the bottom of structures shall be placed in layers not to exceed 12 inches compacted thickness and compacted to 95% of its maximum density within +/- 2% of optimum moisture content as determined by the Laboratory Modified Proctor Test.

3.4.6.5. Where pipe is laid or structures built on fill materials in lieu of undisturbed earth, the fill material shall be brought up to the bottom elevation of the pipe or structure in six inches (compacted thickness) maximum layers. Each layer shall be compacted to 98% of the maximum density as determined by the Laboratory Modified Proctor Tests.

3.4.6.6. The method of compacting backfill shall be at CONTRACTORS discretion, subject to the approval of ENGINEER and REGIONAL

UTILITIES, provided that the compaction requirements specified herein are obtained, except that consolidation by flooding shall not be permitted under or adjacent to paved or unpaved traffic areas.

3.4.6.7. If tests for in place density consistency fail to meet the requirements, ENGINEER or REGIONAL UTILITIES may require CONTRACTOR to change his method of compaction without claiming additional compensation.

3.4.6.8. Compaction control on all new construction shall be accomplished by in-place densities to determine the degree of compaction. Compaction control testing shall be performed at CONTRACTOR'S expense by a qualified independent testing laboratory approved by the ENGINEER. CONTRACTOR shall give the ENGINEER ample notice to notify the laboratory to perform tests as specified. Any compacted layer, which fails to meet the above compaction requirements, shall be removed, replaced and retested at CONTRACTOR'S expense.

3.4.6.9. Field density shall be made in locations approved by the ENGINEER, normally in each vertical layer, and using the following approximate spacing:

3.4.6.9.1. Under structures, pavement and slabs one per 2,500 square feet with at least two per structure or area.

3.4.6.9.2. In trenches, one every three hundred feet in continuous trenches under pavement or future pavement plus one at each intersection or one every five hundred feet in continuous trenches not under pavement.

3.4.7. **BACKFILL MAINTENANCE**

3.4.7.1. CONTRACTOR shall refill all backfill areas to compensate for settlement.

3.4.7.2. The surfaces of backfilled trenches shall be maintained in a safe and satisfactory condition at all times after being opened to traffic until the final acceptance of the work by REGIONAL UTILITIES.

SECTION 4
DEWATERING

SECTION 4 – DEWATERING

4.1. SCOPE

- 4.1.1. The work specified in this section of the specifications shall consist of supplying all labor, materials, and plans and performing all work necessary to lower and control the groundwater levels and hydrostatic pressures to permit all excavation and construction specified under this contract to be performed in the dry.
- 4.1.2. The control of all surface water shall be considered as part of the work.

4.2. GENERAL REQUIREMENTS

- 4.2.1. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction of structures, and the placement of the fill materials, all to be performed under dry conditions.
- 4.2.2. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the structure foundations, the drains, the sewers and all other excavations.
- 4.2.3. The system to be used shall reduce the hydrostatic head in the water-bearing strata below the structure foundations, the drains, sewers and all other excavations, to the extent that the water level and piezo metric water levels in the construction area remain below the prevailing excavation surface at all times.
- 4.2.4. The contractor shall be solely responsible for the arrangement, location, and depths of the dewatering system necessary to accomplish the work described under this section of the specifications.
- 4.2.5. The supply of all labor, materials, and plans, and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by CONTRACTOR to the approval of REGIONAL UTILITIES and at no additional expense.
- 4.2.6. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata or instability of slopes, or damage to the foundations or structures may occur.

4.3. **EXECUTION**

- 4.3.1. Prior to any excavation below the groundwater level, the DEWATERING system shall be placed into operation to lower the water levels as required and then shall be operated 24 hours per day, seven days per week until all drains, sewers, and structures have been satisfactorily constructed, including placement of fill materials, and no longer require dewatering.
- 4.3.2. CONTRACTOR shall take any steps that he feels necessary to familiarize himself with the site conditions, the ground conditions and the groundwater conditions.
- 4.3.3. An adequate weight of fill material shall be in place to prevent buoyancy prior to discontinuing operation of the dewatering system.
- 4.3.4. No pipe shall be installed in standing water. A sufficient amount of bedding material shall be in place.
- 4.3.5. The control of all surface and subsurface water is considered as part of the dewatering requirements.
- 4.3.6. The control shall be adequate so that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavations or damage to the structures does not occur.
- 4.3.7. DEWATERING shall be performed in such a manner so as to cause no inconveniences whatsoever to REGIONAL UTILITIES, ENGINEER, or others engaged in work about the site.
- 4.3.8. All applicable Federal, State, and Local codes shall be met.

SECTION 5

POTABLE WATER - PIPELINES

SECTION 5 – POTABLE WATER - PIPELINES

5.1. SCOPE

- 5.1.1. CONTRACTOR shall furnish and install potable water piping system, complete, tested and ready for operation.
- 5.1.2. This section contains standard specifications for use in general procedures as specified hereinafter or as otherwise shown on the drawings.

5.2. GENERAL REQUIREMENTS

- 5.2.1. All work shall be proved to be in first class working condition and constructed properly in accordance with the drawings and specifications.
- 5.2.2. All defects and leaks disclosed by the tests shall be remedied. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES. Water for testing shall be furnished by CONTRACTOR.
- 5.2.3. CONTRACTOR shall submit to ENGINEER for approval before work begins, certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and the fittings supplied have been inspected at the plant and meet the requirements of these specifications.
 - 5.2.3.1. Any materials outside of those listed in the specifications must be approved by REGIONAL UTILITIES in writing prior to work beginning to be considered an APPROVED EQUAL material.
 - 5.2.3.2. ENGINEER shall submit to REGIONAL UTILITIES, documentation certifying that all materials meet current specifications.
- 5.2.4. All pipe sections shall be a minimum of twenty (20) feet in length.
- 5.2.5. All materials shall be free from defects impairing strength and durability and shall be the best of commercial quality for the purpose specified.
- 5.2.6. All materials have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- 5.2.7. All pipe and fittings shall be clearly marked with the name or trademark of the MANUFACTURER, the batch number, the location of the plant, and strength designation, etc. and the pipe shall be of a color approved by the utility company.

- 5.2.8. Each section of pipe shall be marked with the date of completion of lining and inspection in accordance with these specifications, and its numerical sequence of application on that date. A permanent marker of identifiable color shall be used.
- 5.2.9. All pipe and fittings delivered to the job site shall be accompanied by independent TESTING LABORATORY REPORTS certifying that the pipe and fittings conform to ASTM Specifications.
- 5.2.10. CONTRACTOR shall submit a NOTARIZED STATEMENT OF CERTIFICATION from the pipe MANUFACTURER as to conformance with the aforementioned ASTM Specifications and Modifications thereto, at the time of submitting shop drawing data on the pipe and fittings.

5.3. MATERIALS

5.3.1. POLY-VINYL CHLORIDE (PVC)

- 5.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) pipe for potable water and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 5.3.1.2. Pipe shall be approved for potable water by the National Sanitation Foundation. All herein referenced standards shall be of the latest edition or revision.
- 5.3.1.3. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring for pipe sizes 2-3 inch and larger.
- 5.3.1.4. Ductile iron fittings shall be used for PVC pipe 3 inches and larger.
- 5.3.1.5. **PVC 1120 SCHEDULE 40**

- 5.3.1.5.1. Pipe shall conform to ASTM D1785 - latest, for use in sizes under 2 inches.
- 5.3.1.5.2. The sustained pressure test shall be conducted in accordance with ASTM D1598 at test pressures given in ASTM D1785 when tested in accordance with ASTM D2672 (section 6.5).
- 5.3.1.5.3. The burst pressure test shall be conducted in accordance with ASTM D1599 at test pressures given in ASTM D1785, when determined in accordance with ASTM D2672 (section 6.6).

5.3.1.6. PVC PR200 / SDR21 (CLASS PIPE)

- 5.3.1.6.1. Pipe shall conform to ASTM D2241- latest, for use in 2” up to 12” in size. REGIONAL UTILITIES may specifically approve use in other sizes on request.
- 5.3.1.6.2. Pipe is to be manufactured in I.P.S (steel) standard pipe equivalent outside diameters.
- 5.3.1.6.3. The pipe shall be designed for a hydrostatic working pressure of 200 psi at 73.4 degrees Fahrenheit and to pass without failure sustained pressure test of 420-psi minimum when tested in accordance with ASTM D1598 and for a quick burst test of 630-psi minimum when tested in accordance with ASTM D1599.
- 5.3.1.6.4. The pipe shall be push on bell type with rubber sealing ring.

5.3.1.7. PVC 150 PSI / DR18 (C-905)

- 5.3.1.7.1. Pipe shall conform to AWWA Standard C-905-latest for use in diameters larger than 12-inches.
- 5.3.1.7.2. Pipe is to be cast iron pipe (D.I.P.S.) equivalent outside diameters.
- 5.3.1.7.3. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and for a quick burst test of 755 psi in conformance with ASTM D1599.
- 5.3.1.7.4. In any case of conflict with standards specified herein, the requirements of AWWA Standard C905 shall prevail.
- 5.3.1.7.5. The pipe shall be push on bell type with rubber sealing ring.

5.3.2. HIGH DENSITY POLY-ETHYLENE (HDPE)

- 5.3.2.1. Pipe shall be DR 11.
- 5.3.2.2. HDPE pipe for water system use shall conform to AWWA C-901 (up to 3”) and AWWA C-906 (4” and larger).

- 5.3.2.3. Material shall be PE 4710 meeting cell classification PE445574C and Standards ASTM D2737, ASTM D2239 or ASTM D3035.
- 5.3.2.4. Pipe shall be manufactured in accordance with ASTM D3035 (up to 3") or ASTM F714 (4" and larger) and shall be so marked.
- 5.3.2.5. All pipe shall be marked with a blue stripe.
- 5.3.2.6. Mechanical joint transitions with HDPE pipe stiffeners are not permitted.
- 5.3.2.7. All pipe joints shall be heat fused in accordance with the recommended procedures of the pipe MANUFACTURER.
- 5.3.2.8. Transitions to other types of pipe shall be by fused end transitions.
- 5.3.2.9. The fusion equipment operator shall receive training using the recommended procedure.
 - 5.3.2.9.1. Certification of such training shall be provided to REGIONAL UTILITIES prior to the commencement of fusing/installation of any HDPE pipe and in the final certification submittals provided by the ENGINEER.
- 5.3.2.10. CONTRACTOR shall be responsible to verify that the fusion equipment is in good operating condition.
- 5.3.2.11. 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 provided to REGIONAL UTILITIES in the final certification submittals by the ENGINEER.
 - 5.3.2.11.1. Fusion beads shall not be removed.
- 5.3.3. **DUCTILE IRON**
 - 5.3.3.1. Pipe shall be fabricated by American Cast Iron Pipe Company or approved equal Class 350.
 - 5.3.3.2. Pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51.
 - 5.3.3.3. Push-on joints and mechanical joints for such pipes shall be in accordance with ANSI/AWWA C111/A21.11.

- 5.3.3.4. Pipe shall have cement mortar lining and seal coating in accordance with ANSI/AWWA C104/A21.4.

5.3.4. **FITTINGS**

- 5.3.4.1. Fittings shall be ductile iron and in accordance with the requirements of ANSI/AWWA C153/A21.53, and ANSI/AWWA C110/A21.10.
- 5.3.4.2. Interior and exterior of fittings shall be fusion bonded epoxy coated in compliance with ANSI/AWWA C-550.
- 5.3.4.3. All fittings shall be of DOMESTIC ORIGIN (American Made).
- 5.3.4.4. Ductile fittings and special castings shall conform to the type of pipe being installed and have a minimum working pressure rating of 150 psi. Fittings shall conform to specification (AWWA C153) latest.
- 5.3.4.5. Short body pattern fittings shall normally be installed. Long body fittings (AWWA C110) shall be used where the drawings specifically call for long body fittings or at the option of CONTRACTOR when the laying length is not controlled by short body patterns.
- 5.3.4.6. Fittings shall have joints that match the type of pipe furnished. Joints shall be made using restraint type retainer glands.

5.3.5. **STANDARD JOINTS**

- 5.3.5.1. PVC pipe joints for pipe sizes 2-1/2 inches and smaller shall be extra heavy PVC or CPVC fittings solvent welded with PVC or CPVC cement.
- 5.3.5.2. All mechanical joint fittings shall have mega-lug restraint type retaining glands as manufactured by EBBA IRON.

5.3.6. **RESTRAINED JOINTS**

- 5.3.6.1. In addition to concrete thrust blocks, approved cast iron or ductile iron restraint type retainer glands shall be used.
- 5.3.6.2. Joint Restraints shall be required on all pipe located in paved areas.
- 5.3.6.3. Joint Restraints shall also be required for at least four joints on either side of a directional bore or per the PVC pipe MANUFACTURER's requirements.

5.3.7. SERVICE CONNECTIONS

- 5.3.7.1. Service connections shall be FORD FS202 stainless band iron service saddles.
- 5.3.7.2. Where service headers are proposed for the purpose of installing a multiple meter vault (A.K.A. “meter bank”), the construction shall conform to the detail as shown on Regional Utilities Standard Potable Water Detail sheet W-2.
- 5.3.7.3. All service connections shall terminate at the property lines and no more than 3-feet from the property corners unless directed by REGIONAL UTILITIES.

5.3.8. MARKING SERVICES

- 5.3.8.1. A “W” shall be stamped, not cut, into the back or high part of the curb directly over each service line or in the street or sidewalk where no curb is available.
- 5.3.8.2. The stamp shall be at least 3-inches tall and ¼-inch deep.
- 5.3.8.3. CONTRACTOR shall be responsible for installing blue four-inch ball markers, part number 1403, as manufactured by 3m. A marker ball shall be placed at each tap and in each meter box.

5.3.9. SERVICE TUBING

- 5.3.9.1. One-inch CTS service tubing shall be polyethylene, PE 4710 Resin Formulation, meeting AWWA specification C-901 pressure rated for 200 psi (DR9) with 1”x3/4” meter coupling curb stop. Tubing shall be black with a blue stripe.

5.3.10. BALL MARKERS

- 5.3.10.1. Contractor is to place a 4” ball marker as manufactured by 3m, part no.1403, beside each water main valve, each corp. stop tap at the main, and each curb stop in the buried meter box.
- 5.3.10.2. The marker ball shall be placed no more than 36-inches deep at any point.

5.4. INSTALLATION

- 5.4.1. All work shall be provided to be in first class condition and constructed properly in accordance with the drawings and specifications.

- 5.4.2. CONTRACTOR shall submit to REGIONAL UTILITIES, for approval, shop drawings including manufactures certifications of all pipe and fittings used on this project.
- 5.4.3. CONTRACTOR shall submit to ENGINEER and REGIONAL UTILITIES for approval before work begins, certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 5.4.4. All water mains, fittings, and appurtenances shall be in conformance with all applicable State of Florida Department of Environmental Protection and American Water Works Association (AWWA) Standards.
- 5.4.5. CONTRACTOR shall be responsible for defective, damaged or unsound pipe already laid which are found to be defective or damaged and shall replace with new pipe.
- 5.4.6. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES. Water for testing shall be furnished by CONTRACTOR.
- 5.4.7. Each section of the pipe shall rest upon the pipe bed for full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe, which has its grade or joint disturbed after lying, shall be taken up and relayed.
- 5.4.8. No pipe shall be laid when the trench conditions or weather is unsuitable for such work, except by permission of REGIONAL UTILITIES.
- 5.4.9. Pipe fittings shall be carefully handled to avoid damage, and if feasible while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks.
- 5.4.10. Minimum cover on all piping shall be 36".
- 5.4.11. Maximum cover on all piping shall be 48", unless approved in writing by REGIONAL UTILITIES.

5.5. CLEANING AND FLUSHING

- 5.5.1. After a final inspection has been performed and has passed on the project CONTRACTOR shall be responsible for having a flush point opened and is responsible for where the water is to be dispersed. At this time the REGIONAL UTILITIES construction inspector shall open the main line valve to thoroughly flush out the line.

- 5.5.2. At this time the CONTRACTOR and REGIONAL UTILITIES' construction inspector shall check that ALL water services and fire hydrants are turned on and in working order.

