STANDARD
DESIGN AND CONSTRUCTION
SPECIFICATIONS

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SECTION 1 – GENERAL ITEMS

1.1. DEFINITIONS

1.1.1. . The terms "**REGIONAL UTILITIES**" and "FLORIDA COMMUNITY SERVICES CORPORATION (DBA **REGIONAL UTILITIES**)," as used herein, shall collectively refer to the **OWNER** and operator of the water and sewer utility system bounded by Sandestin Golf and Beach Resort to the west, Lake Powell to the east, the Intracoastal Waterway to the north, and the Gulf of Mexico to the south.

1.1.2. The term "**DEVELOPER**," as used herein, shall mean the **OWNER** of the project who, by way of an Engineered submittal, proposes to improve one or more parcels of real estate by subdivision for the purpose of constructing habitable buildings.

1.1.3. The term "**ENGINEER**," as used herein shall mean the licensed design professional representing **DEVELOPER**.

1.1.4. The term "**CONTRACTOR**," as used herein, shall mean the individual, partnership, company, or corporation entering into a contract for the performance of the work defined by the approved Engineered drawings and properly licensed in the State of Florida for underground utility construction.

1.1.5. The term "**SUBCONTRACTOR**," as used herein, includes only those entities having a direct contract with the **CONTRACTOR**. This term includes parties furnishing materials fabricated to a special design in accordance with the Drawings or Specifications, but excludes parties that merely furnish standard materials.

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 establish minimum requirements 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 deviation from these standards shall be submitted in writing and approved in advance by the **REGIONAL UTILITIES** General Manager or their designated representative prior to construction.

1.2.4. The requirements of this document shall apply in all cases where the facilities being constructed, or proposed to be constructed, will be owned, operated, and/or maintained by **REGIONAL UTILITIES**. These requirements shall also apply to those portions of facilities located within public rights-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 the maintenance of sewer services extending beyond the first cleanout, which shall be located at the right-of-way or within a designated utility easement.

1.2.7. **REGIONAL UTILITIES** shall not acquire, operate, or maintain any sewage facilities that are not constructed in accordance with **REGIONAL UTILITIES'** standards. Responsibility for such lines and/or lift stations shall remain with the **DEVELOPER**.

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

1.2.9. The **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 the **REGIONAL UTILITIES** Plan Review Procedure. The Plan Review Procedure may be found on **REGIONAL UTILITIES'** 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 prior written consent from **REGIONAL UTILITIES**.

1.2.13. While every effort shall be made to ensure that submitted plans comply with the standard specifications detailed herein, **REGIONAL UTILITIES** reserves the right to enforce minimum standards as required by FDEP, USACOE, FDOT, and Walton County.

1.2.14. No construction shall commence prior to a mandatory pre-construction conference with **REGIONAL UTILITIES**.

1.2.15. The **CONTRACTOR** shall notify **REGIONAL UTILITIES** at least 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, including electric, gas, telephone, and cable television, have been installed.

1.2.17. The **CONTRACTOR** shall be responsible for locating and protecting newly constructed water and sewer lines until all underground utilities have been installed.

1.2.18. References within these specifications to standards or specifications issued by other agencies, organizations, or departments are made for purposes of standardization and expediency, and such referenced standards are hereby incorporated by reference and made part of these specifications.

1.2.19. All construction activities, specifications, drawings, details, and procedures shall comply with applicable OSHA safety requirements. All excavation activities shall also comply with the Florida Trench Safety Act.

SECTION 2

DESIGN & INSPECTION GUIDELINES

SECTION 2 – DESIGN GUIDELINES

2.1. GENERAL REQUIREMENTS

2.1.1. All plans shall conform to **REGIONAL UTILITIES'** adopted standards.

2.1.2. . An electronic PDF copy and an editable CAD file of the plans shall be submitted for review. All plans shall be submitted to the email engplanreview@regionalutilities.net.

2.1.3. Upon completion of the review process, **REGIONAL UTILITIES** shall require one (1) hard copy set of the signed and sealed plans and one (1) digital storage device containing a copy of the signed and sealed approved plans and all associated documentation.

2.1.4. The **CONTRACTOR** shall maintain on the job site at all times one (1) set of APPROVED plans that have been stamped by **REGIONAL UTILITIES** at the pre-construction meeting. Any work performed using an unapproved set of plans 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-inch by 36-inch sheets using an appropriate engineering 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 using 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'** standard detail sheets are available for use under the engineering tab on the **REGIONAL UTILITIES'** website at www.regionalutilities.net.

2.1.8.1. Provide all applicable detail drawings.

2.1.8.2. Details altered without the express 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 each pipe to define clear vertical separation.

2.1.11. All sewer data, including manhole invert and rim elevations, shall be clearly defined on the plan sheets.

2.1.12. Profiles shall be provided for all gravity sewer lines.

2.1.12.1. Sewer profiles shall show all stormwater, water, and utility crossings and shall identify any special treatments required by applicable FDEP codes.

2.1.13. Roadway cross sections shall be provided at intervals not exceeding one hundred (100) feet and shall show the elevations of all proposed utilities.

2.1.13.1. Proposed gravity sewer mains shall not be installed at the same elevation as proposed stormwater lines.

2.1.14. All pressurized pipelines shall be located within rights-of-way or utility easements unless otherwise approved in writing by the **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. Details for all connections to existing facilities, including double-valve configurations where required, shall be provided.

2.1.18. Identify the number of stories and dwelling units, and show zero-lot lines with driveway locations, where applicable.

2.1.19. All street names and lot and block numbers shall match those shown on the approved or proposed development drawings.

2.1.20. Finished floor elevations shall be clearly shown on the plan drawings and shall be a minimum of one (1) foot above the crown of the roadway.

2.1.21. Following **REGIONAL UTILITIES'** approval, all revisions shall be documented in the revision block.

2.1.22. Drawings shall be georeferenced to the United States State Plane Coordinate System, NAD 83, Florida State Plane, North Zone, U.S. Foot, and shall include a minimum of two referenced and labeled control points tied to the State Plane Coordinate System.

2.2. DELIVERABLES

2.2.1. Refer to the Developer Plan Review Procedure for a list of deliverables.

2.2.2. All deliverables shall be clearly labeled with the file name, company name, contact name, and contact phone number.

2.2.3. Any additional drawing files used as external references within the submitted drawing file shall be included with the project submittal. Projects containing external references that are not included with the submittal shall not be accepted.

2.2.4. FILE NAMING AND REVISIONS

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

2.2.4.2. File names shall include the project name and the revision date in YYMMDD format.

2.3. DESIGN GUIDELINES

2.3.1. Sewer lift stations shall only discharge to a pressurized sewer force main.

2.3.2. Lift station wet wells shall be designed to ensure pumps remain submerged at all times, with a minimum clearance of five (5) feet between the top of the pump and the bottom of the influent invert.

2.3.3. Non-looped (dead-end) water mains shall be a minimum of eight (8) inches in diameter to meet fire flow requirements.

2.3.4. All water and sewer service laterals shall be located no more than three (3) feet from the property corners.

2.3.5. All gravity sewer mains and sewer force mains crossing beneath creeks and/or mosquito ditches shall be constructed of P401-coated ductile iron pipe in accordance with Specifications 7.3.2 and 7.3.2.8.

2.3.6. All water mains crossing beneath creeks and/or mosquito ditches shall be constructed of cement-lined ductile iron pipe in accordance with Specification 5.3.3.

2.3.7. Commercial and residential units located within the same building shall be metered separately.

2.3.8. Restaurants shall be metered separately from all other units, whether commercial or residential.

2.3.9. Swimming pools and clubhouses shall be metered separately to prevent sewer charges for pool water usage.

2.3.10. No more than one residential lot shall connect to a single sewer service lateral.

2.3.11. Potable water services and fire mains shall not share a common tap, except where the water main is located on the opposite side of the roadway. In all other cases, potable water services and fire mains shall be provided with separate taps.

2.3.12. Where a fire line and a potable water service share a common tap, valves shall be installed on each line at the point of separation in accordance with the detail shown on Sheet W-1 of the **REGIONAL UTILITIES** Potable Water Details.

2.3.13. Where an existing water main, gravity sewer main, and/or sewer force main is to be abandoned as part of a new design, the main shall be completely removed or filled with an excavatable, cementitious flowable fill.

2.3.14. Where existing gravity sewer laterals are to be abandoned as part of a new design, the lateral shall be plugged at the main using an internal point repair liner, and the abandoned lateral shall be filled with an excavatable, cementitious flowable fill.

2.3.15. When a new gravity sewer system is connected to an existing manhole, the new line shall be plugged at the manhole connection and shall remain plugged until the new gravity sewer has been fully tested and certified by FDEP.

2.3.16. Gravity sewer service laterals shall not exceed three (3) feet in depth at the point where they terminate at the cleanout.

2.3.17. Potable water main lines and service lines shall be installed above stormwater exfiltration systems.

2.3.18. An eight-inch (8-inch) sewer lateral shall connect to a gravity sewer main only through a manhole.

2.3.19. Fire hydrants shall be located to maintain a minimum clearance of three (3) feet around the hydrant.

2.3.20. Fire hydrants proposed at intersections shall be located between the water main and a point no less than three (3) feet from the property line.

2.3.21. Sewer lift stations (grinder and non-clog) serving a single commercial building with one (1) water meter shall be installed and maintained by the property **OWNER**.

2.3.22. Sewer lift stations (grinder and non-clog) serving commercial buildings with multiple water meters shall be installed by the **DEVELOPER** in accordance with **REGIONAL UTILITIES'** specifications and shall be maintained by **REGIONAL UTILITIES**.

2.4. EASEMENTS & SEPARATION REQUIREMENTS

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

2.4.2. A minimum ten-foot-wide easement shall be required in areas adjacent and parallel to rights-of-way.

2.4.3. A minimum twelve-foot-wide easement shall be required for single-line installations where zoning or other legal requirements ensure that structures are not located within ten (10) feet of the facilities.

2.4.4. A twelve-foot-wide easement, dedicated exclusively to **REGIONAL UTILITIES**, shall be required to provide vehicular access to all pump stations located within a development.

2.4.5. A minimum twenty-foot-wide easement shall be required for any line installed along the side property line of a single-family lot or through areas that are not typically accessible, including buffer zones, green areas, lakeside easements, golf courses, or similar areas.

2.4.5.1. Twenty-foot-wide easements are required to ensure that structures, trees, shrubs, or other obstructions are not placed within ten (10) feet of any facility or main.

2.4.5.2. Proposed utility facilities shall not be constructed within areas designated for landscaping.

2.4.5.3. If **REGIONAL UTILITIES** determines that no reasonable alternative exists, landscaping with non-aggressive root systems may be permitted within five (5) feet of a facility or main, provided a minimum of four (4) feet of cover is maintained.

2.4.6. In such cases, a Hold Harmless Agreement shall be provided to **REGIONAL UTILITIES**, relieving **REGIONAL UTILITIES** of responsibility for damages resulting from maintenance or construction activities within the easement.

2.4.7. Wider easements may be required for deeper utility installations, at the discretion of **REGIONAL UTILITIES**.

2.4.8. A minimum perpendicular separation of ten (10) linear feet, measured in plan view, shall be maintained between all sewer and water utilities.

2.4.9. A minimum perpendicular separation of ten (10) feet, measured in plan view, shall be maintained between any structure and all water and/or sewer mains.

2.4.10. A minimum perpendicular separation of six (6) linear feet, measured in plan view, shall be maintained between all sewer and/or water utilities and underground electric utilities.

2.4.11. A minimum perpendicular separation of six (6) linear feet, measured in plan view, shall be maintained between all sewer and/or water utilities and underground natural gas utilities.

2.4.12. Deviations from these requirements may be considered on a case-by-case basis, at the sole discretion of the **REGIONAL UTILITIES'** General Manager or their designated representative and shall not be less than minimum FDEP standards.

2.5. AS-BUILT DRAWINGS

2.5.1. All as-built plans submitted to **REGIONAL UTILITIES** shall be provided via email or on digital device in AutoCAD format, PDF format, and one signed and sealed hard copy. All as-built plans submitted to **REGIONAL UTILITIES** shall be provided via email or on a digital storage device and shall include Auto CAD format, PDF format and one (1) signed and sealed hard copy.