5.6. FIELD TESTING

- 5.6.1. All piping to be operated under liquid pressure shall be tested in sections of approved length.
- 5.6.2. All field tests shall be made in the presence of ENGINEER and REGIONAL UTILITIES.
- 5.6.3. Testing shall consist of hydrostatic pressure testing at 150 psi.
- 5.6.4. For the test, CONTRACTOR shall furnish clean water, suitable temporary testing plugs and other necessary equipment and all labor required.
- 5.6.5. Pressure tests shall be of 2-hour duration, unless specified otherwise or notified in writing by REGIONAL UTILITIES.
- 5.6.6. Pressure tests shall be conducted with a pressure loss of not more than 2 psi regardless of length of pipe being tested.
- 5.6.7. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If hydrants, blow offs, or other outlets are not available at high points for releasing air, CONTRACTOR shall make the temporary taps at such points and shall plug said holes after completion of tests.
- 5.6.8. Specified test pressures shall be applied by means of a pump connected to the pipe in a manner satisfactory to REGIONAL UTILITIES.
- 5.6.9. The pump, pipe connection, and all necessary apparatus, including the proper gauges, shall be furnished by CONTRACTOR and shall be subject to the approval of ENGINEER and REGIONAL UTILITIES.
- 5.6.10. Pressure gauges shall be calibrated by an approved testing laboratory, with increments no greater than 2 psi.
- 5.6.11. Gauges used shall be of such size that pressures tested shall not register less than 10% or more than 90% of the gauge capacity.
- 5.6.12. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or

replaced with sound material and the test shall be performed until it is satisfactory.

5.6.13. In the event a section fails to pass the test, CONTRACTOR shall locate, uncover (even to the extent of uncovering the entire section), and repair or replace the defective pipe, fitting, or joint.

5.6.14. Visible leaks shall be corrected regardless of total leakage.

5.6.15. Lines shall be repaired and retested as necessary until test requirements are achieved.

5.7. **DISINFECTION**

5.7.1. All water pipes and fittings at whatever size and wherever installed on potable water lines shall be thoroughly disinfected prior to being placed into service.

5.7.2. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains in AWWA C-651-latest, Florida Rule 62-555.345, F.A.C., and shall be in accordance with both Federal, State and Local requirements.

5.8. **WARRANTY**

5.8.1. CONTRACTOR shall provide a warranty on installation and workmanship for no less than one year from the date of FDEP certification.

5.9. **AS-BUILT WATER PLANS**

5.9.1.1. See Section 2.0 of this Specification

SECTION 6

POTABLE WATER – VALVES & FITTINGS

SECTION 6 – POTABLE WATER – VALVES & FITTINGS

6.1. SCOPE

- 6.1.1. CONTRACTOR shall provide, install, joint, and test all valves and appurtenances as shown on the drawings and herein specified.
- 6.1.2. All items furnished shall be new, unused, and shall be the products of manufactures having long experience in the manufacturing of the specified items.

6.2. GENERAL REQUIREMENTS

- 6.2.1. All valves shall be NSF Standard 61 certified.
- 6.2.2. Valves over 12 inches shall have right angle drive assemblies.
- 6.2.3. Valves 3 inches and above in size shall be gate valves unless otherwise noted.
- 6.2.4. All water valves shall be marked with 3M water ball markers (3M part # 1403).
- 6.2.5. Valves installed within a water system shall open by turning to the left or counterclockwise, when viewed from the stem.
- 6.2.6. Where extension stems are required, substantial, adjustable wall brackets and extension stems shall be furnished and located as directed.
- 6.2.7. Extension stems shall be provided on all buried valves when the operating nut is deeper than 4-feet below final grade.
- 6.2.8. Interior and exterior of valves shall be fusion bonded epoxy coated in compliance with ANSI/AWWA C-550.

6.3. MATERIALS

6.3.1. GATE VALVES

- 6.3.1.1. All valves shall be manufactured by American Flow Control or AVK.
- 6.3.1.2. All GATE VALVES shall be resilient wedge and shall meet the requirements of AWWA C-515 (sizes up to 12”) and AWWA C-550.
- 6.3.1.3. GATE VALVE sizes 3 to 12 inches in diameter shall be designed for 250-psi minimum working pressure.

- 6.3.1.4. GATE VALVE sizes over 12 inches in diameter shall be designed for 150-psi minimum working pressure.
- 6.3.1.5. When fully open, all GATE VALVES shall have a clear waterway equal to the nominal diameter of the pipe.
- 6.3.1.6. All GATE VALVE operating nuts or wheels shall have an arrow cast in the metal indicating the direction of opening.
- 6.3.1.7. All GATE VALVES shall have the manufacture's distinctive marking, pressure ratings, and year of manufacturing cast on the body.
- 6.3.1.8. Prior to shipment from the factory, each GATE VALVE shall be tested by applying it to a hydraulic pressure equal to twice the specified working pressure.
- 6.3.1.9. All buried GATE VALVES shall be resilient seat iron body non-rising stem type with two inch operating nut and adjustable valve boxes.
- 6.3.1.10. GATE VALVES located above ground and inside structures shall be hand wheel operated, non-rising stem type with flanged ends and of the same general construction as buried valves.

6.3.2. VALVE JOINTS

- 6.3.2.1. All gate valves shall have mechanical joint ends to fit the pipe run in which they are to be used, except valves installed on slip joint pipe shall have mechanical joint ends unless otherwise specified.
- 6.3.2.2. Joint restraint type mechanical joint gland shall be used and shall be mega-lug type or approved equal.
- 6.3.2.3. Hydrostatic shall be performed to check all valve joints and conducted in strict accordance with AWWA requirements and Section 5.5 of this specification.

6.3.3. CHECK VALVES

- 6.3.3.1. CHECK VALVES shall conform to the requirements of AWWA C508, latest, "AWWA Standard for Swing-Check Valves for Ordinary Waterworks Service".
- 6.3.3.2. CHECK VALVES larger than two-inch nominal size shall be iron body, flanged ends, outside lever, spring loaded, swing type with

straightaway passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber faced disc.

6.3.3.3. CHECK VALVES shall be AVK manufactured.

6.3.3.4. CHECK VALVE sizes 2-inches in diameter and smaller shall be brass swing check valves, 200 psi working pressure, American Valve M 31, or APPROVED EQUAL.

6.3.4. **CUSHIONED CHECK VALVES**

6.3.4.1. The CHECK VALVE used on a high service pump discharge line shall be series 6011 oil-cushioned swing check valves with weight and lever as manufactured by APCO or APPROVED EQUAL.

6.3.5. **HOSE VALVES (BIBS)**

6.3.5.1. All garden hose valves or bibs shall be $\frac{3}{4}$ inch.

6.3.6. **TAPS**

6.3.6.1. REGIONAL UTILITIES shall perform all taps greater than 2" in diameter.

6.3.6.2. CONTRACTOR shall perform all taps 2-inches diameter and less.

6.3.6.3. A representative of REGIONAL UTILITIES must be onsite prior to performing any and all taps.

6.3.6.4. CONTRACTOR shall provide at least five working days' notice to REGIONAL UTILITIES prior to performing the work.

6.3.6.5. At the time the line is to be tapped, it shall be the responsibility of CONTRACTOR to ensure that the tapping sleeve and valve is pressurized and can sustain the pressure test (See Section 6.3.7 of this specification).

6.3.6.6. In the event the line has not been tested prior to the arrival of REGIONAL UTILITIES at the job site, there shall be a \$50.00 service charge added to the cost of the tap and the tap shall be rescheduled. Should CONTRACTOR prefer REGIONAL UTILITIES to remain on-site in preparation for the work, a service charge equal to \$50.00 an hour shall apply so long as REGIONAL UTILITIES is on-site.

- 6.3.6.7. All taps EQUAL TO OR GREATER THAN 4" IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SLEEVE and associated tapping valve.
 - 6.3.6.7.1. The TAPPING SLEEVE and gland shall be Stainless Steel Wraparound "Fast Style", and shall be as manufactured by FORD METER CO. or APPROVED EQUAL and shall be furnished complete with all necessary accessories.
 - 6.3.6.7.2. The TAPPING SLEEVE shall have a working pressure rating of 200 psi for sizes 4" through 12" and 150 psi for sizes 14" and larger, and shall conform to the applicable sections of AWWA Standard C110 of latest revision.
 - 6.3.6.7.3. The TAPPING SLEEVE shall be of the split type for assembly on the pipe and the sleeve shall be sized for use with all classes of cast iron pipe.
 - 6.3.6.7.4. The outlet flange shall be Class 125 Standard, with recess for standard tapping valves.
- 6.3.6.8. All taps SMALLER THAN 4" IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SADDLE and associated tapping valve.
 - 6.3.6.8.1. The TAPPING SADDLE shall be Fusion Bonded Epoxy Coated, and shall be as manufactured by FORD METER CO. or APPROVED EQUAL and shall be furnished complete with all necessary accessories.
- 6.3.6.9. The excavated area in which the tap shall be made must be a minimum of 4" below the bottom of the valve, at least seven feet in length and able to accommodate two people working.
- 6.3.6.10. The area where the tap shall be made must be completely dry. It is the responsibility of CONTRACTOR to pursue all means necessary to dewater the area in which the tap is to be made.
- 6.3.6.11. TAPPING VALVES shall meet all the requirements of Section 6.3 of this specification and shall be a mechanical joint outlet by tapping flange with a raised inner lip for alignment with the tapping sleeve.
- 6.3.6.12. Prior to tapping a potable water main, the drilling machine's pilot drill, shell cutter and cutter hub shall be sterilized in accordance with the following procedure:

- 6.3.6.12.1. Four gallons of potable water shall be combined with 8 oz. of sodium hypochlorite; the pilot drill, shell cutter and cutter hub shall be swabbed until clean or totally immersed in the sterilizing solution and allowed to remain wet at least five minutes before tapping operation commences. It is not necessary to rinse the sterilizing solution from the tapping components prior to use.

6.3.7. TAP HYDROSTATIC PRESSURE TEST

- 6.3.7.1. After installing a tapping sleeve and valve, and prior to tapping a pressurized water main, a hydrostatic pressure test shall be performed.
- 6.3.7.2. The test shall be conducted by introducing water into a tap or test hole located on the neck of the outlet half of the sleeve with the tapping valve in the closed position. Sleeves that do not have a tap shall be tested with water supplied through a mechanical joint tapped plug connected to the open tapping valve. Upon completion, a watertight plug shall be inserted into the test hole.
- 6.3.7.3. The sleeve and valve shall be capable of maintaining test pressure of 150 psi for 30 minutes duration, with no sign of visible leaks.
- 6.3.7.4. All leaks shall be repaired by removing and replacing defective items with items free from defect, after which the sleeve and valve shall be retested. Such repair and retesting shall be done until the installation passes the specified test.
- 6.3.7.5. CONTRACTOR shall furnish and install any necessary and temporary restraints, gauges, pumps, and other incidental and appurtenant items necessary to complete this work, and shall remove same upon completion of the test.

6.3.8. CORPORATION STOPS (LEAD FREE)

- 6.3.8.1. CORPORATION STOPS shall be manufactured from lead free cast bronze with machined fitting surfaces, and in accordance with AWWA C-800, latest, in sizes 1 inch up to and including 2 inches.
- 6.3.8.2. The inlet connection shall be AWWA Standard corporation stop thread or iron pipe (I.P.) thread. CORPORATION STOPS with compression joint outlets for copper or plastic tubing shall be Ford type F 1000.

6.3.9. CURB STOPS (LEAD FREE)

- 6.3.9.1. CURB STOPS shall be manufactured from lead free cast bronze with machine fitting surfaces, and in accordance with AWWA C800, latest, in sizes 1 inch up to and including 2 inch.
- 6.3.9.2. CURB STOPS shall be a straight ball meter valve with pack joint, with lock wing cast on stop body and operating tee cap to provide for locking the stop in the closed position.
- 6.3.9.3. CURB STOPS shall be Ford type B43 with an HB-34 lever handle for 1 inch diameters.
- 6.3.9.4. CURB STOPS shall be Ford type B41 with an HH-67 lever handle for 1-1/4 – 2 inch diameters.

6.3.10. BALL VALVES (LEAD FREE)

- 6.3.10.1. BALL VALVES shall be limited to $\frac{3}{4}$ inch through 2 inch in size and shall have a lead free cast bronze body, bronze tee head, stem with check, full round way opening and provisions for locking in a closed position.
- 6.3.10.2. BALL VALVES for use with copper services shall have an inlet connection with a flare nut fitting for type K copper tubing and an outlet connection with female iron pipe thread, FORD B-21 series or approved equal.
- 6.3.10.3. BALL VALVES for use with schedule 40 PVC pipe shall have inlet and outlet connections with female iron pipe threads. The latter shall require the use of brass nipples. Compression joints shall require insert stiffeners.
- 6.3.10.4. BALL VALVES used in conjunction with pitometer tap installations shall be cast bronze body with inlet and outlet opening with 1 $\frac{1}{4}$ inch female iron pipe thread. (Valve size 1 $\frac{1}{4}$ inch). The BALL VALVE shall be No. B11-455 with HP-4 handle as manufactured by Ford Meter Company, Inc., or approved equal.

6.3.11. VALVE BOXES

- 6.3.11.1. CONTRACTOR shall furnish, assemble and place a valve box for each buried valve.
- 6.3.11.2. Adjustable valve boxes with a cast iron base shall be used, each with an adjustable length center and top section with cover. The sections

shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade.

- 6.3.11.3. The base shall be centered over the valve and shall be approximately on line with nut at top of the valve stem and the entire assembly shall be plumb.
- 6.3.11.4. The cover shall be marked "WATER" or "FIRE" as appropriate.
- 6.3.11.5. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM Designation A48, Class 20 B, gray iron castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, or other harmful defects.
- 6.3.11.6. The valve boxes shall be coated with a single coat of coal tar pitch varnish before machining, so that machined seating surfaces shall be free from any coating. The seating surfaced of both the cover and the jacket shall be machined to fit so that the cover shall not rock after it has been seated in any position in its associated jacket.
- 6.3.11.7. The location of the valve shall be marked in the high back of the curb with a "V".

6.3.12. BACKFLOW PREVENTERS

- 6.3.12.1. The following standards shall be referenced and adhered to in the design and application of BACKFLOW PREVENTERS:

- 6.3.12.1.1. REGIONAL UTILITIES: Cross Connection Control Program.

6.3.13. FIRE HYDRANTS

- 6.3.13.1. The FIRE HYDRANTS shall be cast iron body, fully bronze mounted, for 150 psi working pressure, complying with AWWA C502-latest.
- 6.3.13.2. The FIRE HYDRANT inlet connection shall be mechanical joint type, with accessories for a six-inch pipe connection. The internal shutoff valve shall be five and a quarter inch diameter and the hose nozzles shall be bronze with American National Standard fire hose coupling screen threads.
- 6.3.13.3. The FIRE HYDRANT shall have two (2), two and half (2.5") inch hose nozzles and one (1) four (4.5") and half inch pumper nozzle.

- 6.3.13.4. The FIRE HYDRANT shall be American-Darling Model B-84-B.
- 6.3.13.5. The FIRE HYDRANT shall be yellow in color.
- 6.3.13.6. The FIRE HYDRANT shall be installed with an auxiliary six-inch gate valve at least 30-inches but no more than 10-feet from the FIRE HYDRANT.
- 6.3.13.7. All FIRE HYDRANTS shall be restrained with the mechanical-joint type mega-lug joint restraints retainer glands referenced herein. In addition, all FIRE HYDRANTS shall be restrained to the hydrant valve, which shall be restrained to the main with no less than two Grade 304 stainless steel all-thread rods 3/4" diameter per Regional Utilities' standard details.
- 6.3.13.8. Thrust blocks shall be required as per Regional Utilities' Standard Details.
- 6.3.14. **FLUSH POINT**
 - 6.3.14.1. End of the line flush point shall be constructed per Regional Utilities' standard details as a 2-inch water service.
 - 6.3.14.2. A 2-inch quick connect shall be installed on the curb stop.

SECTION 7
SEWER - GRAVITY

SECTION 7 – SEWER - GRAVITY

7.1. SCOPE

- 7.1.1. CONTRACTOR shall furnish and install all gravity sewer lines, manholes, fittings, and appurtenances required for a complete system as shown on the drawings and specified herein.