2.5.2. Drawings shall be georeferenced to the U.S. State Plane Coordinate System, NAD 83, Florida State Plane, North Zone, U.S. Foot, and shall contain two (2) referenced and labeled control points tied to the State Plane Coordinate System.

2.5.3. All features shown on the as-built drawings shall be surveyed after construction to verify accuracy. **REGIONAL UTILITIES** may randomly spot-check features to confirm compliance.

2.5.3.1. Water system features shall be surveyed to an accuracy of ≤ 0.3 feet.

2.5.3.2. Sewer system features shall be surveyed to an accuracy of ≤ 0.5 feet.

2.5.4. **REGIONAL UTILITIES** shall provide a template drawing available for download on its web site at www.regionalutilities.net.

2.5.5. Computer-generated scales that cannot be read using a standard engineer's box scale shall not be used.

2.5.6. Show profile grade between manholes.

2.5.6.1. Manhole inverts and top elevations. Profiles shall be shown between manholes and shall include:

2.5.6.2. Manhole invert elevations

2.5.6.3. Manhole top elevations

2.5.7. Special detail drawings shall be provided where required to illustrate installations necessary to meet field conditions.

2.5.8. Appropriate symbols shall be used to differentiate natural ground, compacted earth, and pavement.

2.5.9. **LAYERING**

2.5.9.1. Layer names must appear exactly as specified in Appendix A.

2.5.9.2. Each required layer listed in the **REGIONAL UTILITIES**–approved CAD layer standards shall contain only the features described for that layer.

2.5.9.2.1. Example: The BOUND-PROJECT layer shall contain only the project boundary line.

2.5.9.3. All required layers shall be present in the drawing, except for layers associated with features not applicable to the project.

2.5.9.4. All layers shall be clearly differentiated. Layers with similar names (e.g., *WATER-MAIN* and *WATER-MAINS*) shall not coexist within the same drawing.

2.5.9.5. All text shall be placed on layers separate from the feature layers they annotate.

2.5.9.5.1. Example: Text describing a water main shall be placed on the WATER-MAIN-TXT layer, not the WATER-MAIN layer.

2.5.9.6. Leaders and dimensions shall be placed on the appropriate text layers, not on feature layers.

2.5.9.6.1. All dimensions shall be associative.

2.5.9.6.2. Exploded dimensions will not be accepted.

2.5.9.7. All layers shall conform to the geometry type specified in Appendix A (line/polyline, polygon, text, insert).

2.5.9.8. All polygon features shall be completely closed. Duplicate lines may be required on multiple layers to properly define polygon geometry.

2.5.9.9. Gravity sewer lines and force mains shall be drawn as polylines and shall be broken only at:

2.5.9.9.1. Changes in pipe type
2.5.9.9.2. Valves
2.5.9.9.3. Tees
2.5.9.9.4. Crosses
2.5.9.9.5. Manholes
2.5.9.9.6. Reducers

2.5.9.10. All valves shall be labeled with coordinates and referenced to road centerlines, power poles, utility poles, phone boxes, or other permanent above-ground structures.

2.5.9.10.1. All valve reference dimensions shall be placed on the appropriate Valve-TXT layer.

2.5.9.11. Water lines shall be drawn as polylines and shall be broken only at:

2.5.9.11.1. Changes in pipe type
2.5.9.11.2. Valves
2.5.9.11.3. Tees
2.5.9.11.4. Crosses
2.5.9.11.5. Reducers

2.5.9.12. Pipe endpoints shall be snapped together at endpoints.

2.5.9.13. End-of-line caps shall be shown to differentiate permanent line terminations from lines extending beyond the drawing limits.

2.5.9.13.1. End-of-line caps shall be shown only for permanently capped lines.
2.5.9.13.2. Temporary caps pending inspection shall not be shown as end-of-line caps.

2.5.10. **SYMBOLS**

2.5.10.1. 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

2.5.11. **ANNOTATION**

2.5.11.1. All water and sewer lines shall include details identifying:

2.5.11.1.1. Line diameter
2.5.11.1.2. Material type
2.5.11.1.3. Slope

2.5.11.2. Addresses and lot numbers shall not include special characters such as *, #, quotation marks (" "), or similar symbols.

2.5.11.3. All required text shall be single-line text.

2.5.12. **FILE NAMING AND REVISIONS**

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

2.5.12.2. Each file name shall include the project name and the revision date in YYMMDD format.

2.6. ENGINEER CERTIFICATION GUIDELINES

2.6.1. When the project is ready for certification, the **ENGINEER** shall submit the following certifications and status reports to **REGIONAL UTILITIES**:

2.6.1.1. Written certification stating that all materials used in the project comply with the most current edition of **REGIONAL UTILITIES'** Standard Design and Construction Specifications, as well as all applicable ASTM, AWWA, and ANSI standards.

2.6.1.2. Fusion equipment operator certification, in accordance with section 5.3.2.

2.6.1.2.1. Fusion equipment Data Logger records, in accordance withsection 5.3.2.

2.6.1.3. Inspection reports from gravity sewer camera inspections, identifying required repairs and/or certifying that the sewer lines meet **REGIONAL UTILITIES'** specifications.

2.7. **INSPECTION REQUIREMENTS (**Final Inspection)

2.7.1. The **CONTRACTOR** shall be responsible for having all property corners and rights-of-way properly staked prior to final inspection.

2.7.2. The **CONTRACTOR** shall notify **REGIONAL UTILITIES** at least forty-eight (48) hours in advance of all required inspections.

2.7.3. All construction activities shall be complete prior to the **CONTRACTOR** scheduling a final walk-through inspection with **REGIONAL UTILITIES**.

2.7.4. On the day of the scheduled inspection, the **CONTRACTOR** shall provide sufficient personnel to accompany the inspector and to:

2.7.4.1. Open all manholes
2.7.4.2. Open meter boxes
2.7.4.3. Test all fire hydrants
2.7.4.4. Address and correct punch list items identified during the inspection
2.7.4.5. The inspector may return to the site at the **CONTRACTOR'S** request to inspect larger or more complex items once they have been completed.

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 eternal 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 one 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 **CONTRACTOR'**S 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 contactor 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. The **CONTRACTOR** shall furnish and install a complete potable water piping system, fully tested and ready for operation.

5.1.2. This section establishes standard specifications governing materials and general procedures, as specified herein or as otherwise shown on the construction drawings.

5.2. GENERAL REQUIREMENTS

5.2.1. All work shall be constructed in accordance with the approved drawings and specifications and shall be proven to be in first-class working condition.

5.2.2. All defects and leaks revealed by testing shall be corrected by the **CONTRACTOR**.

5.2.2.1. All required tests shall be performed by the **CONTRACTOR**.

5.2.2.2. Testing shall be observed by **REGIONAL UTILITIES**.

5.2.2.3. Water required for testing shall be furnished by the **CONTRACTOR**.

5.2.3. Prior to commencement of work, the **CONTRACTOR** shall submit to the **ENGINEER**, for approval, copies of certificates of inspection from the pipe **MANUFACTURER** stating that the pipe and fittings have been inspected at the manufacturing plant and meet the requirements of these specifications.

5.2.3.1. Materials not specifically listed in these specifications shall require written approval from **REGIONAL UTILITIES** prior to installation to be considered an Approved Equal.

5.2.3.2. The **ENGINEER** shall submit documentation to **REGIONAL UTILITIES** certifying that all materials comply with current specifications.

5.2.4. Unless otherwise approved, pipe sections shall have a minimum laying length of twenty (20) feet.

5.2.5. All materials shall be free from defects that impair strength or durability and shall be of the highest commercial quality suitable for the intended application.

5.2.6. All materials shall possess sufficient structural properties to safely withstand the strains and stresses to which they will normally be subjected and shall conform accurately to specified dimensions and details.

5.2.7. All pipe and fittings shall be clearly and permanently marked with:

5.2.7.1. **MANUFACTURER'S** name or trademark
5.2.7.2. Batch number
5.2.7.3. Manufacturing plant location
5.2.7.4. Strength designation
5.2.7.5. Any other applicable identification
5.2.7.6. Pipe color shall be as approved by **REGIONAL UTILITIES**.

5.2.8. Each pipe section shall be permanently marked with:

5.2.8.1. Date of lining completion and inspection
5.2.8.2. Numerical sequence of application for that date
5.2.8.3. Markings shall be made with a permanent, clearly identifiable marker.

5.2.9. All pipe and fittings delivered to the project site shall be accompanied by independent testing laboratory reports certifying compliance with applicable ASTM specifications.

5.2.10. At the time shop drawings are submitted, the **CONTRACTOR** shall provide a notarized statement of certification from the pipe **MANUFACTURER** confirming compliance with applicable ASTM specifications and any approved modifications.

5.2.11. After a DIRECTIONAL BORE has been completed, the boring **CONTRACTOR** shall run a SONDE back through the pipe to measure the actual depths of the pipe. Measurements shall be taken in 20-foot increments, noting the direction the SONDE was inserted. This shall be required for all bores 3-inches in diameter and larger. The measurements shall be recorded and included on the final as-built drawings. Upon completion of any directional bore installation, the boring **CONTRACTOR** shall pull a SONDE through the installed pipe to verify actual pipe depth.

5.2.11.1. Measurements shall be taken at twenty (20) foot intervals.

5.2.11.2. The direction of SONDE insertion shall be documented.

5.2.11.3. This requirement applies to all bores 3 inches in diameter and larger.

5.2.11.4. Recorded depth measurements shall be included in the final as-built drawings.

5.3. MATERIALS

5.3.1. POLY-VINYL CHLORIDE (PVC)

5.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) pipe intended for potable water service. Pipe 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 use by NSF International and shall comply with the latest edition or revision of all referenced standards.

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 inches 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 edition) for sizes under 2 inches.

5.3.1.5.2. Sustained pressure testing shall be conducted in accordance with ASTM D1598 at test pressures specified in ASTM D1785 when tested in accordance with ASTM D2672 (Section 6.5).

5.3.1.5.3. Burst pressure testing shall be conducted in accordance with ASTM D1599 at test pressures specified 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 edition) for use in sizes 2 inches through 12 inches. REGIONAL UTILITIES may approve other sizes upon written request.

5.3.1.6.2. Pipe shall be manufactured with Iron Pipe Size (IPS/steel) standard outside diameters.

5.3.1.6.3. Pipe shall be designed for a hydrostatic working pressure of 200 psi at 73.4°F, and shall pass without failure:

5.3.1.6.3.1. Sustained pressure test: Minimum 420 psi (ASTM D1598)

5.3.1.6.3.2. Quick burst test: Minimum 630 psi (ASTM D1599)

5.3.1.6.4. 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 American Water Works Association (AWWA) Standard C905 (latest edition) for diameters larger than 12 inches.

5.3.1.7.2. Pipe shall be manufactured with Ductile Iron Pipe Size (DIPS) equivalent outside diameters.

5.3.1.7.3. Pipe shall pass without failure:

5.3.1.7.3.1. Sustained pressure test: 500 psi minimum (ASTM D1598)

5.3.1.7.3.2. Quick burst test: 755 psi minimum (ASTM D1599)

5.3.1.7.4. In the event of conflict between standards referenced herein, the requirements of AWWA C905 shall govern.

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 unless otherwise approved.

5.3.2.2. HDPE pipe for potable water systems shall conform to:

5.3.2.2.1. AWWA C901 for sizes up to 3 inches.
5.3.2.2.2. AWWA C906 for sizes 4 inches and larger.

5.3.2.3. Material shall be PE 4710 meeting cell classification PE445574C and complying with ASTM D2737, ASTM D2239, or ASTM D3035.

5.3.2.4. Pipe shall be manufactured in accordance with:

5.3.2.4.1. ASTM D3035 (up to 3 inches)
5.3.2.4.2. ASTM F714 (4 inches and larger)
5.3.2.4.3. Pipe shall be permanently marked accordingly.

5.3.2.5. All pipe shall be marked with a continuous blue stripe for potable water identification.

5.3.2.6. Mechanical joint transitions utilizing HDPE pipe stiffeners are not permitted.

5.3.2.7. All pipe joints shall be heat fused in accordance with the pipe manufacturer's recommended procedures.

5.3.2.8. Transitions to other pipe materials shall be made using fused end transition fittings.

5.3.2.9. Fusion equipment operators shall receive training in accordance with the pipe manufacturer's recommended procedures.

5.3.2.9.1. Certification of operator training shall be submitted to **REGIONAL UTILITIES** prior to commencement of HDPE fusion and included in the **ENGINEER**'s final certification submittals.