7.2. GENERAL REQUIREMENTS

- 7.2.1. All work shall be proved to be in first class working condition and constructed properly in accordance with the drawings and specifications.
- 7.2.2. All defects and leaks disclosed by the tests shall be remedied. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES. Water for testing shall be furnished by CONTRACTOR.
- 7.2.3. CONTRACTOR shall submit to ENGINEER for approval before work begins certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and the fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 7.2.4. Excavation and backfill are specified in Section 3 of this specification, *Excavation and Backfill for Utilities*.
- 7.2.5. Manholes and gravity sewer lines shall not be placed outside of paved areas without written approval from REGIONAL UTILITIES.
- 7.2.6. Where feasible, allow for margin of error in design of sewers at minimum slopes and cover (i.e. 0.10 foot drop through manholes, or 0.42% slopes, or, a combination of both).
- 7.2.7. Gravity sewers shall have no greater than a 0.5-foot inside drop. In other situations there shall be no greater than a 1.0-foot drop in incoming and outgoing sewer elevations unless a proper drop manhole assembly is used.
- 7.2.8. Gravity sewers shall have no less than a 90-degree angle between sewer runs unless specific prior approval is given and it is unavoidable.
- 7.2.9. All materials shall be free from defects impairing strength and durability and shall be the best of commercial quality for the purpose specified.
- 7.2.10. All materials have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

- 7.2.11. All pipe and fittings shall be clearly marked with the name or trademark of the MANUFACTURER, the batch number, the location of the plant, and strength designation, etc. and the pipe shall be of a color approved by the utility company.
- 7.2.12. Each pipe joint shall be marked with the date of completion of lining and inspection in accordance with these specifications, and its numerical sequence of application on that date. A permanent marker of identifiable color shall be used.
- 7.2.13. All pipe and fittings delivered to the job site shall be accompanied by independent TESTING LABORATORY REPORTS certifying that the pipe and fittings conform to the above mentioned ASTM Specifications.
- 7.2.14. CONTRACTOR shall submit a NOTARIZED STATEMENT OF CERTIFICATION from the pipe MANUFACTURER as to conformance with the aforementioned ASTM Specifications and Modifications thereto, at the time of submitting shop drawing data on the pipe and fittings.

7.3. **MATERIALS**

7.3.1. **POLYVINYL CHLORIDE (PVC)**

- 7.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) pipe for use in gravity sewer systems and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 7.3.1.2. All herein referenced standards shall be of the latest edition or revision.
- 7.3.1.3. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring for pipe sizes 2-3 inch and larger.
- 7.3.1.4. **PVC SDR 35**
 - 7.3.1.4.1. Polyvinyl Chloride sewer pipe for use in gravity sewer systems, shall conform to ASTM D3034-latest for PVC sewer pipe and fittings for sizes 6-inch through 12-inch in diameter, except as hereinafter modified.
 - 7.3.1.4.2. The pipe material shall meet or exceed the approved cell class 12454, PVC compound conforming to ASTM D1784 - latest.
 - 7.3.1.4.3. The bell shall be extruded integral with the pipe barrel with a thickness equal to or greater than that of the barrel.

- 7.3.1.4.4. The laying length shall not exceed 14 foot (+/-1”) without specific written approval from REGIONAL UTILITIES.

7.3.1.5. **ELASTOMERIC GASKET JOINT**

- 7.3.1.5.1. Provision shall be made for contraction and/or expansion at each joint with a solid cross section rubber ring. The rubber ring shall be factory assembled and secured in the bell in such a manner so as to prevent sliding and rolling when the spigot end of the adjoining pipe is installed.
- 7.3.1.5.2. Manual cuts to the pipe shall be to MANUFACTURER standards to prevent damage to the gasket.

7.3.1.6. **FITTINGS**

- 7.3.1.6.1. All fittings and accessories shall be manufactured in accordance with ASTM D3034.
- 7.3.1.6.2. Saddle TEE's or saddle WYE's shall not be permitted except by special written approval from ENGINEER and REGIONAL UTILITIES.
- 7.3.1.6.3. Gravity sewer main fittings shall be of the bell and spigot configuration.
- 7.3.1.6.4. Gravity sewer service laterals shall be solvent weld fittings.

7.3.2. **DUCTILE IRON**

- 7.3.2.1. Ductile iron pipe sizes 6 inch through 48 inch diameter shall conform to AWWA Standard C151 – latest.
- 7.3.2.2. Minimum pipe strength shall be Class 350.
- 7.3.2.3. The pipe shall have design values of 60,000-psi tensile strength, 42,000-psi yield strength, and 10% minimum elongation.
- 7.3.2.4. The wall thickness shall be in accordance with Table 51.2 and the corresponding class designation in Table 51.3 of the above referenced specification using wall thickness for laying condition “b” and thickness as required to the depth of cut, shown on the drawings.

- 7.3.2.5. In addition to the standard markings required by AWWA Standard C151-, the utility company may require each joint of pipe to be marked for the depth of cut it is used on the project, in which case, such markings shall be stenciled on the pipe exterior.

7.3.2.6. **JOINTS**

- 7.3.2.6.1. Joints for ductile iron pipe shall conform to AWWA Standard C111, Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings, of the push-on type, unless otherwise specified or shown on the drawings.

7.3.2.7. **FITTINGS**

- 7.3.2.7.1. Fittings shall conform to AWWA Standard C110 American Standard for Cast Iron Fittings, 2.0 inch diameter through 48.0 inch diameter, for water and other liquid, Class 150, mechanical joint unless otherwise noted on the drawings.

7.3.2.8. **COATING**

- 7.3.2.8.1. All ductile iron pipe and fittings for sewer use shall be furnished with a factory applied coating Protecto 401 ceramic epoxy.

7.3.2.9. **LINING**

- 7.3.2.9.1. The interior of all ductile iron pipe and fittings for sewer use shall be furnished with a factory applied lining. The lining material shall be Protecto 401 Ceramic Epoxy, unless otherwise directed by ENGINEER and approved by REGIONAL UTILITIES in writing.
- 7.3.2.9.2. The lining system shall be applied in accordance with the manufactures standard specifications and requirements.
- 7.3.2.9.3. The Lining the system shall cover the interior surface of the pipe, extending from the plain or beveled end, to the rear of the gasket socket. The surface shall be adequately prepared prior to lining.
- 7.3.2.9.4. The lining shall be allowed to cure at least 5 days after the final cast. However, the minimum time shall be increased if the drying temperature is below 65 degrees Fahrenheit.

- 7.3.2.9.5. The MANUFACTURER shall furnish notarized certificates of compliance stating that the lining conforms to all requirements of these specifications.

7.3.3. **TAPPING SADDLES**

- 7.3.3.1. TAPPING SADDLES shall conform to AWWA Standard C110, American Standard for Gray-Iron and Ductile Iron Fittings, 2.0 inch diameter through 48.0 inch diameter, for water and other liquids, Class 150, with a mechanical joint socket connection in accordance with AWWA C111 latest edition, Table 10.1.

7.3.4. **PRECAST CONCRETE MANHOLES**

- 7.3.4.1. MANHOLES shall meet the latest requirements of ASTM C478 *Specification for Precast Reinforced Concrete Manhole Sections*.
- 7.3.4.2. Minimum wall thickness shall be five inches.
- 7.3.4.3. Cement shall meet the latest requirements of ASTM C 150 *Specification for Portland Cement, TYPE II*.
- 7.3.4.4. Minimum concrete strength shall 4000 PSI at 28 days.
- 7.3.4.5. The required minimum strength of concrete shall be confirmed by making and testing four standard cylinders at seven (7) days and at (28) days. The test results shall be submitted to the ENGINEER prior to any manhole being installed.
- 7.3.4.6. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations.
- 7.3.4.7. Openings shall be adequately sealed with approved non-shrinking grout, applied and cured in strict conformance with the MANUFACTURERS recommendations so that there shall be zero leakage around pipes and joints.
- 7.3.4.8. Approval of ENGINEER and REGIONAL UTILITIES shall be obtained before placing any order for manholes.

7.3.4.9. **BASES**

- 7.3.4.9.1. MANHOLE BASES shall be cast integrally with the bottom manhole section.

7.3.4.9.2. The base section shall be set in a 12-inch thick leveling course of #4 or #57 stone with filter fabric above and below the stone, extending at least 12-inches outside the base.

7.3.4.9.3. In order to permit adjustment of the precast base section and insure full bearing on the leveling course, said section shall be placed just prior to initial set.

7.3.4.10. **JOINTS**

7.3.4.10.1. Joint contact surfaces shall be formed with machine castings; they shall be exactly parallel with a 2 degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an "o" ring rubber gasket, conforming to the latest edition of C443, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gasket or Pre-Molded Plastic Joint Sealer with Joints Pre-Primed.

7.3.4.10.2. Each joint shall be grouted on the inside with approved grouting materials.

7.3.4.11. **COATING**

7.3.4.11.1. The interior and exterior surfaces of each manhole shall be given two (2) coats of a waterproof bituminous coating approved by ENGINEER and REGIONAL UTILITIES.

7.3.4.11.2. Total minimum dry film thickness shall be 12 mils. Each coat shall be applied at a rate of no less than 1 gallon per 100 square feet.

7.3.4.11.3. The waterproofing materials shall be applied by brush or spray and in accordance with the instructions of the MANUFACTURER.

7.3.4.11.4. Time shall be allowed between each coat to permit sufficient drying so that the application of the second coat has no effect on the first coat.

7.3.4.11.5. The paint shall be applied at the place of fabrication.

7.3.4.11.6. Additional coating or touch up work shall be required after manhole installation if so directed by ENGINEER and/or REGIONAL UTILITIES.

7.3.4.12. **ADJUSTMENT MATERIALS**

7.3.4.13. **BRICK**: Solid, concrete only.

7.3.4.14. **CONCRETE**: Pre-cast concrete rings

7.3.4.15. **GROUT**: Fast Setting, Non-shrinking Hydraulic Cement shall be used for all grouting and mortar applications.

7.3.4.16. **I&I Barrier**: HDPE manhole frame seal. REQUIRED on all manholes.

7.3.5. **CAST IRON MANHOLE FRAMES AND COVERS**

7.3.5.1. Shall be U.S. Foundry E 170 with NPPB pick bar.

7.3.5.2. Castings shall be made of good quality, strong, tough, and even.

7.3.5.3. Sand holes and defects of any nature which would render them unfit for the service for which they are intended shall not be allowed.

7.3.5.4. Castings shall meet the requirements of ASTM A48, latest Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12, Ductile Iron Castings. In either Case, manhole frame and cover shall be designed to withstand an HS20-44 loading defined in the AASHTO Specifications.

7.3.5.5. Before being shipped from the foundry, castings shall be given one (1) coat of coal-tar pitch varnish applied in a satisfactory manner so as to make a smooth coating, tough, tenacious and not brittle or with any tendency to scale off.

7.3.5.6. Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be rejected.

7.4. **INSTALLATION**

7.4.1. The method of pipe laying shall be subject to the approval of ENGINEER and REGIONAL UTILITIES.

7.4.2. Each pipe length shall be inspected and tested before being laid to ensure that it is sound and of good quality.

7.4.3. The pipe laying shall proceed upgrade; beginning at the lower end of the sewer, with the pipe bell ends facing upgrade.

- 7.4.4. Upon identification of any defective pipe which may have been installed, CONTRACTOR shall immediately act to remove and replace the damaged or defective material with sound pipe.
- 7.4.5. Extreme care shall be taken to keep the pipe in exact alignment and elevation.
- 7.4.6. Pipe shall be laid to conform accurately to the lines and grades indicated on the drawings.
- 7.4.7. CONTRACTOR assumes complete responsibility for locating all underground utilities in advance of construction, to ensure that no conflicts occur with the proposed line and grade.

- 7.4.7.1. Minor changes in alignment, but not the grade, shall be permitted to avoid unforeseen underground facilities only if approved by ENGINEER and REGIONAL UTILITIES, provided that straight alignment can be maintained between manholes.

- 7.4.7.2. If a conflict is discovered between an existing utility and the proposed grade, CONTRACTOR shall furnish ENGINEER all pertinent information, so that remedial design can be performed and approved by REGIONAL UTILITIES.

7.4.8. **SURVEYS AND GRADE STAKES**

- 7.4.8.1. CONTRACTOR is responsible for providing; protecting and the accuracy of all survey and grade stakes.

7.4.9. **LAYING AND JOINTING**

- 7.4.9.1. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
 - 7.4.9.2. The bedding shall be shaped to conform to the outside of the pipe.
 - 7.4.9.3. Suitable excavation shall be made to receive, where applicable, the bell of each pipe, which shall be carefully laid true to line and grade.
 - 7.4.9.4. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging or blocking up any portion of the pipe.
 - 7.4.9.5. The spigot end of each pipe shall not abut against the base of unevenness of any kind along the bottom halves of the pipe.

- 7.4.9.6. Prior to jointing the pipes, the mating ends shall be thoroughly cleaned of any debris, dirt, or foreign material.
 - 7.4.9.7. If the pipe is to be cut to length, it shall be cut and beveled per the MANUFACTURE's specifications.
 - 7.4.9.8. The pipe shall be adjoined in accordance with the recommendations from the MANUFACTURERS of the pipe and gaskets.
 - 7.4.9.9. In all jointing operations the trench must be dewatered when joints are made, unless otherwise approved in writing by ENGINEER, and kept dewatered until sufficient time has elapsed to assure efficient hardening of the jointing material, or as may be required.
 - 7.4.9.10. CONTRACTOR shall make all necessary precautions to prevent floatation of the pipe due to flooding in the trench.
 - 7.4.9.11. The pipe shall not be driven down to grade by striking it with the end of shovel, handle, timber, rammer, or other unyielding object.
 - 7.4.9.12. Openings such as stubs, tees or other services along the lines shall be securely closed by means of an approved gasketed leak proof STOPPER that fits into the bell of the pipe and is recommended by the pipe MANUFACTURER.
 - 7.4.9.12.1. This STOPPER shall be jointed in such a manner that it may be removed at some future time without injury to the pipe itself.
 - 7.4.9.13. At the close of each days work, and at other times when pipe is not being laid, the end of the pipe shall be temporarily closed with a close-fitting STOPPER approved by ENGINEER and REGIONAL UTILITIES.
- 7.4.10. **SERVICE CONNECTIONS**
- 7.4.10.1. All gravity sewer services shall be 6" diameter single services unless otherwise approved by REGIONAL UTILITIES.
 - 7.4.10.2. All service connections shall terminate at the property lines and no more than 3-feet from the property corners unless directed by REGIONAL UTILITIES.
 - 7.4.10.3. All service connections shall be constructed using solvent weld fittings. The solvent weld fittings shall start at the first fitting upstream of the tee wye.

- 7.4.10.4. All service connections shall terminate at the property line with a single stub up with a cleanout cap per the standard detail sheet.
- 7.4.10.5. Any service connection located in a paved area shall have a brass traffic rated cleanout cap installed.
- 7.4.10.6. All service connections shall be stubbed up at least 24-inches and no more than 36-inches above final grade.
- 7.4.10.7. Unless authorized by ENGINEER in writing, or shown on the drawings, service connections shall not be tied into new or existing manholes.

7.4.11. **MARKING SERVICE LINES**

- 7.4.11.1. An “S” shall be stamped, not cut, into the back or high part of the curb directly over each service line or in the street or sidewalk where no curb is available.
- 7.4.11.2. The stamp shall be at least 3-inches tall and ¼-inch deep.
- 7.4.11.3. CONTRACTOR shall be responsible for installing a green four-inch ball marker, part number 1404, as manufactured by 3m. The service ball shall be placed at the cleanout and no more than 36 inches deep.

7.4.12. **MANHOLE INSTALLATION**

7.4.12.1. **INSTALLING SECTIONS**

- 7.4.12.1.1. Precast concrete sections shall be set so the manhole shall be vertical and with sections in true alignment.
- 7.4.12.1.2. Joint surfaces of the base or previously set section shall have an o-ring installed in the recess or shall be sealed with approved premolded plastic joint sealer. Joints shall be pre-primed.

7.4.12.2. **NON-SHRINKING MORTAR**

- 7.4.12.2.1. All holes in sections used for their handling, all interior and exterior joints and the annular space between the wall and entering pipes shall be thoroughly plugged with an approved non-shrinking mortar, applied and cured in strict conformance with the MANUFACTURER’s recommendations so that there shall be zero leakage through openings around pipes.

7.4.12.2.2. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.

7.4.12.2.3. As soon as mortar is hydrated to the point where it shall not be marred by such application, and within two hours after installing mortar, CONTRACTOR shall install an approved membrane curing compound, conforming to AST C309, latest, to the finished mortar surface both inside and outside the manhole.

7.4.12.3. **GRADE ADJUSTMENT**

7.4.12.3.1. For grade adjustment in setting the manhole frame, brick masonry or precast concrete adjustment rings shall be used on top of manhole slabs and precast concrete manhole cones in accordance with the drawings.

7.4.12.3.2. Mortar shall be one part cement and two parts sand; lime shall not be used.

7.4.12.3.3. I&I Barrier shall be installed above top section of manhole and below cover. Barrier will sit on the top section with precast concrete adjustments rings around the outside adjusted to finished grade.

7.4.12.4. **SETTING MANHOLE FRAMES**

7.4.12.4.1. Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the contract drawings, unless otherwise directed by ENGINEER.

7.4.12.4.2. Frames on manhole cones shall be set concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame shall be completely filled and made watertight.

7.4.12.4.3. A ring of mortar at least one inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend to the outer edge of the masonry and shall be finished smooth and flush with the top of the flange.

7.4.12.5. **FLOW CHANNELS IN MANHOLE BASE**

- 7.4.12.5.1. Shall be conformed of Class C concrete and/or brick rubble and mortar while the manholes are under construction.
- 7.4.12.5.2. Cut off pipes at inside face of the manholes and construct the invert to the shape and sizes of the pipe indicated. All inverts shall follow the grades of the pipe entering the manhole.
- 7.4.12.5.3. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest radius possible, which is tangent to the centerline of adjoining pipelines.
- 7.4.12.5.4. Flow channels shall be at least 8-inches wide so that a sewer camera can pass through the channel.

7.4.12.6. **CONCRETE MANHOLE BOOTS**

- 7.4.12.6.1. Precast concrete manholes shall have leak-proof boots installed where pipes enter or exit.
- 7.4.12.6.2. The boots shall be watertight and shall allow for a limited amount of differential settlement.
- 7.4.12.6.3. All boot bands, bolts, etc. shall be stainless steel.

7.4.13. **STUB-OUTS**

- 7.4.13.1. Where shown on the drawings, stub-outs shall be provided for the connection of future sewer lines to manholes.
- 7.4.13.2. The end of each stub-out shall be provided with a bell and which shall be closed by an approved stopper as specified herein before.
- 7.4.13.3. Each stub-out shall be accurately referenced to the center of the manhole, and the actual invert elevation of each end of the stub-out shall be accurately recorded on the as-built drawings.

7.4.14. **BEDDING AND BACKFILL**

- 7.4.14.1. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury or movement.

7.4.14.2. Where so indicated on the drawings, or directed by ENGINEER or REGIONAL UTILITIES, the pipe shall be supported by compacted granular fill or concrete cradle or encasing according to the applicable detail shown on the plans.

7.4.14.3. Pipe bedded in compacted granular fill shall not be supported on blocking, wedges, bricks, or anything except the bedding material. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or precast concrete saddles which shall become part of the completed cradle or encasement.

7.4.14.4. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

7.5. CLEANING AND FLUSHING

7.5.1. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing materials into the pipelines.

7.5.2. As the work progresses, the interior of the sewer shall be cleaned of all dirt, jointing material, and superfluous materials of every description.

7.5.3. CONTRACTOR shall flush all sewer lines constructed with clean water prior to a final inspection to assure complete removal of all debris and foreign material, and to the satisfaction of ENGINEER and REGIONAL UTILITIES.

7.5.4. A visual inspection and approval by REGIONAL UTILITIES shall be required.

7.6. FIELD TESTING

7.6.1. All work constructed shall be subject to visual and internal television inspections for faults or defects and any other deviations or omissions shall be corrected at once.

7.6.2. All tests shall be made by CONTRACTOR who shall provide any necessary equipment for testing and televising the system as directed by REGIONAL UTILITIES.

7.6.3. All costs for testing defined within, but not limited to, this section shall be the responsibility of CONTRACTOR.

7.6.4. AIR TEST

7.6.4.1. Air testing of the gravity sewer system shall comply with standard ASTM F-1417 for plastic pipe.

7.6.5. CAMERA INSPECTION

- 7.6.5.1. All gravity sewer mains and service laterals shall be camera inspected by a qualified third party camera inspector. Camera inspections shall be witnessed by REGIONAL UTILITIES. Camera inspections performed by the contractor installing the pipe shall not be accepted if REGIONAL UTILITIES cannot witness.
 - 7.6.5.1.1. Camera Inspection shall be scheduled with REGIONAL UTILITIES at least five working days prior to the inspection.
- 7.6.5.2. Camera inspection shall be just before final paving and after all underground utilities (conduit, gas mains) have been installed but prior to FDEP certification.
 - 7.6.5.2.1. It is recommended that the CONTRACTOR perform a preliminary camera inspection immediately after installation to identify any issues and make repairs under the ENGINEER's direction. CONTRACTOR and ENGINEER shall consult with REGIONAL UTILITIES about any issues found in the preliminary inspection.
 - 7.6.5.2.2. Gravity mains and laterals shall not contain bellies that hold more than ½-inch of water.
 - 7.6.5.2.3. All joints and fittings shall have no leaks visible.
- 7.6.5.3. Contractor shall provide a color video, DVD format or USB Flash Drive, recording of all footage televised.
 - 7.6.5.3.1. Video equipment used shall CLEARLY show all pipe and joints being inspected. Any pipe or fittings not clearly shown shall be rejected.
 - 7.6.5.3.2. The speed of the camera shall not exceed 30-feet per minute.
- 7.6.5.4. Video equipment shall include on-screen character generation showing the following information.
 - 7.6.5.4.1. Location of camera at all times, in reference to beginning manhole.
 - 7.6.5.4.2. Location of entry manhole and sewer line being examined

7.6.5.4.3. Date of examination

- 7.6.5.5. Gravity mains and service laterals shall be jetted and clean from debris and mud prior to inspection.
- 7.6.5.6. Gravity mains shall be inspected upstream so that each joint can be clearly viewed.
- 7.6.5.7. Camera inspection shall require water to be introduced to the laterals and mains prior to the inspections to highlight deformities.
- 7.6.5.8. Water shall be added to the laterals and mains at least 2 hours but no more than 24 hours prior to inspection and must be witnessed by REGIONAL UTILITIES.
- 7.6.5.9. A minimum of 500 gallons shall be added to the main lines.

7.6.5.9.1. A minimum of 10 gallons shall be added to each lateral.

- 7.6.5.10. Upon completion, each section of sewer lines shall show a straight run, free of structural defects and joint misalignment between manholes.

7.6.5.10.1. At the beginning of each main inspection, a light shall be flashed from the next manhole back towards the camera for a minimum of 15 seconds to highlight any deformities.

- 7.6.5.11. Videos of gravity mains shall be labeled from manhole to manhole in accordance with the approved set construction plans. Video file names that are not properly labeled shall be rejected.
- 7.6.5.12. Videos of service laterals shall be labeled to match the approved set of construction plans. Video file names that are not properly labeled shall be rejected.
- 7.6.5.13. Camera operator shall supply a written report identifying any issues or certifying the system has passed inspection. Video submittals without written reports shall be rejected.

7.6.6. **MANHOLE TESTING**

- 7.6.6.1. Vacuum Testing (Manholes) – The vacuum test shall be performed on manholes, completely constructed, with inlet and outlet pipes in place. Test shall be conducted before any backfilling begins. Any material around the base section shall be removed to expose the entire side of the manhole. Plug pinholes and horizontal seams with a non-shrinking mortar.

- 7.6.6.2. Brace the inlet and outlet pipes/plugs to prevent movement during the test. Use air inflated plugs in good condition.
- 7.6.6.3. The vacuum test shall be performed using equipment approved by the ENGINEER. The equipment shall be in good operating condition. No gauges are to have any broken glass or other visible abnormalities. The test shall be performed by trained personnel familiar with the equipment and the test.
- 7.6.6.4. The test shall have a minimum duration of two minutes (dependent on manhole depth, see 7.6.5.5 below. The vacuum shall be pumped down to 10 inches (250 mm) of mercury on an approved gauge, and held. At the time the removal of air is stopped, the test time shall begin.
- 7.6.6.5. Any manhole that has a vacuum drop to nine inches (225 mm) of mercury or less, within the following time intervals, shall have failed the test.
 - 0 – 10 ft. deep: less than 2 minutes.
 - 10 ft. – 15 ft. deep: less than 2-1/2 minutes.
 - 15 ft. – 20 ft. deep: less than 3 minutes.
- 7.6.6.6. Manhole vacuum test shall be per ASTM C-1244.
- 7.6.7. **DEFLECTION TEST**
 - 7.6.7.1. All PVC pipe shall be inspected for deflection.
 - 7.6.7.2. Maximum allowable deflection shall be equal to 5%, or manufactures recommendations, whichever is less.
 - 7.6.7.3. REGIONAL UTILITIES may require verification of compliance with this deflection test by requiring a mandrel at 95% of pipe inside diameter be pulled through the installed pipeline.

7.7. WARRANTY

- 7.7.1. CONTRACTOR shall provide a warranty on installation and workmanship for no less than one year from the date of FDEP certification.

7.8. AS-BUILT SEWER PLANS

- 7.8.1. CONTRACTOR shall provide as built plans to REGIONAL UTILITIES in accordance with Section 2.0 of this specification.

SECTION 8

SEWER - FORCE MAINS & APPURTENANCES

SECTION 8 – SEWER - FORCE MAINS AND APPURTENANCES

8.1. SCOPE

- 8.1.1. This section contains standard specifications for use in the design and construction of SEWAGE FORCE MAINS AND APPURTENANCES as required by REGIONAL UTILITIES.
- 8.1.2. CONTRACTOR shall furnish and install sewage force main piping system, valves and vents complete, tested and ready for operation.

8.2. GENERAL REQUIREMENTS:

- 8.2.1. All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and the specifications.
- 8.2.2. CONTRACTOR shall submit to ENGINEER and REGIONAL UTILITIES for approval before work begins, certificates of inspections in triplicate from the pipe MANUFACTURER that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 8.2.3. All pipe and fittings shall be clearly marked with the name of the MANUFACTURER, the batch number, the location of the plant, strength designation and pressure rating.
- 8.2.4. It shall be the responsibility of CONTRACTOR to keep extra fittings on hand to make vertical and/or horizontal adjustments as a result of unknown interferences to avoid unnecessary delays to the project.
- 8.2.5. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES.
- 8.2.6. Water for testing shall be furnished by CONTRACTOR.
- 8.2.7. See Section 3 and 4 of this specification for “*Excavation and Backfill*” and “*Dewatering*.”
- 8.2.8. All herein referenced standards shall be the latest edition or revision.
- 8.2.9. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.
- 8.2.10. All valves shall be Dezurik Plug Valves, except tapping valves which shall be manufactured by American Flow Control.

8.2.11. All materials shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

8.2.12. Unless otherwise indicated on the drawings, pipe materials for force main shall be as follows:

8.2.12.1. PVC Class 200, SDR 21 for pipes 2" up to 12" in diameter.

8.2.12.2. PVC DR 25, C905 165psi for pipes 14" in diameter and larger

8.2.12.3. Ductile iron fittings shall be used for PVC pipe 3 inches and larger.

8.2.12.3.1. 90-degree fittings shall not be used except in the lift station valve vault.

8.2.12.4. Solvent weld fittings shall be used for PVC pipe 2 inches and smaller.

8.2.13. The entire product of any MANUFACTURER or of any one plant may be rejected when, in the opinion of ENGINEER or REGIONAL UTILITIES, the methods of MANUFACTURER fail to secure uniform results acceptable to the requirements of these specifications

8.2.14. All pipe and fittings shall be subject to the inspection at time of delivery and also in the field just prior to installation.

8.2.15. All pipe and fittings which in the opinion of ENGINEER or REGIONAL UTILITIES do not conform to these specifications shall be rejected and shall be removed by CONTRACTOR.

8.2.15.1. Pipes crossing ditches, culverts, rivers, creeks, etc., shall be considered as buried pipe.

8.3. **MATERIALS**

8.3.1. **MATERIAL SPECIFICATIONS**

8.3.1.1. Pipe material shall be tested in and for conformity with the latest editions of the following:

<u>ITEM</u>	<u>SPECIFICATIONS</u>	<u>NUMBER OF TEST</u>
DUCTILE IRON PIPE AND FITTINGS	ANSI A21.50 (AWWA C150) ANSI A21.51 (AWWA C151) ANSI A21.10 (AWWA C110)	Sworn Statement

POLYVINYL
CHLORIDE PIPE

ASTM D-1598
ASTM D-1599
ASTM D-1784
ASTM D-2122
ASTM D-2241
ASTM D-2837
PS-22-70

Sworn Statement

8.3.2. POLYVINYL CHLORIDE (PVC)

- 8.3.2.1. Pipe shall be virgin Polyvinyl Chloride (PVC) pipe for and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 8.3.2.2. The pipe material shall be clean, virgin, NSF approved class 12454-0A or 12454-B PVC compound conforming to ASTM resin specification D-1784.
- 8.3.2.3. The pipe shall be tested at levels meeting the requirements of the U.S. department of commerce public standard 22-70, and shall conform to the physical standards and specifications of the plastic pipe institute.
- 8.3.2.4. The pipe shall be designed for a hydrostatic working pressure of 160 psi at 73.4 degrees Fahrenheit and to pass without failure sustained pressure of 340-psi minimum when tested in accordance with ASTM D-1598 and for a quick burst test of 500-psi minimum when tested in accordance with ASTM D-159a.
- 8.3.2.5. Pipe shall conform to ASTM D-2241-latest, for use in sizes 4 inches up to and including 12 inches in diameter.
- 8.3.2.6. The pipe shall be of the “bell ring” type.
- 8.3.2.7. Pipe shall be manufactured in I.P.S. (steel) standard pipe equivalent outside diameters.
- 8.3.2.8. Pipe shall be green in color.

8.3.3. HIGH DENSITY POLYETHYLENE PIPE (HDPE)

- 8.3.3.1. Pipe shall be DR11.
- 8.3.3.2. HDPE pipe for sewer force main use shall conform to AWWA C-901 (up to 3”) and AWWA C-906 (4” and larger).

- 8.3.3.3. HDPE pipe for force main system use shall be PE 3608 meeting cell classification PE445574C per ASTM D3035 and NSF 14.
- 8.3.3.4. Pipe shall be manufactured in accordance with ASTM F714 and shall be so marked.
- 8.3.3.5. All pipe joints shall be heat fused in accordance with the recommended procedures of the pipe MANUFACTURER and by a qualified heat fusing equipment operator. Refer to section 2 for requirements.
- 8.3.3.6. Transitions to other types of pipe shall be by fused end transitions.
- 8.3.3.7. Mechanical joint transitions with HDPE pipe stiffeners shall not be allowed.
- 8.3.3.8. All pipe shall be as manufactured by Performance Pipe or approved equal.

8.3.4. **DUCTILE IRON, CLASS 350**

- 8.3.4.1. Pipe shall be ductile iron manufactured in accordance with the requirements of ANSI.
- 8.3.4.2. Pipe shall be Protecto 401 ceramic epoxy coated inside and out.
- 8.3.4.3. Push-on joints and mechanical joints for such pipes shall be in accordance with ANSI/AWWA C111/A21.11.
- 8.3.4.4. Pipe shall be manufactured by American or written approved equal Class 350.
- 8.3.4.5. Fittings shall be ductile iron and in accordance with the requirements of ANSI/AWWA C153/A21.53, and ANSI/AWWA C110/A21.10.
- 8.3.4.6. Pipe fittings shall have seal coating, where applicable, in accordance with ANSI/AWWA C104/A21.4.
- 8.3.4.7. Mechanical joints shall conform to ANSI/AWWA C111/A21.11. .

8.3.5. **FITTINGS**

- 8.3.5.1. Ductile iron fittings and special castings shall conform to the type for pipe being installed and have a minimum working pressure of 350 psi.