5.3.2.10. The **CONTRACTOR** shall verify that all fusion equipment is in proper working condition prior to use.

5.3.2.11. Fusion equipment shall be equipped with a data logger. Weld records shall include:

5.3.2.11.1. Heater temperature
5.3.2.11.2. Fusion pressure
5.3.2.11.3. Graph of the complete fusion cycle
5.3.2.11.4. These records shall be submitted to **REGIONAL UTILITIES** as part of the **ENGINEER**'s final certification package
5.3.2.11.5. 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 an approved equal and shall be Class 350.

5.3.3.2. Pipe shall be ductile iron manufactured in accordance with ANSI/AWWA C151/A21.51.

5.3.3.3. Push-on joints and mechanical joints shall conform to 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. **STANDARD JOINTS**

5.3.4.1. PVC pipe joints for pipe sizes 2½ inches and smaller shall use extra-heavy PVC or CPVC fittings solvent-welded with approved PVC or CPVC cement.

5.3.4.2. All mechanical joint fittings shall utilize Mega-Lug® restraint-type retaining glands as manufactured by EBBA Iron.

5.3.5. **RESTRAINED JOINTS**

5.3.5.1. In addition to concrete thrust blocks, approved cast iron or ductile iron restraint-type retainer glands shall be installed where required.

5.3.5.2. Joint Restraints shall be required on all pipe installed in paved areas.

5.3.5.3. Joint restraints shall be installed on a minimum of four (4) joints on each side of a directional bore, or as otherwise required by the PVC pipe manufacturer.

5.3.5.4. Joint restraints shall be installed on a minimum of three (3) joints upstream of valves serving dead-end fire hydrants or stub-outs.

5.3.5.5. Joint restraints shall be installed on a minimum of two (2) joints or forty (40) feet, whichever is greater, downstream of tapping valves.

5.3.6. **SERVICE CONNECTIONS**

5.3.6.1. Service connections shall be made using FORD FC202 stainless steel band iron service saddles or approved equal.

5.3.6.2. Where service headers are proposed for installation of multiple meter vaults (also known as *meter banks*), construction shall conform to **REGIONAL UTILITIES** Standard Potable Water Detail Sheet W-2.

5.3.6.3. All service connections shall terminate at the property line and no more than three (3) feet from property corners unless otherwise directed by **REGIONAL UTILITIES**.

5.3.7. **MARKING SERVICES**

5.3.7.1. A stamped letter “W” (not cut) shall be placed into the back or high point of the curb directly above each service line, or within the street or sidewalk where no curb exists.

5.3.7.2. The marking shall be a minimum of three (3) inches high and one-quarter (¼) inch deep.

5.3.7.3. The **CONTRACTOR** shall install blue 4-inch ball markers, Part No. 1403, as manufactured by 3M, at each service tap and within each meter box.

5.3.8. **SERVICE TUBING**

5.3.8.1. One-inch (1") CTS service tubing shall be polyethylene, PE 4710 resin, meeting AWWA C901, pressure rated for 200 psi (DR9), and furnished with a 1-inch × ¾-inch meter coupling curb stop. Tubing shall be black with a continuous blue stripe.

5.3.9. **BALL MARKERS**

5.3.9.1. The **CONTRACTOR** shall place a 4-inch blue marker ball (3M Part No. 1403) adjacent to:

5.3.9.1.1. Each water main valve
5.3.9.1.2. Each corporation stop at the main
5.3.9.1.3. Each curb stop within a buried meter box

5.3.9.2. Marker balls shall be installed at a depth not exceeding thirty-six (36) inches below finished grade.

5.4. **INSTALLATION**

5.4.1. All work shall be completed in first-class condition and constructed in strict accordance with the approved drawings and specifications.

5.4.2. The **CONTRACTOR** shall submit shop drawings, including **MANUFACTURER** certifications for all pipe and fittings, to **REGIONAL UTILITIES** for approval prior to installation.

5.4.3. Prior to commencing work, the **CONTRACTOR** shall submit to both the **ENGINEER** and **REGIONAL UTILITIES**, in triplicate, certificates of inspection from the pipe manufacturer certifying that all pipe and fittings were inspected at the manufacturing plant and meet these specifications.

5.4.4. All water mains, fittings, and appurtenances shall comply with all applicable Florida Department of Environmental Protection (FDEP) and AWWA standards.

5.4.5. Any pipe found to be defective, damaged, or unsound after installation shall be removed and replaced with new pipe at the **CONTRACTOR'S** expense.

5.4.6. All testing shall be performed by the **CONTRACTOR** and observed by **REGIONAL UTILITIES**. Water required for testing shall be furnished by the **CONTRACTOR**.

5.4.7. Each pipe section shall rest uniformly on the prepared pipe bedding for the full length of the barrel, with bell holes excavated to accommodate joints. Any pipe disturbed after placement shall be removed and relaid.

5.4.8. Pipe shall not be installed when trench or weather conditions are unsuitable, unless expressly approved by **REGIONAL UTILITIES**.

5.4.9. Pipe fittings shall be handled carefully to prevent damage. Where practical, fittings shall be inspected for defects and cracks while suspended prior to placement in the trench.

5.4.10. Minimum cover for all piping shall be thirty-six (36) inches.

5.4.11. Maximum cover for all piping shall be forty-eight (48) inches, unless otherwise approved in writing by **REGIONAL UTILITIES**.

5.5. CLEANING AND FLUSHING

5.5.1. After final inspection has been completed and the project has passed, the **CONTRACTOR** shall be responsible for opening an approved flush point and for directing and controlling the discharge of flushed water. At that time, the **REGIONAL UTILITIES** construction inspector shall open the main line valve to thoroughly flush the water main.

5.5.2. During flushing operations, the **CONTRACTOR** and the **REGIONAL UTILITIES** construction inspector shall verify that all water services and fire hydrants are open and in proper working order.

5.6. FIELD TESTING

5.6.1. All piping intended to operate under liquid pressure shall be tested in sections of approved length.

5.6.2. All field testing shall be conducted in the presence of the **ENGINEER** and **REGIONAL UTILITIES**.

5.6.3. Testing shall consist of hydrostatic pressure testing at 150 psi, unless otherwise approved in writing.

5.6.4. The **CONTRACTOR** shall furnish clean water, suitable temporary testing plugs, all required equipment, and all labor necessary to perform testing.