- 8.3.5.2. Fittings shall conform to ANSI specification A21.10 (AWWA C110) latest.
- 8.3.5.3. Fittings shall be of DOMESTIC ORIGIN (American Made).
- 8.3.5.4. Short body pattern fittings shall normally be installed.
- 8.3.5.5. Long body fittings shall be used where the drawings specifically call for long body fittings or at the option of CONTRACTOR when the laying length is not controlled by short body patterns.
- 8.3.5.6. Fittings shall be mechanical joint fittings unless otherwise specified or indicated on the drawings.
- 8.3.5.7. Restraint type mechanical joint retainer glands shall be used on all mechanical joints. These shall be mega-lug restraints or approved equal.
- 8.3.5.8. Joint Restraints shall be used on all joints located in paved areas.

8.3.6. **JOINTS**

- 8.3.6.1. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring installed in strict accordance with the pipe manufacture's recommendations.
- 8.3.6.2. Sealing rings shall be in conformance with ASTM F477.
- 8.3.6.3. All bolts, nuts, studs and other uncoated parts of joints for underground installation shall be 316 stainless steel.

8.3.7. **LININGS AND COATINGS**

- 8.3.7.1. All ductile iron pipe, fittings and specials for sewer use shall have an exterior coating of and shall be lined with Protecto 401 Ceramic Epoxy or equal.

8.4. **INSTALLATION**

- 8.4.1. Force mains shall be constructed of the materials specified and as shown on the drawings.
- 8.4.2. Pipe shall be laid with spigot ends pointing in the direction of flow.

- 8.4.3. Each section of pipe shall rest on the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints.
- 8.4.4. Any pipe which has its grade or joint disturbed after lying shall be taken up and relayed.
- 8.4.5. No pipe shall be laid when the trench conditions or weather is unsuitable for such work, except by permission by REGIONAL UTILITIES.
- 8.4.6. Pipe fittings shall be carefully handled to avoid damage, and if feasible while they are suspended over the trench before lowering they shall be inspected to detect defects and cracks.
- 8.4.7. Defective, damaged, or unsound pipe or fittings shall be rejected. Any section of pipe already laid, which is found to be defective or damaged, shall be replaced.

8.4.8. **SURVEYS AND GRADE STAKES:**

- 8.4.8.1. CONTRACTOR shall be responsible for setting grade stakes, lines, and levels.
- 8.4.8.2. CONTRACTOR or Contractor's surveyor shall provide centerline of construction and shall establish a benchmark.
- 8.4.8.3. Any reference points, points of intersections, property corners, or bench marks, which are disturbed during construction, shall be restored by a land surveyor registered to practice in the State of Florida, and all cost thereof shall be borne of CONTRACTOR.
- 8.4.8.4. CONTRACTOR shall assume all responsibility for the correctness of the grade and alignment stakes.

8.4.9. **PIPE BEDDING**

- 8.4.9.1. Pipe bedding shall be in accordance with Section 3.0 of this specification and REGIONAL UTILITIES Standard Pressure Sewer Detail Sheet S-1

8.4.10. **PIPE COVER**

- 8.4.10.1. The minimum cover over all piping shall not be less than 36 inches except where specifically shown on the construction drawings and approved by REGIONAL UTILITIES.

- 8.4.10.2. The maximum cover over all piping shall not be greater than 48 inches except where specifically shown on the construction drawings and approved by REGIONAL UTILITIES.

8.4.11. THRUST BLOCKING

- 8.4.11.1. Suitable concrete reaction or THRUST BLOCKING shall be applied on all pressure pipe lines (except for those having screwed or flanged joints) at all tees, plugs, caps, and at bends deflecting 22-1/2 degrees or more.
- 8.4.11.2. Concrete used for THRUST BLOCKS shall be 2,500-psi minimum.
- 8.4.11.3. Schedule and details for required thrust blocks are included on REGIONAL UTILITIES standard details and shall be required as part of the approved drawings.
- 8.4.11.4. All mechanical joint fittings shall have restraint type mechanical joint retainer glands.

8.4.12. TAPS

- 8.4.12.1. REGIONAL UTILITIES shall perform all taps greater than 2" in diameter.
- 8.4.12.2. CONTRACTOR shall perform all taps 2-inches diameter and less.
- 8.4.12.3. A representative of REGIONAL UTILITIES must be onsite prior to performing any and all taps.
- 8.4.12.4. CONTRACTOR shall provide at least five working days' notice to REGIONAL UTILITIES prior to performing the work.
- 8.4.12.5. At the time the line is to be tapped, it shall be the responsibility of CONTRACTOR to ensure that the tapping sleeve and valve is pressurized and can sustain the pressure test (See Section 8.6 for this specification).
- 8.4.12.6. In the event the line has not been tested prior to the arrival of REGIONAL UTILITIES at the job site, there shall be a \$50.00 service charge added to the cost of the tap and the tap shall be rescheduled. Should CONTRACTOR prefer REGIONAL UTILITIES to remain on-site in preparation for the work, a service charge equal to \$50.00 an hour shall apply so long as REGIONAL UTILITIES is on-site.

- 8.4.12.7. All taps EQUAL TO OR GREATER THAN 4" IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SLEEVE and associated tapping valve.
- 8.4.12.7.1. The TAPPING SLEEVE and gland shall be Stainless Steel Wraparound "Fast Style", and shall be as manufactured by FORD METER CO. or APPROVED EQUAL and shall be furnished complete with all necessary accessories.
- 8.4.12.7.2. The TAPPING SLEEVE shall have a working pressure rating of 200 psi for sizes 4" through 12" and 150 psi for sizes 14" and larger, and shall conform to the applicable sections of AWWA Standard C110 of latest revision.
- 8.4.12.7.3. The TAPPING SLEEVE shall be of the split type for assembly on the pipe and the sleeve shall be sized for use with all classes of cast iron pipe.
- 8.4.12.7.4. The outlet flange shall be Class 125 Standard, with recess for standard tapping valves.
- 8.4.12.8. All taps 3-INCH AND SMALLER IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SADDLE and associated corporation stop.
- 8.4.12.8.1. The TAPPING SADDLE shall be Fusion Bonded Epoxy Coated, and shall be an FS202 with a stainless steel as manufactured by FORD METER CO. or APPROVED EQUAL and shall be furnished complete with all necessary accessories.
- 8.4.12.9. The excavated area in which the tap shall be made must be a minimum of 4" below the bottom of the valve, at least seven feet in length and able to accommodate two people working.
- 8.4.12.10. The area where the tap shall be made must be completely dry. It is the responsibility of CONTRACTOR to pursue all means necessary to dewater the area in which the tap is to be made.
- 8.4.12.11. TAPPING VALVES shall meet all the requirements of Section 6.3.1 of this specification and shall be a mechanical joint outlet by tapping flange with a raised inner lip for alignment with the tapping sleeve.

8.4.13. LOW PRESSURE SERVICE CONNECTIONS (2-INCH & LESS)

- 8.4.13.1. Low pressure service connections shall conform to the detail as shown on REGIONAL UTILITIES' Standard Pressure Sewer Detail Sheet PS-1.

8.5. CLEANING AND FLUSHING

- 8.5.1. Prior to pressure testing, all force mains shall be flushed out to remove air from the lines.
- 8.5.2. At the time of flushing the line CONTRACTOR shall be responsible for having a flush point opened and shall be responsible for where the water is to be dispersed.

8.6. FIELD TESTING

- 8.6.1. All piping to be operated under liquid pressure shall be tested in sections of approved length.
- 8.6.2. All field tests shall be made in the presence of ENGINEER and REGIONAL UTILITIES.
- 8.6.3. Pipelines laid in excavations other than trench excavations or pipelines embedded in concrete, shall be tested prior to backfilling of the excavated material or placing of the concrete.
- 8.6.4. Hydrostatic testing shall consist of a pressure test.
- 8.6.5. For this test, CONTRACTOR shall furnish clean water, suitable temporary testing plugs and other necessary equipment and all labor required.
- 8.6.5.1. In no case shall CONTRACTOR connect the force main to any water main to obtain water for testing.
- 8.6.5.2. Water may be obtained via a jumper meter with a RPZ and there shall be an AIR GAP between the two mains.
- 8.6.5.3. Water must be re-pumped from a holding tank into the force main so as to eliminate any cross-connection or potential backflow.
- 8.6.6. Pressure tests shall be of 2-hour duration at 120 psi, unless specified otherwise or notified in writing by REGIONAL UTILITIES.
- 8.6.7. Pressure tests shall be conducted with a pressure loss of not more than 2 psi regardless of length of pipe being tested.

- 8.6.8. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If hydrants, blow offs, or other outlets are not available at high points for releasing air, CONTRACTOR shall make the temporary taps at such points and shall plug said holes after completion of tests.
- 8.6.9. Specified test pressures shall be applied by means of a pump connected to the pipe in a manner satisfactory to REGIONAL UTILITIES.
- 8.6.10. The pump, pipe connection, and all necessary apparatus, including the proper gauges, shall be furnished by CONTRACTOR and shall be subject to the approval of ENGINEER and REGIONAL UTILITIES.
- 8.6.11. Pressure gauges shall be calibrated by an approved testing laboratory, with increments no greater than 2 psi.
- 8.6.12. Gauges used shall be of such size that pressures tested shall not register less than 10% nor more than 90% of the gauge capacity.
- 8.6.13. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be performed until it is satisfactory.
- 8.6.14. In the event a section fails to pass the test, CONTRACTOR shall do everything possible to locate, uncover (even to the extent of uncovering the entire section), and repair or replace the defective pipe, fitting, or joint.
- 8.6.15. Visible leaks shall be corrected regardless of test results.
- 8.6.16. Lines shall be repaired and retested as necessary until test requirements are achieved.

8.7. WARRANTY

- 8.7.1. CONTRACTOR shall provide a warranty on installation and workmanship for no less than one year from the date of FDEP certification.

SECTION 9

SEWER - NONCLOG PUMP STATIONS

SECTION 9 – SEWER - NONCLOG PUMP STATIONS

9.1. SCOPE

9.1.1. This section contains standard specifications for use in the design and construction of SUBMERSIBLE SEWAGE NON-CLOG PUMP STATIONS as required by REGIONAL UTILITIES.

9.1.2. CONTRACTOR shall furnish and install all WET WELLS, PUMPS, VALVES, ELECTRICAL COMPONENTS AND CONTROL PANELS and all other LABOR, TESTING AND EQUIPMENT necessary to complete an operational PUMP STATION.

9.2. GENERAL REQUIREMENTS:

9.2.1. All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and the specifications.

9.2.2. CONTRACTOR shall submit to ENGINEER OF RECORD and REGIONAL UTILITIES for approval before work begins, certificates of inspections in triplicate from the SUBCONTRACTOR that the materials supplied have been inspected at the respective places of fabrication and meet the requirements of these specifications.

9.2.3. All materials including, but not limited to, concrete structures, pumps, pipes, valves, fittings, lids, panels and electrical equipment shall be clearly marked with the name of the MANUFACTURER, batch/serial number, strength/capacity designation and/or pressure rating.

9.2.4. It shall be the responsibility of CONTRACTOR to keep extra fittings on site to make vertical and/or horizontal adjustments as a result of unknown interferences so as to avoid any unnecessary delays to the project.

9.2.5. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES.

9.2.6. All SUBMERSIBLE PUMPS shall be manufactured by Wilo EMU

9.2.7. In order to insure proper performance and compatibility of interacting components within these specifications; all submersible pumps, control panels, access frames, guide rails, and lifting systems shall be the product of one MANUFACTURER or furnished by the SUBMERSIBLE NON-CLOG PUMP MANUFACTURER for sole source responsibility.

9.2.8. Water for testing shall be furnished by CONTRACTOR.

- 9.2.9. All hardware associated with the lift station shall be 316 stainless steel.
- 9.2.10. See Section 3.0 and 4.0 of this specification for “*Excavation and Backfill Procedures*” and “*Dewatering Procedures.*”
- 9.2.11. All herein referenced standards shall be the latest edition or revision.

9.3. **MATERIALS**

9.3.1. **WET WELL**

- 9.3.1.1. All NON-CLOG PUMP STATIONS located in a public and/or FDOT Right-of-Way must be designed and constructed of reinforced concrete as per detail drawing LS-1.
- 9.3.1.2. Regional Utilities requires that all lift stations are constructed as per these specifications and detail drawing LS-1.
- 9.3.1.3. WET WELLS shall meet the latest requirements of ASTM C478 *Specification for Precast Reinforced Concrete Manhole Sections.*
- 9.3.1.4. Minimum wall thickness shall be seven inches.
- 9.3.1.5. Cement shall meet the latest requirements of ASTM C 150 *Specification for Portland Cement, TYPE II.*
- 9.3.1.6. Minimum concrete strength shall 4000 PSI at 28 days.
- 9.3.1.7. The required minimum strength of concrete shall be confirmed by making and testing four standard cylinders at seven (7) days and at (28) days. The test results shall be submitted to the ENGINEER prior to any manhole being installed.
- 9.3.1.8. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations.
- 9.3.1.9. Openings shall be adequately sealed with water tight boots or approved non-shrinking grout, applied and cured in strict conformance with the MANUFACTURERs recommendations so that there shall be zero leakage around pipes and joints.
- 9.3.1.10. Approval of ENGINEER and REGIONAL UTILITIES shall be obtained before placing any order for manholes.

9.3.1.11. **BASES**

- 9.3.1.11.1. WET WELL BASES shall be cast integrally with the bottom manhole section.
- 9.3.1.11.2. The base section shall be set in a 12-inch leveling course of #4 or #57 stone with filter fabric above and below the stone, extending at least 12-inches outside the base.
- 9.3.1.11.3. In order to permit adjustment of the precast base section and insure full bearing on the leveling course, said section shall be placed just prior to initial set.

9.3.1.12. **JOINTS**

- 9.3.1.12.1. Joint contact surfaces shall be formed with machine castings; they shall be exactly parallel with a 2 degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an “o” ring rubber gasket, conforming to the latest edition of C443, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gasket or Pre-Molded Plastic Joint Sealer with Joints Pre-Primed.
- 9.3.1.12.2. Each joint shall be grouted on the inside with approved grouting materials.

9.3.1.13. **HATCH**

- 9.3.1.13.1. CONTRACTOR shall furnish and install one access door on wet well.
- 9.3.1.13.2. The access door shall be Type ASP300 as manufactured by U.S. Foundry and Manufacturing Corp., Miami, FL with the size being at least 48-inch x 36-inch.
- 9.3.1.13.3. Door leaf shall be .250” thick aluminum floor plate reinforced to 300 p.s.f. live load.
- 9.3.1.13.4. The access door shall be equipped with a flush aluminum drop handle which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle.
- 9.3.1.13.5. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place.

9.3.1.13.6. For security, the access door shall be equipped with a staple for padlock.

9.3.1.13.7. Access door shall be furnished with mill finish.

9.3.1.13.8. The frame shall be extruded aluminum with an integral anchor flange and seat.

9.3.1.14. **EXTERIOR COATING**

9.3.1.14.1. The exterior surface shall be given two (2) coats of KOP-COAT COAL TAR EPOXY 300-M, 9 MILS each.

9.3.1.14.2. The waterproofing materials shall be applied by brush or spray and in accordance with the instructions of the MANUFACTURER.

9.3.1.14.3. Time shall be allowed between each coat to permit sufficient drying so that the application of the second coat has no effect on the first coat.

9.3.1.14.4. The paint shall be applied at the place of fabrication.

9.3.1.14.5. Additional coating or touch up work shall be required after WET WELL installation if so directed by ENGINEER and/or REGIONAL UTILITIES.

9.3.1.15. All hardware associated with the lift station shall be 316 stainless steel.

9.3.2. **VALVE VAULTS**

9.3.2.1. Refer to section 9.3.1 for concrete specifications.

9.3.2.2. Valve Vault shall be coated inside and out with KOP-COAT COAL TAR EPOXY 300-M at (2) coats at 9 MILS each.

9.3.2.3. Valve vault shall use same type of hatch used for wet well.

9.3.2.4. Valve vault shall be sized accordingly to allow room for workers and tools.

9.3.3. VALVES AND FITTINGS

- 9.3.3.1. Refer to section 8 of this document and detail drawing LS-1 for specifications on valves and fittings.