5.6.5. Pressure tests shall have a minimum duration of two (2) hours, unless otherwise specified or directed in writing by **REGIONAL UTILITIES**.

5.6.6. During the test period, pressure loss shall not exceed two (2) psi, regardless of the length of pipe being tested.

5.6.7. The test section shall be completely filled with water of approved quality, and all air shall be expelled.

5.6.7.1. Where hydrants, blow-offs, or other air-release points are not available at high points, the **CONTRACTOR** shall provide temporary taps.

5.6.7.2. All temporary taps shall be properly plugged and sealed following completion of testing.

5.6.8. Specified test pressure shall be applied using a pump connected to the pipeline in a manner acceptable to **REGIONAL UTILITIES**.

5.6.9. The pump, connections, gauges, and all necessary testing apparatus shall be furnished by the **CONTRACTOR** and shall be subject to approval by the **ENGINEER** and **REGIONAL UTILITIES**.

5.6.10. Pressure gauges shall be calibrated by an approved testing laboratory and shall have graduation increments of no greater than two (2) psi.

5.6.11. Gauge size shall be selected so that test pressure readings fall between 10 percent and 90 percent of the gauge's full-scale capacity.

5.6.12. All exposed pipe, fittings, valves, hydrants, and joints shall be carefully inspected during testing. Any damaged or defective components discovered shall be repaired or replaced with sound materials, and the test shall be repeated until satisfactory results are achieved.

5.6.13. If a test section fails, the **CONTRACTOR** shall locate, uncover (including uncovering the entire section if necessary), and repair or replace the defective pipe, fitting, or joint.

5.6.14. All visible leaks shall be corrected, regardless of the measured pressure loss.

5.6.15. Lines shall be repaired and retested as required until all test criteria are met.

5.7. DISINFECTION

5.7.1. All potable water pipes and fittings, regardless of size or location, shall be thoroughly disinfected prior to being placed into service.

5.7.2. Disinfection shall be performed in accordance with:

5.7.2.1. American Water Works Association (AWWA) Standard C651, latest edition.

5.7.2.2. Florida Administrative Code Rule 62-555.345, F.A.C.

5.7.2.3. All applicable Federal, State, and Local regulations

5.8. WARRANTY

5.8.1. The **CONTRACTOR** shall provide a warranty covering installation and workmanship for a minimum period of one (1) year from the date of certification by the Florida Department of Environmental Protection (FDEP).

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. The **CONTRACTOR** shall furnish, install, joint, and test all valves and appurtenances as shown on the drawings and as specified herein.

6.1.2. All furnished materials shall be new, unused, and manufactured by companies with established experience in producing the specified products.

6.2. GENERAL REQUIREMENTS

6.2.1. All valves installed in potable water systems shall be certified to NSF/ANSI 61.

6.2.2. Valves greater than 12 inches in diameter shall be equipped with right-angle drive assemblies.

6.2.3. Valves 3 inches and larger shall be gate valves unless otherwise specified.

6.2.4. All water system valves shall be marked with 3M™ blue water ball markers, Part No. 1403, as manufactured by 3M.

6.2.5. Valves installed in the water system shall open by turning counterclockwise (to the left) when viewed from the stem.

6.2.6. Where extension stems are required, adjustable extension stems and substantial wall brackets shall be furnished and installed as directed.

6.2.7. Extension stems shall be provided for all buried valves where the operating nut is located more than four (4) feet below finished grade.

6.2.8. Interior and exterior valve surfaces shall be fusion-bonded epoxy coated in accordance with ANSI/AWWA C550.

6.3. MATERIALS

6.3.1. GATE VALVES

6.3.1.1. Gate valves shall be manufactured by American Flow Control, AVK, or approved equal.

6.3.1.2. All gate valves shall be resilient wedge type and shall comply with:

6.3.1.2.1. AWWA C515 (sizes up to 12 inches)
6.3.1.2.2. AWWA C550

6.3.1.3. Gate valves 3 inches through 12 inches shall be rated for a minimum working pressure of 250 psi.

6.3.1.4. Gate valves greater than 12 inches shall be rated for a minimum working pressure of 150 psi.

6.3.1.5. When fully open, gate valves shall provide a clear waterway equal to the nominal pipe diameter.

6.3.1.6. Operating nuts or handwheels shall have a cast arrow indicating the direction of opening.

6.3.1.7. Valve bodies shall be cast with the manufacturer's distinctive marking, pressure rating, and year of manufacture.

6.3.1.8. Prior to shipment, each gate valve shall be factory-tested at 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, equipped with a two-inch (2") operating nut and adjustable valve boxes.

6.3.1.10. Gate valves installed above ground or inside structures shall be non-rising stem, handwheel-operated type with flanged ends, of similar construction to buried valves.

6.3.2. VALVE JOINTS

6.3.2.1. Gate valves shall have mechanical joint ends compatible with the pipe system in which they are installed, unless otherwise specified.

6.3.2.2. Mechanical joint restraint glands shall be Mega-Lug® type or approved equal.

6.3.2.3. Hydrostatic testing of valve joints shall be performed in strict accordance with applicable AWWA standards and Section 5 of this specification.

6.3.3. CHECK VALVES

6.3.3.1. Check valves shall conform to AWWA C508, latest edition, *"AWWA Standard for Swing-Check Valves for Ordinary Waterworks Service."*

6.3.3.2. Check valves larger than 2 inches nominal diameter shall be iron body, flanged-end, outside lever and spring-loaded swing type, with straightaway full pipe area passageway. Valves shall include:

6.3.3.2.1. Renewable bronze seat ring
6.3.3.2.2. Rubber-faced disc

6.3.3.3. Check valves shall be manufactured by AVK.

6.3.3.4. Check valves 2 inches and smaller shall be brass swing-check type rated for 200 psi working pressure, such as American Valve Model M31, or approved equal.

6.3.4. **CUSHIONED CHECK VALVES**

6.3.4.1. Check valves installed on high-service pump discharge lines shall be Series 6011 oil-cushioned swing check valves with weight and lever, as manufactured by APCO Valve & Primer, or approved equal.

6.3.5. **HOSE VALVES (BIBS)**

6.3.5.1. All garden hose valves (hose bibbs) shall be ¾ inch nominal size.

6.3.6. **FITTINGS**

6.3.6.1. Fittings shall be ductile iron and shall conform to ANSI/AWWA C153/A21.53 and ANSI/AWWA C110/A21.10, latest editions.

6.3.6.2. Interior and exterior surfaces of fittings shall be fusion-bonded epoxy coated in accordance with ANSI/AWWA C550.

6.3.6.3. All fittings shall be of DOMESTIC ORIGIN (American Made).

6.3.6.4. Ductile iron fittings and special castings shall be compatible with the type of pipe installed and shall have a minimum working pressure rating of 150 psi. Fittings shall conform to AWWA C153, latest edition.

6.3.6.5. Short-body pattern fittings shall be installed unless otherwise specified. Long-body fittings (AWWA C110) shall be used where specifically indicated on the drawings or where laying length requirements are not governed by short-body patterns.

6.3.6.6. Fittings shall have joint configurations compatible with the pipe furnished. All joints shall utilize restraint-type retainer glands.

6.3.7. **TAPS**

6.3.7.1. All taps greater than 2 inches in diameter shall be performed by **REGIONAL UTILITIES**.

6.3.7.2. All taps 2 inches and smaller shall be performed by the **CONTRACTOR**.

6.3.7.3. A representative of **REGIONAL UTILITIES** shall be present on-site prior to and during all tapping operations.

6.3.7.4. The **CONTRACTOR** shall provide a minimum of five (5) working days' notice to **REGIONAL UTILITIES** prior to scheduling tapping work.

6.3.7.5. Prior to tapping, the **CONTRACTOR** shall ensure that the tapping sleeve and valve have been installed, pressurized, and successfully hydrostatically tested in accordance with Section 6.3.8.

6.3.7.6. If the line has not been tested prior to the arrival of **REGIONAL UTILITIES** personnel, a $50.00 service charge shall be added to the cost of the tap and the tap shall be rescheduled. If the **CONTRACTOR** elects to have **REGIONAL UTILITIES** remain on-site while preparations are completed, a service charge of $50.00 per hour shall apply for the duration of the on-site time.

6.3.7.7. All taps equal to or greater than 4 inches in diameter, regardless of the diameter of the main being tapped, shall utilize a single tapping sleeve and tapping valve assembly.

6.3.7.7.1. The tapping sleeve shall be stainless steel wraparound "Fast Style" as manufactured by Ford Meter Box Company, or approved equal, and shall be furnished complete with all necessary accessories.

6.3.7.7.2. Tapping sleeves shall have a working pressure rating of:

6.3.7.7.2.1. 200 psi for sizes 4 inches through 12 inches

6.3.7.7.2.2. 150 psi for sizes 14 inches and larger

6.3.7.7.3. Sleeves shall conform to applicable sections of AWWA C110, latest revision.

6.3.7.7.4. Sleeves shall be split-type for field assembly and sized for compatibility with all classes of cast iron pipe.

6.3.7.7.5. Outlet flanges shall be Class 125 Standard, recessed for standard tapping valves.

6.3.7.8. All taps smaller than 4 inches in diameter, regardless of the diameter of the main, shall consist of a single tapping saddle and associated tapping valve.

6.3.7.8.1. Tapping saddles shall be fusion-bonded epoxy coated and manufactured by Ford Meter Box Company, or approved equal.

6.3.7.9. Excavation for tapping operations shall:

6.3.7.9.1. Extend a minimum of 4 inches below the bottom of the valve

6.3.7.9.2. Be at least seven (7) feet in length

6.3.7.9.3. Provide sufficient space for two (2) workers

6.3.7.10. The tapping area shall be completely dry. The **CONTRACTOR** shall be responsible for all necessary dewatering.

6.3.7.11. Tapping valves shall comply with all applicable requirements of Section 6.3 and shall consist of a mechanical joint outlet by tapping flange with a raised inner lip for alignment with the tapping sleeve.

6.3.7.12. 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:

6.3.7.12.1. Prior to tapping a potable water main, the drilling machine pilot drill, shell cutter, and cutter hub shall be sterilized as follows:

6.3.7.12.2. Combine four (4) gallons of potable water with eight (8) ounces of sodium hypochlorite.

6.3.7.12.3. Swab the pilot drill, shell cutter, and cutter hub until clean, or fully immerse in the sterilizing solution.

6.3.7.12.4. Components shall remain wet for a minimum of five (5) minutes prior to commencing tapping operations.

6.3.7.12.5. Rinsing after sterilization is not required.

6.3.8. TAP HYDROSTATIC PRESSURE TEST

6.3.8.1. After installation of the tapping sleeve and valve, and prior to tapping a pressurized water main, a hydrostatic pressure test shall be conducted.

6.3.8.2. Testing shall be performed by introducing water into a test tap or test hole located on the outlet half of the sleeve, with the tapping valve in the closed position.

6.3.8.2.1. If no test tap is provided, testing shall be conducted through a mechanical joint tapped plug connected to the open tapping valve. Upon completion, a watertight plug shall be installed in the test opening.

6.3.8.3. The sleeve and valve assembly shall maintain 150 psi for a duration of thirty (30) minutes with no visible leakage.

6.3.8.4. Any leakage shall require removal and replacement of defective components. The assembly shall be retested until it passes the specified requirements.

6.3.8.5. The **CONTRACTOR** shall furnish and install all temporary restraints, gauges, pumps, and incidental equipment necessary to perform the test and shall remove such equipment upon completion.

6.3.9. CORPORATION STOPS (LEAD FREE)

6.3.9.1. Corporation stops shall be manufactured from lead-free cast bronze with machined fitting surfaces and shall conform to AWWA C800, latest edition, in sizes 1 inch up to and including 2 inches.

6.3.9.2. The inlet connection shall be AWWA standard corporation stop thread or iron pipe (IP) thread.

6.3.9.3. Corporation stops with compression joint outlets for copper or plastic tubing shall be Ford Type F1000, as manufactured by Ford Meter Company, Inc., or approved equal.

6.3.10. CURB STOPS (LEAD FREE)

6.3.10.1. Curb stops shall be manufactured from lead-free cast bronze with machined fitting surfaces and shall conform to AWWA C800, latest edition, in sizes 1 inch up to and including 2 inches.