9.3.4. SUBMERSIBLE NON-CLOG PUMP

- 9.3.4.1. All SUBMERSIBLE NON-CLOG PUMPS shall be *Wilo EMU Model FA Pumps*.
- 9.3.4.2. The NON-CLOG PUMPS shall be designed and constructed to pump sewage, storm water, sludge, and other water based liquids without injurious damage during operation.
- 9.3.4.3. The NON-CLOG PUMPS shall be capable of passing 3-inch diameter solid non-deformable without clogging.
- 9.3.4.4. The NON-CLOG PUMPS shall be designed for continuous operation under submerged conditions without leakage to a depth of up to 65 feet.
- 9.3.4.5. The NON-CLOG PUMP design shall be such that the lifting cover, stator housing, and volute casing are constructed of ASTM A48, Class 30, gray cast iron.
- 9.3.4.5.1. The volute shall be of centerline discharge design and shall be fitted with ANSI 125 pound compatible discharge flange which shall be capable of withstanding 150% of the pump shutoff head in accordance with the Hydraulic Institute Standards.
- 9.3.4.5.2. The interfaces between the major castings shall be machined for metal contact and shall be additionally protected with circular cross section Buna-N o-rings.
- 9.3.4.5.3. All the nuts, bolts, washers and other fastening devices shall be constructed of type 316 stainless steel.
- 9.3.4.5.4. All exposed surfaces of the castings shall be coated with a single coat of PVC type varnish that is resistant to sewage.
- 9.3.4.6. The NON-CLOG PUMP impeller, both statically and dynamically balanced, shall be of double shrouded non-clog design having smooth surfaces and free from acute angles in the flow path.

- 9.3.4.6.1. The NON-CLOG PUMP impeller shall be constructed of ASTM A339 ductile cast iron.
- 9.3.4.6.2. The NON-CLOG PUMP impeller and volute both shall be equipped with AISI type 316 stainless steel wear rings that are heat treated to differing Brinell hardness to prevent friction welding.
- 9.3.4.6.3. Pump-out vanes shall be located on the backside of the NON-CLOG PUMP impeller to help reduce pressure on the lower mechanical seal.

9.3.5. **MOTOR**

- 9.3.5.1. The motor shall be designed with a service factor of 1.25 over and above the nameplate horsepower as standard.
- 9.3.5.2. The motor shall be warranted for ten (10) evenly spaced starts per hour when used with across the line starters, and unlimited starts per hour when used with variable frequency drives or soft start starters.

9.3.6. **PUMP GUIDE RAIL**

- 9.3.6.1. Furnish a minimum of one (1) GUIDE RAIL for each pump to permit raising and lowering.
 - 9.3.6.1.1. The GUIDE RAIL shall be constructed of type 316L stainless steel that shall reach from the top of the discharge elbow to the upper guide rail holder on the access frame or on the vertical face of the concrete opening.
 - 9.3.6.1.2. The single GUIDE RAIL system shall be supplied by the pump manufacturer.
 - 9.3.6.1.3. GUIDE RAILS that are longer than 15 feet shall have a cross brace system installed for support.

9.3.7. **PUMP POWER & CONTROL CABLES**

- 9.3.7.1. The power supply shall be: 120/208/240 volt, DELTA 3 phase, 4 wire, 60 hertz for pumps up to 25 hp.
- 9.3.7.2. The power supply shall be 277/480 volt, 3 phase, wye, 60 hertz for pumps over 25 hp with soft starts.

- 9.3.7.3. Soft starts are acceptable for 20 hp pumps and larger.
- 9.3.7.4. The power and control cables shall enter the motor housing through an isolated chamber that is completely isolated from the oil filled stator chamber.
- 9.3.7.5. The Hypalon power and control cable jackets shall be sealed via a compressible Buna-N grommet flanked by washers forming the first isolation point of the assembly.
- 9.3.7.6. The cables shall be terminated on the individually o-ringed brass terminal lugs of the terminal board thereby sealing the cable entry chamber completely from the stator housing to the extent that any and all moisture that happens to find its way into the cable entry chamber is trapped there.
- 9.3.7.7. The terminal board is designed to short out in the event that moisture has found its way into the cable entry chamber thus signaling that the motor must have service without the costly complete overhaul that occurs with pumps that do not have isolated terminal boards.
- 9.3.8. **PUMP POWER & CONTROL PANEL**
 - 9.3.8.1. Monitoring and control system to be designed to function with pumping units and to be factory wired and tested.
 - 9.3.8.2. Primary control system shall be by RELAY LOGIC using Float Level Switches.
 - 9.3.8.2.1. The FIRST LEVEL SWITCH (lowest) stops the lead pump and the lag pump if it is energized, when the level drops below this point, and triggers the alternator.
 - 9.3.8.2.2. The SECOND LEVEL SWITCH (lead) starts one pump as the liquid rises to close this circuit. Which pump starts at this level is determined by the alternator.
 - 9.3.8.2.3. The THIRD LEVEL SWITCH (lag) causes both pumps to run as the liquid level rises to this point.
 - 9.3.8.2.4. The FOURTH LEVEL SWITCH (highest) illuminates the alarm indicator.
 - 9.3.8.2.5.
 - 9.3.8.3. ALL panels shall come constructed and pre-wired to use both RELAY LOGIC and a DATA FLOW telemetry unit if so desired.

- 9.3.8.4. Each panel shall be supplied with an electrical schematic permanently fastened to the inside of the enclosure door.
- 9.3.8.5. All internal wiring shall be neat and concealed in 1" x 2" tall white wire way.
 - 9.3.8.5.1. Control wiring shall be red 14-gauge minimum.
 - 9.3.8.5.2. Power shall be black 10-gauge minimum.
 - 9.3.8.5.3. Neutral wiring shall be white.
 - 9.3.8.5.4. Ground wiring shall be green.
 - 9.3.8.5.5. Each wire shall terminate in screw or lug terminal connection.
- 9.3.8.6. Every panel shall be tested to perform as designed through the entire sequence of operation before it leaves the factory.
- 9.3.8.7. Every panel shall include a permanent sticker that is signed by the person who built, wired, and tested the panel.
- 9.3.8.8. ENCLOSURE
 - 9.3.8.8.1. Shall be a NEMA 4X 316 stainless steel construction to provide protection against rain, sleet and snow.
 - 9.3.8.8.2. Door shall be fastened securely with pad-lockable stainless steel draw latches, spring loaded for smoother action.
 - 9.3.8.8.3. Standard size shall be 36" high x 24" wide and 10" deep unless larger panel is warranted by component sizes or heat generation considerations.
 - 9.3.8.8.4. Control panel shall have an air gap installed by the manufacturer on the bottom of the panel. The air gap shall be constructed of 316 stainless steel or aluminum.
- 9.3.8.9. DEADFRONT
 - 9.3.8.9.1. Shall be clear plexi-glass see through design to give operator visual inspection of panel without opening DEADFRONT or interrupting operation of pumping station.

9.3.8.10. ALARM SYSTEM

- 9.3.8.10.1. An ALARM SYSTEM shall be provided for all pumping stations.
- 9.3.8.10.2. The ALARM SYSTEM shall be activated in cases of power failure, high water elevation, .
- 9.3.8.10.3. ALARM shall be 90 decibels in sound, with a silence push button.
- 9.3.8.10.4. ALARM shall be supplied with a battery back-up power system.
- 9.3.8.10.5. ALARMS for Large Collection Pumping Stations shall be telemetered, including identification of the alarm condition, to a municipal facility that is manned 24 hours a day. If such a facility is not available and 2-hour holding capacity is not provided, the alarm shall be telemetered to city offices during normal working hours and to the home of the person(s) in responsible charge of the lift station during off-duty hours.
- 9.3.8.10.6. Audio visual ALARM SYSTEMS with a self-contained power supply may be acceptable in some cases in lieu of the telemetering system outlined above, depending upon location, station holding capacity, and inspection frequency.
- 9.3.8.10.7. The ALARM LIGHT shall be a red XENON strobe light. The light shall be mounted on top of the enclosure with a neoprene gasket. The light shall be visible over all obstacles.
- 9.3.8.10.8. An AUDIBLE ALARM shall be provided in addition to the ALARM LIGHT.
- 9.3.8.10.9. ALARM LADDER DIAGRAM shall show, and construction shall be, that all the alarm conditions (phase failure, power failure, pump failure, high level or any case of pump station malfunction) engage the audible and visual alarm system. If telemetered, the telemetry shall report all the required alarm conditions.

9.3.8.11. SURGE SUPPRESSER

- 9.3.8.11.1. Shall be ASCO APT TE Series to operate up to 136,500 amp total peak surge current.

9.3.8.12. PHASE FAILURE RELAY

- 9.3.8.12.1. Shall be Time Mark Model NO. 257B, plug in and 8 pin design.
- 9.3.8.12.2. The relay shall provide against phase loss, phase reversal and low voltage. The relay shall cut control panel when a failure is detected.

9.3.8.13. TRANSFER SWITCH

- 9.3.8.13.1. Shall be mounted inside the control panel through the Lexan door.
- 9.3.8.13.2. Shall be rated for 100 amp or 200 amp (depending on horsepower) 3 pole, and rated for 600 volt.
- 9.3.8.13.3. Switch handle shall interlock with the lexan door so that the door cannot be opened with the power on.

9.3.8.14. PUMP CONTROLS

- 9.3.8.14.1. Shall be by relay logic using a Time-Mark 2611-120 alternating relay for non-telemetered stations.
- 9.3.8.14.2. Shall be by DATA FLOW SYSTEMS controller with relay logic as backup for telemetered stations.
- 9.3.8.14.3. All panels shall come constructed and wired for both options.

9.3.8.15. GENERATOR RECEPTACLE

- 9.3.8.15.1. Shall be a Hubbell Pin and Sleeve type Model 4100R9W for 240 volt, 3 phase, and equivalent type for 460 volt, 3 phase.
- 9.3.8.15.2. Shall be weather proof and mounted on the exterior of the enclosure.

9.3.8.16. MOTOR CIRCUIT PROTECTORS

- 9.3.8.16.1. Shall be Square D Type FAL 100 amp frame or as required and provided for each pump for instantaneous trip on a short circuit fault.

9.3.8.17. **MOTOR STARTERS**

- 9.3.8.17.1. MOTOR STARTERS shall be Square D NEMA rated, sized to match each pump horsepower.
- 9.3.8.17.2. The overload shall be thermal melting alloy type. IEC rated starters shall not be accepted. Overloads shall not be adjustable or of the solid state type.
- 9.3.8.17.3. Soft Start starters are required on pumps 20 horse power and larger.

9.3.8.18. **ELAPSED TIME METERS**

- 9.3.8.18.1. Shall be 6 digit non re-settable.
- 9.3.8.18.2. The meters shall be mounted on the deadfront for each pump to record hours of operation.

9.3.8.19. **GROUND FAULT INTERRUPTER**

- 9.3.8.19.1. Shall be a 15A, 120-volt device provided for a convenience outlet to operate power tools.
- 9.3.8.19.2. The GFI shall be mounted on the deadfront and protected by a 1 pole, 15A circuit breaker mounted on the back plate.

9.3.8.20. **TRANSFORMER**

- 9.3.8.20.1. Shall be a 1 KVA, 460/240 – 120 volt, 1 phase.
- 9.3.8.20.2. The transformer shall provide all 120-volt power to operate the control circuit and the GFI.

9.4. **INSTALLATION**

- 9.4.1. Each PUMP shall be supplied with a universal COUPLING constructed of ASTM A48, Class 309 gray cast iron which bolts to the pump discharge flange.

- 9.4.1.1. The COUPLING shall be capable of sliding down the pump guide rail and attaching to the base DISCHARGE ELBOW that shall be also constructed of ASTM A48, Class 30 gray cast iron so that no personnel entry into the wet pit is required to connect the pump coupling to the DISCHARGE ELBOW.
- 9.4.2. The pump SEAL to the elbow shall be accomplished by the cantilevered effect of the COUPLING being suspended by the rounded fit on top of the DISCHARGE ELBOW.
 - 9.4.2.1. The effect shall be such that sealing forces of the COUPLING to DISCHARGE ELBOW are 1.5 times higher than the weight of the pump and coupling alone.
 - 9.4.2.2. The cantilever effect also requires that no part of the PUMP rest directly on the floor of the sump to obstruct flow into the suction eye of the pump.
- 9.4.3. The SEAL at the COUPLING to DISCHARGE ELBOW interface shall be made by a replaceable Buna-N sealing rubber.
 - 9.4.3.1. Machined metal-to-metal sealing surface is not considered an equal and is not acceptable.
 - 9.4.3.2. The SEAL rubber shall be constructed so that it comprises the flat gasket between the PUMP and COUPLING and the seal at the COUPLING to DISCHARGE ELBOW connection.
 - 9.4.3.3. This sealing system must guarantee a positive leak proof seal in the wet pit PUMP installation.

9.5. FIELD TESTING

- 9.5.1. Each pump and motor shall be given the following tests at the factory prior to shipment:
 - 9.5.1.1. The mechanical and electrical integrity of the pump shall be established by the use of physical inspection and the use of a megger of verification of the stator resistance to short circuit.
 - 9.5.1.2. The power leads shall be connected to the motor in accordance to the jobsite voltage and the pump started to verify rotation and no load amp readings.
 - 9.5.1.3. Any undue noise or vibration shall be cause for discontinuing the test and further investigation.

- 9.5.1.4. If requested, the pump shall be installed in the test tank on a wet pit discharge elbow and complete hydraulic tests conducted.
- 9.5.1.5. The KW input, power factor, flowrate and head shall be measured and recorded.
- 9.5.1.6. The pump shall be operated at the duty point for the project and checked for compliance with Hydraulic Institute Standards prior to being certified.
- 9.5.1.7. The pump shall then be removed and given a physical inspection and additional megger insulation test to verify the mechanical and electrical integrity.
- 9.5.1.8. Copies of hydraulic test results are maintained at the factory and supplied when requested.

9.6. PUMP WARRANTY

- 9.6.1. The MANUFACTURER shall WARRANT the pump to be supplied to the OWNER for a period of five (5) years under normal use.
- 9.6.2. The WARRANTY includes 100% coverage for the parts and labor for the first year and then 50% coverage for the second to the fifth year.
- 9.6.3. This WARRANTY shall not be limited by duty cycle or hours of running time.
- 9.6.4. The applicable WARRANTY shall be in preprinted form and shall be a part of these specifications.

SECTION 10

SEWER - GRINDER PUMP STATIONS

SECTION 10 – SEWER - GRINDER PUMP STATIONS

10.1. SCOPE

- 10.1.1. This section contains standard specifications for use in the design and construction of SUBMERSIBLE SEWAGE GRINDER PUMP STATIONS as required by REGIONAL UTILITIES.
- 10.1.2. CONTRACTOR shall furnish and install WET PITS, PUMPS, VALVES, and ELECTRICAL CONTROL PANELS complete, tested and ready for operation.
- 10.1.3. GRINDER PUMPS are defined as centrifugal submersible pumps designed to reduce material found in normal domestic and light industrial sewage into a finely ground slurry.
 - 10.1.3.1. The slurry produced by a GRINDER PUMP is then pumped through small diameter piping into a gravity interceptor or wastewater treatment facility.
 - 10.1.3.2. The temperature of the liquid being pumped is 104 degrees F continuous, 160 degrees F intermittent and shall be capable of running dry for extended periods.

10.2. GENERAL REQUIREMENTS

- 10.2.1. All GRINDER PUMPS shall be Barnes SGV Double Seal, Oil Filled Motor, 3 phase Grinder Pumps, or Keen KHG(X)5, 3 phase grinder pumps .
- 10.2.2. All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and the specifications.
- 10.2.3. CONTRACTOR shall submit to ENGINEER OF RECORD and REGIONAL UTILITIES for approval before work begins, certificates of inspections in triplicate from the SUBCONTRACTOR that the materials supplied have been inspected at the respective places of fabrication and meet the requirements of these specifications.
- 10.2.4. All materials including, but not limited to, concrete structures, pumps, pipes, valves, fittings, lids, panels and electrical equipment shall be clearly marked with the name of the MANUFACTURER, batch/serial number, strength/capacity designation and/or pressure rating.
- 10.2.5. It shall be the responsibility of CONTRACTOR to keep extra fittings on site to make vertical and/or horizontal adjustments as a result of unknown interferences so as to avoid any unnecessary delays to the project.

- 10.2.6. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by REGIONAL UTILITIES.
- 10.2.7. In order to insure proper performance and compatibility of interacting components within these specifications; all submersible pumps, control panels, access frames, guide rails, and lifting systems shall be the product of one MANUFACTURER or furnished by the GRINDER PUMP MANUFACTURER for sole source responsibility.
- 10.2.8. Water for testing shall be furnished by CONTRACTOR.
- 10.2.9. See Section 3 and 4 of this specification for “*Excavation and Backfill*” and “*Dewatering*.”
- 10.2.10. All herein referenced standards shall be the latest edition or revision.

10.3. **MATERIALS**

10.3.1. **WET WELL**

- 10.3.1.1. All GRINDER PUMP STATIONS located in a public and/or FDOT Right-of-Way must be designed and constructed of reinforced concrete as per detail drawing GS-1.
- 10.3.1.2. Regional Utilities requires that all GRINDER PUMP STATIONS are constructed as per these specifications and detail drawing GS-1.
- 10.3.1.3. WET WELLS shall meet the latest requirements of ASTM C478 *Specification for Precast Reinforced Concrete Manhole Sections*.
- 10.3.1.4. Minimum wall thickness shall be seven inches.
- 10.3.1.5. Cement shall meet the latest requirements of ASTM C 150 *Specification for Portland Cement, TYPE II*.
- 10.3.1.6. Minimum concrete strength shall 4000 PSI at 28 days.
- 10.3.1.7. The required minimum strength of concrete shall be confirmed by making and testing four standard cylinders at seven (7) days and at (28) days. The test results shall be submitted to the ENGINEER prior to any manhole being installed.
- 10.3.1.8. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations.

10.3.1.9. Openings shall be adequately sealed with water tight boots or approved non-shrinking grout, applied and cured in strict conformance with the MANUFACTURERs recommendations so that there shall be zero leakage around pipes and joints.

10.3.1.10. Approval of ENGINEER and REGIONAL UTILITIES shall be obtained before placing any order for manholes.

10.3.1.11. **BASES**

10.3.1.11.1. WET WELL BASES shall be cast integrally with the bottom manhole section.

10.3.1.11.2. The base section shall be set in a 12-inch leveling course of #4 or #57 stone with filter fabric above and below the stone, extending at least 12-inches outside the base.

10.3.1.11.3. In order to permit adjustment of the precast base section and insure full bearing on the leveling course, said section shall be placed just prior to initial set.

10.3.1.12. **JOINTS**

10.3.1.12.1. Joint contact surfaces shall be formed with machine castings; they shall be exactly parallel with a 2 degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an "o" ring rubber gasket, conforming to the latest edition of C443, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gasket or Pre-Molded Plastic Joint Sealer with Joints Pre-Primed.

10.3.1.12.2. Each joint shall be grouted on the inside with approved grouting materials.

10.3.1.13. **EXTERIOR COATING**

10.3.1.13.1. The interior and exterior surface shall be given two (2) coats of KOP-COAT COAL TAR EPOXY 300-M, 9 MILS each.

10.3.1.14. **HATCH**

10.3.1.14.1. CONTRACTOR shall furnish and install one access door on wet well.

- 10.3.1.14.2. The access door shall be Type ASP300 as manufactured by U.S. Foundry and Manufacturing Corp., Miami, FL with the size being 36" X 36" and an actual opening of 32" X 35".
- 10.3.1.14.3. Door leaf shall be .250" thick aluminum floor plate reinforced to 300 p.s.f. live load.
- 10.3.1.14.4. The access door shall be equipped with a flush aluminum drop handle which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle.
- 10.3.1.14.5. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place.
- 10.3.1.14.6. For security, the access door shall be equipped with a staple for padlock.
- 10.3.1.14.7. Access door shall be furnished with mill finish.
- 10.3.1.14.8. The frame shall be extruded aluminum with an integral anchor flange and seat.

10.3.2. **VALVE VAULT**

- 10.3.2.1. Refer to section 10.3.1 for concrete specifications.
- 10.3.2.2. Valve Vault shall be coated inside and out with KOP-COAT COAL TAR EPOXY 300-M at (2) coats at 9 MILS each.
- 10.3.2.3. Valve vault shall use same type of hatch specified for wet well.
- 10.3.2.4. Valve vault shall be sized accordingly to allow room for workers and tools.

10.3.3. **VALVES AND FITTINGS**

- 10.3.3.1. Refer to detail drawing GS-1 for specifications on valves and fittings.

10.3.4. **SUBMERSIBLE GRINDER PUMP**

- 10.3.4.1. The volute, seal plates, impeller and motor housing shall be constructed of high quality ASTM 48 Class 30 cast iron.

- 10.3.4.2. Pump(s) shall be painted with a water based air-dry enamel of 2.0 mil minimum thickness.
- 10.3.4.3. All exposed hardware shall be 300 series stainless steel.
- 10.3.4.4. The pump construction shall contain no points of critical clearance nor require periodic adjustment or replacement to maintain reasonable operating efficiency.
- 10.3.4.5. Discharge connection shall be a standard 2" NPT in the vertical position. All gaskets shall be of the compression square ring type eliminating critical slip fits and the possibility of damage during service associated with sliding "O"-Ring sealing arrangements.
- 10.3.4.6. The impeller shall be of the recessed vortex design.
- 10.3.4.7. Pumps with standard centrifugal semi open impeller designs shall not be acceptable.
- 10.3.4.8. The impeller shall be of 85-5-5-5 bronze construction and machined for threading to the motor shaft. The impeller shall be capable of being trimmed to meet specific performance characteristics.
- 10.3.4.9. The grinder mechanism shall consist of a radial cutter threaded and locked on the motor shaft by a washer in conjunction with a countersunk flat head cap screw, and a shredding ring containing a minimum of fifteen flow passages with cutting edges.
- 10.3.4.10. The shredding ring shall be reversible to provide twice the cutting edge life. Both the shredding ring and radial cutter shall be of 440C stainless steel hardened to a minimum of Rockwell C55 and shall be finish ground for a fine cutting edge.
- 10.3.4.11. Two stage cutter mechanisms requiring external adjustment for proper clearance are not acceptable.
- 10.3.4.12. The unit shall utilize a tandem mechanical shaft seal arrangement and shall operate in an oil atmosphere.
- 10.3.4.13. The seal shall be commercially available and not a proprietary design of the MANUFACTURER.
- 10.3.4.14. The materials of construction shall be carbon for the rotating face and ceramic for the stationary face, lapped and polished to a tolerance of

one light band, 300 series stainless steel hardware, and all elastomer parts to be Buna-N.

10.3.4.15. The pump shall have a three bearing design consisting of an upper ball bearing, an intermediate ball bearing restrained for the purpose of carrying the thrust loads, and a lower bronze sleeve bearing to carry radial loads and prevent shaft deflection imposed by the pump impeller and grinder operation.

10.3.4.16. Bearings shall operate in an oil bath atmosphere for superior life.

10.3.4.17. Permanently lubricated bearings are not acceptable.

10.3.5. **PUMP MOTOR**

10.3.5.1. The pump shall be designed to be non-overloading throughout the entire pump curve.

10.3.5.2. Three phase motors shall be of the dual voltage 230/460 design.

10.3.5.3. Motor designs incorporating shrink or press fit assembly between the stator and motor housing shall not be acceptable.

10.3.5.4. The rotor and stator assembly shall be of the standard frame design and secured to the pump seal plate by four threaded fasteners allowing for easy serviceability.

10.3.5.5. The motor shall be constructed with the windings operating in a sealed environment containing clean dielectric oil, making it capable of operating in a totally, partially or non-submerged condition for extended periods of time without damage to the heat being generated.

10.3.5.6. Air filled motors shall not be acceptable.

10.3.5.7. The motor windings shall be Class B insulation.

10.3.5.8. The motor shall meet the standard NEMA design B for three phase. The motor shaft shall be of 416 stainless steel.

10.3.5.9. Protection against excessive temperature shall be provided by a heat sensor thermostat attached to the stator windings and connected in series with the contactor coil in the control panel.

10.3.6. **PUMP GUIDE RAIL**

- 10.3.6.1. The guide rail assemblies shall consist of 316 stainless steel upper guide rail brackets and pump guide brackets with the slide rail assemblies of 11 gauge 316 stainless steel.
- 10.3.6.2. The stationary and moveable portions of the hydraulically sealed discharge coupling assemblies shall be machined cast iron.
- 10.3.6.3. The upper guide rail bracket(s) shall mount to the basin cover and position the lower end of the guide rail.
- 10.3.6.4. The stainless steel rail shall support the pump at a distance of four (4) inches from the basin floor to provide unrestricted flow of material into the pump.
- 10.3.6.5. Stainless steel guide brackets shall be attached to the pump for positioning of the unit on the guide rail during installation or removal of the unit within the basin.

10.3.7. PUMP POWER & CONTROL CABLES

- 10.3.7.1. Pump power supply shall be 120/208/240 Volts, DELTA 3 Phase, 4 Wire, 60 Hertz.
- 10.3.7.2. The pump shall be equipped with 25 feet of type S spliced power cable, and 25 feet of sensor cable type SO.
- 10.3.7.3. All incoming lead wires shall be spliced in the motor terminal housing.
- 10.3.7.4. After splicing, the terminal housing shall be filled with epoxy to seal the outer cable jacket and the individual strands to prevent water from entering the motor housing.
- 10.3.7.5. A secondary rubber pressure grommet shall be provided as an additional sealing point and strain relief at the point of cable entry.

10.3.8. PUMP POWER & CONTROL PANEL

- 10.3.8.1. Monitoring and control system to be designed to function with pumping units and to be factory wired and tested.
- 10.3.8.2. Primary control system shall be by RELAY LOGIC using Float Level Switches.
 - 10.3.8.2.1. The FIRST LEVEL SWITCH (lowest) stops the lead pump and the lag pump if it is energized, when the level drops below this point, and triggers the alternator.

- 10.3.8.2.2. The SECOND LEVEL SWITCH (lead) starts one pump as the liquid rises to close this circuit. Which pump starts at this level is determined by the alternator.
- 10.3.8.2.3. The THIRD LEVEL SWITCH (lag) causes both pumps to run as the liquid level rises to this point.
- 10.3.8.2.4. The FOURTH LEVEL SWITCH (highest) illuminates the alarm indicator.
- 10.3.8.2.5.
- 10.3.8.3. ALL panels shall come constructed and pre-wired to use both RELAY LOGIC and a DATA FLOW telemetry unit if so desired.
- 10.3.8.4. Each panel shall be supplied with an electrical schematic permanently fastened to the inside of the enclosure door.
- 10.3.8.5. All internal wiring shall be neat and concealed in 1" x 2" tall white wire way.
 - 10.3.8.5.1. Control wiring shall be red 14-gauge minimum.
 - 10.3.8.5.2. Power shall be black 10-gauge minimum.
 - 10.3.8.5.3. Neutral wiring shall be white.
 - 10.3.8.5.4. Ground wiring shall be green.
 - 10.3.8.5.5. Each wire shall terminate in screw or lug terminal connection.
- 10.3.8.6. Every panel shall be tested to perform as designed through the entire sequence of operation before it leaves the factory.
- 10.3.8.7. Every panel shall include a permanent sticker that is signed by the person who built, wired, and tested the panel.
- 10.3.8.8. ENCLOSURE
 - 10.3.8.8.1. Shall be a NEMA 4X 316 stainless steel construction to provide protection against rain, sleet and snow.
 - 10.3.8.8.2. Door shall be fastened securely with pad-lockable stainless steel draw latches, spring loaded for smoother action.

10.3.8.8.3. Standard size shall be 36" high x 24" wide and 10" deep unless larger panel is warranted by component sizes or heat generation considerations.

10.3.8.8.4. Control panel shall have an air gap installed by the manufacturer and fastened to the bottom of the panel. The air gap shall be constructed of 316 stainless steel or aluminum.

10.3.8.9. DEADFRONT

10.3.8.9.1. Shall be clear plexi-glass see through design to give operator visual inspection of panel without opening DEADFRONT or interrupting operation of pumping station.

10.3.8.10. ALARM SYSTEM

10.3.8.10.1. An ALARM SYSTEM shall be provided for all pumping stations.

10.3.8.10.2. The Alarm system shall be activated in cases of power failure, high water level, or any cause of pump station malfunction.

10.3.8.10.3. Alarm shall be 90 decibels in sound, with a silence push button.

10.3.8.10.4. Alarm shall be supplied with a battery back-up power system.

10.3.8.10.5. ALARMS for stations in environmentally critical areas shall be telemetered, including identification of the alarm condition, to a municipal facility that is manned 24 hours a day. If such a facility is not available and 2-hour holding capacity is not provided, the alarm shall be telemetered to REGIONAL UTILITIES' offices during normal working hours and to the home of the person(s) in responsible charge of the lift station during NON-Business hours.

10.3.8.10.6. Audio visual Alarm systems with a self-contained power supply may be acceptable in some cases in lieu of the telemetering system outlined above, depending upon location, station holding capacity, and inspection frequency.

10.3.8.10.7. The Alarm Light shall be a red XENON strobe and shall be mounted on top of the enclosure with a neoprene gasket. Light shall be visible over all obstacles.

10.3.8.10.8. The audible Alarm shall be provided in addition to the alarm light.

10.3.8.10.9. ALARM Ladder diagram shall show, and construction shall be, that all the alarm conditions (phase failure, power failure, pump failure, high water level or any cause of pump station malfunction) engage the audible and visual alarm system. If telemetered, the telemetry shall report all the required alarm conditions.

10.3.8.11. SURGE SUPPRESSER

10.3.8.11.1. Shall be ASCO APT TE Series, to operate up to 136,500 amp total peak surge current.

10.3.8.12. PHASE FAILURE RELAY

10.3.8.12.1. Shall be Time Mark Model NO. 257B, plug in and 8 pin design.

10.3.8.12.2. The relay shall provide against phase loss, phase reversal and low voltage.

10.3.8.13. TRANSFER SWITCH

10.3.8.13.1. Shall be mounted inside the control panel through the lexan door.

10.3.8.13.2. Shall be rated for 100 amp or 200 amp (depending on horsepower) 3 pole, and rated for 600 volt.

10.3.8.13.3. Switch handle shall interlock with the lexan door so that the door cannot be opened with the power on.

10.3.8.14. PUMP CONTROLS

10.3.8.14.1. Shall be by relay logic using a Time-Mark 2611-120 alternating relay.

10.3.8.15. GENERATOR RECEPTACLE

- 10.3.8.15.1. Shall be a Hubbell Pin and Sleeve type Model 4100R9W for 240 volt, 3 phase and rated at 100 Amps.
- 10.3.8.15.2. Shall be weather proof and mounted on the exterior of the enclosure.

10.3.8.16. MOTOR CIRCUIT PROTECTORS

- 10.3.8.16.1. Shall be Square D Type FAL 100 amp frame or as required and provided for each pump for instantaneous trip on a short circuit fault.

10.3.8.17. MOTOR STARTERS

- 10.3.8.17.1. MOTOR STARTERS shall be Square D NEMA rated, sized to match each pump horsepower.
- 10.3.8.17.2. The overload shall be thermal melting alloy type. IEC rated starters shall not be accepted.

10.3.8.18. ELAPSED TIME METERS

- 10.3.8.18.1. Shall be 6 digit non re-settable.
- 10.3.8.18.2. The meters shall be mounted on the dead front for each pump to record hours of operation.

10.3.8.19. GROUND FAULT INTERRUPTER

- 10.3.8.19.1. Shall be a 15A, 120-volt device provided for a convenience outlet to operate power tools.
- 10.3.8.19.2. The GFI shall be mounted on the dead front and protected by a 1 pole, 15A circuit breaker mounted on the back plate.

10.3.8.20. TRANSFORMER

- 10.3.8.20.1. Shall be a 1 KVA, 460/240 – 120 volt, 1 phase.
- 10.3.8.20.2. The transformer shall provide all 120-volt power to operate the control circuit and the GFI.

10.4. INSTALLATION

- 10.4.1. The stationary fitting shall have a Neoprene diaphragm clamped between the stainless steel rail and the stationary cast iron discharge.
- 10.4.2. The cast iron moveable fitting, when in position, shall be held against the stationary fitting by the construction of the stainless steel rail, aligning the movable fitting to the flexible diaphragm for proper sealing of the two surfaces under pressure.
- 10.4.3. The flexible diaphragm shall also serve as an anti-siphon device. A stainless steel lifting cable with a minimum breaking strength of 2100 pounds shall be provided for pump installation and removal.
- 10.4.4. The discharge piping shall consist of 2 inch Schedule 40 stainless steel pipe. A ball check valve shall be installed in the vertical position between the pump discharge and the moveable fitting.
- 10.4.5. Each valve shall be 2 inches in size and shall consist of three major components; body, access plug, and ball.
- 10.4.6. The design of the valve shall be such that it keeps solids, stringy material, grit, rags, etc. moving without the need for back flushing.
- 10.4.7. In the operating mode, the ball shall not impede flow through the valve.
- 10.4.8. The operating flow area shall be equal to the nominal size of the valve. The ball shall clear the waterway providing "full flow" equal to the nominal size. It shall be non-clog design.
- 10.4.9. There shall not be outside levers, weights, springs, dashpots or other accessories required for a swing (clapper) type check valve.
- 10.4.10. The ball shall be natural rubber and be resistant to material normally found in sewage. The body and access plug shall be gray cast iron, ASTM Class 30. All fasteners shall be stainless steel. Inlet and outlet ports shall be 2 inch NPT threaded.
- 10.4.11. A 2-inch brass true union ball valve shall be installed in the discharge piping of each pump to provide shut-off capabilities during pump removal. Each valve shall be mounted in a separate valve box adjacent to the wet well for ease of access and maintenance.

10.5. TESTING

- 10.5.1. The pump MANUFACTURER shall perform the following inspections and tests in accordance with the Hydraulic Institute Type B standards before shipment from the factory:
- 10.5.2. A check of the motor voltage and frequency shall be made as shown on the nameplate.
- 10.5.3. A motor and cable insulation test for moisture content or insulation defects shall be made per UL criteria.
- 10.5.4. The pump shall be completely submerged and run to determine that the unit meets pre-determined hydraulic performance points.
- 10.5.5. A written report shall be available showing the aforementioned tests have been performed in accordance with the specifications.
- 10.5.6. The pump(s) shall be tested by a qualified representative of the MANUFACTURER, and shall be inspected and approved by Regional Utilities.

10.6. WARRANTY

- 10.6.1. The MANUFACTURER shall WARRANT the pump to be supplied to the OWNER for a period of five (5) years under normal use.
- 10.6.2. The WARRANTY includes 100% coverage for the parts and labor for the first year and then 50% coverage for the second to the fifth year.
- 10.6.3. This WARRANTY shall not be limited by duty cycle or hours of running time.
- 10.6.4. The applicable WARRANTY shall be in preprinted form and shall be a part of these specifications.

APPENDIX

APPENDIX A – AS-BUILT LAYERS & LINE TYPES

Layer Name	Color	Linetype	Lineweight	Description	Type
ADDRESS-TXT	7	CONTINUOUS	0.25	STREET POSTAL ADDRESS NUMBER	TEXT
BLDG-IDEN	7	CONTINUOUS	0.25	BUILDING IDENTIFICATION	TEXT
BLDG-OTLN	7	CONTINUOUS	0.18	BUILDING OUTLINE	POLYGON
BLOCK-IDEN-TXT	3	CONTINUOUS	0.25	SUBDIVISION BLOCK IDENTIFICATION	TEXT
BORE	7	CONTINUOUS	0.15	BORE LOCATION	POLYGON
BORE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH BORE	TEXT
BOUND-EASE	11	PHANTOM2	0.18	BOUNDARY LINE OF EASEMENTS	POLYGON
BOUND-EASE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH EASEMENTS	TEXT
BOUND-FENCE-WALL	20	CONTINUOUS	0.13	FENCES, RETAINING WALLS, GUARDRAILS, ETC.	POLYLINE
BOUND-FENCE-TXT	20	CONTINUOUS	0.25	TEXT ASSOCIATED WITH FENCES, RETAINING WALLS, GUARDRAILS, ETC.	TEXT
BOUND-LOT-LINE	84	PHANTOM2	0.18	LOT LINES WITHIN AND ASSOCIATED TO PROJECT	TEXT
BOUND-LOT-LINE-TXT	3	CONTINUOUS	0.25	LOT IDENTIFICATION	TEXT
BOUND-PROJECT	1	PHANTOM2	0.20	OVERALL BOUNDARY OF PROJECT	POLYGON
BOUND-PROJECT-TXT	1	PHANTOM2	0.25	TEXT ASSOCIATED WITH BOUNDARY OF PROJECT	TEXT
C-ANNO-PATT	9	CONTINUOUS	0.13	HATCH PATTERNS	INSERT
C-ANNO-TXT	3	CONTINUOUS	0.25	MISCELLANEOUS TEXT	TEXT
DEFPOINTS	7	CONTINUOUS	0.00	DEFPOINTS	
G-ANNO-LOGO	7	CONTINUOUS	0.20	COMPANY LOGO	INSERT
G-ANNO-NOTE	2	CONTINUOUS	0.25	TEXT FOR TITLE BLOCK FOR PROJECT	TEXT
G-ANNO-TTLB	6	CONTINUOUS	0.80	TITLE BOCKS	INSERT
G-ANNO-TEXT	2	CONTINUOUS	0.18	TEXT ASSOCIATED WITH TITLE BLOCKS	TEXT
G-LAYOUT	2	CONTINUOUS	0.00	VIEWPORT IN PAPER SPACE	
HYDRANT	152	CONTINUOUS	0.25	HYDRANTS (FLUSH, FIRE, ETC.)	INSERT
HYDRANT-TXT	152	CONTINUOUS	0.25	TEXT ASSOCIATED WITH HYDRANTS	TEXT
HYDRO-SHORELINE	5	DIVIDE2	0.18	SHORELINES OF LAKES, STREAMS, PONDS, ETC.	POLYGON
HYDRO-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER BODIES	TEXT
PLSS-SECTION	4	DASHED	0.25	SECTION LINES AND INDENTIFICATION	POLYLINE AND TEXT
PLSS-TOWNSHIP-RANGE	143	PHANTOM	0.20	TOWNSHIP AND RANGE LINES INCLUDING TEXT	POLYLINE AND TEXT
RECLAIM-WATER-FITINGS	211	CONTINUOUS	0.30	RECLAIM WATER END CAPS, BENDS, REDUCERS, ETC.	INSERT
RECLAIM-WATER-FITTINGS-TXT	211	CONTINUOUS	0.25	TEXT ASSOCIATED WITH RECLAIM WATER LINE FITTINGS	TEXT
RECLAIM-WATER	211	CONTINUOUS	0.40	RECLAIM WATER MAIN LINES	POLYLINE
RECLAIM-WATER-	211	CONTINUOUS	0.25	TEXT ASSOCIATED TO RECLAIM	POLYLINE


























2019 Construction Specifications and Standard Details

TXT				WATER MAIN LINES	
RECLAIM-WATER-VALVE	211	CONTINUOUS	0.30	RECLAIM WATER VAVLES	INSERT
RECLAIM-WATER-VAVLE-TXT	211	CONTINUOUS	0.25	TEXT ASSOCIATED WITH RECLAIM WATER VALVES	TEXT
ROAD-CENTER	12	CENTER2	0.15	ROAD CENTERLINES	POLYLINE
ROAD-CURB	95	CONTINUOUS	0.15	BACK AND FACE OF CURB	POLYLINE
ROAD-DRIVEWAY	8	CONTINUOUS	0.13	DRIVEWAYS AND IDENTIFICATION	POLYGON
ROAD-EOP	2	CONTINUOUS	0.13	EDGE OF ROAD SURFACES	POLYGON
ROAD-EOP-TXT	2	CONTINUOUS	0.25	TEXT ASSOCIATED TO ROAD SURFACE	TEXT
ROAD-ROW	3	PHANTOM2	0.13	ROAD RIGHT OF WAYS	POLYGON
ROAD-ROW-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO ROAD RIGHT OF WAYS	TEXT
ROAD-SIDEWALK-DECK	7	CONTINUOUS	0.13	SIDEWALKS, DECKS, WALKWAYS, ETC.	POLYLINE
ROAD-TXT	1	CONTINUOUS	0.25	ROAD NAMES	TEXT
SSWR-CLEANOUT	31	CONTINUOUS	0.25	SANITARY SEWER FORCE MAIN CLEAN OUTS	INSERT
SSWR-CLEANOUT-TXT	31	CONTINUOUS	0.25	TEXT ASSOCIATED WITH FORCE MAIN CLEAN OUTS	TEXT
SSWR-EXISTING	31	HIDDEN	0.18	EXISTING SANITARY SEWER LINE, FORCE OR GRAVITY	POLYLINE
SSWR-EXISTING-FITTINGS	3	CONTINUOUS	0.15	EXISTING SANITARY SEWER VALVES, END CAPS, BENDS, ETC.	INSERT
SSWR-EXISTING-FITTINGS-TXT	3	CONTINUOUS	0.25	TEXT ASSOCIATED WITH EXISTING SANITARY SEWER VALVES, END CAPS, ETC.	TEXT
SSWR-EXISTING-MANHOLE	3	CONTINUOUS	0.15	EXISTING MANHOLES	INSERT
SSWR-EXISTING-MANHOLE-TXT	3	CONTINUOUS	0.25	TEXT ASSOCIATED WITH EXISTING MANHOLES	TEXT
SSWR-EXISTING-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH EXISTING SANITARY SEWER LINES FORCE AND GRAVITY	TEXT
SSWR-FITTINGS	1	CONTINUOUS	0.25	SANITARY SEWER END CAPS, BENDS, REDUCERS, ETC.	INSERT
SSWR-FITTINGS-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH SANITARY SEWER END CAPS, BENDS. REDUCERS ETC	TEXT
SSWR-FM	222	CONTINUOUS	0.40	SANITARY SEWER FORCE MAINS	POLYLINE
SSWR-FM-TXT	222	CONTINUOUS	0.25	TEXT ASSOCIATED WITH SANITARY SEWER FORCE MAINS	TEXT
SSWR-GRAVITY	3	CONTINUOUS	0.40	SANITARY SEWER GRAVITY MAINS	POLYLINE
SSWR-GRAVITY-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH SANITARY SEWER GRAVITY MAINS	TEXT
SSWR-LAT	202	CONTINUOUS	0.30	SANITARY SEWER SERVICE LINES AND TAPS	POLYLINE
SSWR-LAT-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO SANITARY SEWER GRAVITY LINES	TEXT

2019 Construction Specifications and Standard Details

SSWR-MANHOLE	1	CONTINUOUS	0.30	SANITARY SEWER MANHOLES	INSERT
SSWR-MANHOLE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH MANHOLES	TEXT
SSWR-STATION	200	CONTINUOUS	0.30	LIFT STATIONS, ETC	INSERT
SSWR-STATION-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH LIFT STATIONS, ETC.	TEXT
SSWR-VALVE	7	CONTINUOUS	0.30	SANITARY SEWER VALVES	INSERT
SSWR-VALVE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO SANITARY SEWER VALVES	TEXT
SURVEY-CONTROL	2	CONTINUOUS	0.13	HORIZONTAL AND VERTICAL CONTROL OF SURVEY	LINES
SURVEY-CONTROL-TXT	2	CONTINUOUS	0.25	TEXT ASSOCIATED TO HORIZONTAL AND VERTICAL	TEXT
SURVEY-POINTS	6	CONTINUOUS	0.13	ALL SURVEY POINTS	POINT
WATER-BFP	152	CONTINUOUS	0.20	BACK FLOW PREVENTER	
WATER-BFP-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO BACK FLOW PREVENTERS	TEXT
WATER-EXISTING	153	HIDDEN	0.13	EXISTING WATER MAINS AND SERVICES	POLYLINE
WATER-EXISTING-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO EXISTING WATER MAINS AND SERVICES	TEXT
WATER-FIRELINE	1	CONTINUOUS	0.40	WATER FIRE LINES	POLYLINE
WATER-FIRELINE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO FIRE LINES	TEXT
WATER-FITTING	152	CONTINUOUS	0.30	END CAPS, REDUCERS, TEES, ETC.	INSERT
WATER-FITTING-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER END CAPS, REDUCERS, TEES, ETC.	TEXT
WATER-LAT	130	CONTINUOUS	0.30	WATER SERVICE LINES	POLYLINE
WATER-LAT-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER SERVICE LINES	TEXT
WATER-MAIN	152	CONTINUOUS	0.40	WATER MAINS	POLYLINE
WATER-MAIN-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO WATER MAINS	TEXT
WATER-METER	152	CONTINUOUS	0.30	WATER METER	INSERT
WATER-STATION	152	CONTINUOUS	0.30	BOOSTER PUMPS, MONITORING WELLS, TANKS, TOWERS, ETC.	INSERT
WATER-STATION-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER STATIONS	TEXT
WATER-VALVE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER VALVES	TEXT
WATER-VAULT	152	CONTINUOUS	0.30	LARGE METER OR CONNECTION VAULT	POLYGON
WATER-VAULT-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH LARGE METER OR CONNECTION VAULT	TEXT
U-CABLE	53	CONTINUOUS	0.13	TELEVISION CABLE STRUCTURES	INSERT
U-POWER	53	CONTINUOUS	0.13	ELECTRICAL POWER STRUCTURES	INSERT
U-STORM	53	CONTINUOUS	0.13	STORM WATER DRAINAGE STRUCTURES	INSERT
U-TELE	53	CONTINUOUS	0.13	TELEPHONE STRUCTURES	INSERT

APPENDIX B – AS-BUILT SYMBOLS

SYMBOL LEGEND		
	BLOCK NAME	DESCRIPTION
	22DBEND	22 1/2 DEGREE BEND
	45DBEND	45 DEGREE BEND
	ARV	AIR RELIEF VALVE
	BFP	BLACK FLOW PREVENTER
	CAP	END OF LINE CAP
	CLOUT	CLEAN OUT
	EBOX	ELECTRICAL BOX
	EX-HYD	EXISTING HYDRANT
	EX-VALVE	EXISTING VALVE
	FH	FIRE HYDRANT
	FHV	FIRE HYDRANT WITH VALVE
	FLH	FLUSH HYDRANT
	LP	LIGHT POLE
	MH	MANHOLE
	LS	LIFT STATION
	PP	POWER POLE
	REDUCER	REDUCER
	TAP-SAD	TAPPING SADDLE
	TBOX	TELEPHONE BOX
	TCBOX	TELEVISION CABLE BOX
	TEE-V	TAPPING TEE WITH VALVE
	TEE	TAPPING TEE
	UP	UTILITY POLE
	VALVE	VALVE
	WELL	WELL

APPENDIX C – UTILITY CONTACT INFORMATION

- A.1. AT&T Florida (formerly Bellsouth)
2221 Industrial Drive
Panama City, Florida 32405
(850) 913-3703
www.att.com
- A.2. Choctawhatchee Electric Cooperative, Inc.
1350 W. Baldwin Avenue
DeFuniak Springs, Florida 32435
(800) 892-5069
www.chelco.com
- A.3. Cox Communications
320 Racetrack Rd., NW
Ft. Walton Beach, Florida 32547
(850) 314-8163
www.cox.com
- A.4. Century Link (formerly Embarq)
650 Denton Boulevard
Ft. Walton Beach, Florida 32547
(850) 664-3751
www.centurylink.com
- A.5. Gulf Power
PO Box 1388
DeFuniak Springs, Florida 32435
(850) 892-2154
www.southernco.com
- A.6. Mediacom
2814 E. County Hwy 390
Suite D
Panama City, FL 32405
(850) 271-9815
www.medicomcc.com
- A.7. Okaloosa Gas District
P.O. Box 548
Valparaiso, Florida 32580
(850) 729-4870
www.okaloosagas.com

- A.8. Regional Utilities
4432 Hwy 98 East
Santa Rosa Beach, Florida 32459
(850) 231-5114
www.regionalutilities.net
- A.9. South Walton Utility Co, Inc.
369 Miramar Beach Dr.
Miramar Beach, Florida 32550
(850) 837-2988
www.swuci.org
- A.11. Southern Light
156 St. Anthony Street
Mobile, AL 36603
(251) 662-1170
www.southernlightfiber.com