6.3.10.2. Curb stops shall be straight ball-type meter valves with pack joint, with a lock wing cast integrally on the stop body and operating tee cap to provide for locking the stop in the closed position.

6.3.10.3. Curb stops for 1-inch diameter shall be Ford Type B43 with HB-34 lever handle, as manufactured by Ford Meter Company, Inc.

6.3.10.3.1. The handle shall be installed so that it does not obstruct the locking mechanism.

6.3.10.4. Curb stops for 1-1/4 inch through 2-inch diameters shall be Ford Type B41.

6.3.10.5. All curb stops shall be locked with a Highfield Lockseal lock. The lock shall be installed with the lock opening facing upward and readily accessible.

6.3.11. **BALL VALVES (LEAD FREE)**

6.3.11.1. BALL VALVES shall be limited to ¾ 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 the closed position.

6.3.11.2. Ball valves used with copper services shall have:

6.3.11.2.1. Inlet connection with flare nut fitting for Type K copper tubing, and

6.3.11.2.2. Outlet connection with female iron pipe (FIP) thread.

6.3.11.3. Valves shall be Ford B-21 Series, as manufactured by Ford Meter Company, Inc., or approved equal.

6.3.11.4. Ball valves used with Schedule 40 PVC pipe shall have inlet and outlet connections with female iron pipe threads. Brass nipples shall be required. Compression joints shall require insert stiffeners.

6.3.11.5. Ball valves used in conjunction with pitometer tap installations shall have a cast bronze body with 1-1/4 inch female iron pipe thread inlet and outlet openings (valve size 1-1/4 inch).

6.3.11.6. Valve shall be Model B11-455 with HP-4 handle, as manufactured by Ford Meter Company, Inc., or approved equal.

6.3.12. **VALVE BOXES**

6.3.12.1. The **CONTRACTOR** shall furnish, assemble, and install one valve box for each buried valve.

6.3.12.2. Adjustable valve boxes with cast iron bases shall be used. Each box shall consist of an adjustable center section and top section with cover.

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

6.3.12.4. The base shall be centered over the valve and aligned with the operating nut at the top of the valve stem. The entire assembly shall be installed plumb.

6.3.12.5. The cover shall be marked "WATER" or "FIRE" as appropriate.

6.3.12.6. Castings shall be clean, even-grained gray cast iron conforming to ASTM A48, Class 20B. Castings shall be smooth, true to pattern, and free from blow holes, sand holes, projections, or other harmful defects.

6.3.12.7. Valve boxes shall be coated with a single coat of coal tar pitch varnish prior to machining. Machined seating surfaces shall remain uncoated. The seating surfaces of both cover and jacket shall be machined to fit so that the cover does not rock when seated in any position.

6.3.12.8. The location of the valve shall be marked in the high back of the curb with a "V".

6.3.13. BACKFLOW PREVENTERS

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

6.3.13.1.1. Backflow preventers shall be designed and installed in accordance with the following:

6.3.13.1.2. **REGIONAL UTILITIES** Cross Connection Control Program requirements

6.3.13.1.3. All applicable local and state regulations

6.3.14. FIRE HYDRANTS

6.3.14.1. Fire hydrants shall have a cast iron body, be fully bronze-mounted, rated for 150 psi working pressure, and comply with AWWA C502, latest edition.

6.3.14.2. The hydrant inlet connection shall be mechanical joint type with accessories for a 6-inch pipe connection. The internal main valve shall be 5-1/4 inches in diameter. Hose nozzles shall be bronze with American National Standard fire hose coupling threads.

6.3.14.3. Each hydrant shall have:

6.3.14.3.1. Two (2) 2-1/2 inch hose nozzles
6.3.14.3.2. One (1) 4-1/2 inch pumper nozzle

6.3.14.4. Fire hydrants shall be American-Darling Model B-84-B, as manufactured by American Flow Control, or approved equal.

6.3.14.5. Fire hydrants shall be yellow in color.

6.3.14.6. Each hydrant shall be installed with an auxiliary 6-inch gate valve located not less than 30 inches and not more than 10 feet from the hydrant.

6.3.14.7. The hydrant shall connect to the water main via a mechanical joint swivel tee.

6.3.14.8. All hydrants shall be restrained to the valve using a 24-inch long by 6-inch diameter swivel adapter, fusion bonded epoxy coated interior and exterior.

6.3.14.9. Thrust blocking shall be provided in accordance with **REGIONAL UTILITIES'** Standard Details.

6.3.14.10. Where hydrants are installed more than 30 inches and not more than 10 feet from the valve, restraint from hydrant to valve shall be provided using no fewer than two (2) Grade 304 stainless steel, ¾-inch diameter all-thread rods in accordance with **REGIONAL UTILITIES** Standard Details.

6.3.14.11. If a hydrant is located more than 10 feet from the water main, a second water valve shall be installed no less than 30 inches in front of the hydrant. Installation shall comply with Sections 6.3.14.7 and 6.3.14.8.

6.3.15. **FLUSH POINT**

6.3.15.1. End-of-line flush points shall be constructed as a 2-inch water service in accordance with **REGIONAL UTILITIES** Standard Details.

6.3.15.2. A 2-inch quick-connect fitting shall be installed on the curb stop.

SECTION 7

SEWER - GRAVITY

SECTION 7 – SEWER - GRAVITY

7.1. SCOPE OF WORK

7.1.1. **CONTRACTOR** shall furnish and install all gravity sewer lines, manholes, fittings, and appurtenances necessary for a complete system per drawings and specifications.

7.2. GENERAL REQUIREMENTS

7.2.1. All work shall be constructed in strict accordance with the approved drawings and specifications and shall be demonstrated to be in first-class working condition.

7.2.2. All defects and leaks disclosed by required testing shall be corrected by the **CONTRACTOR** at no additional cost. All testing shall be performed by the **CONTRACTOR** and witnessed by **REGIONAL UTILITIES**. The **CONTRACTOR** shall furnish all water and equipment necessary for testing.

7.2.3. Prior to commencement of work, the **CONTRACTOR** shall submit to the **ENGINEER**, for approval, copies of the pipe **MANUFACTURER'S** plant inspection certificates verifying that all pipe and fittings have been inspected and comply with these Specifications.

7.2.4. Excavation and backfill shall be performed in accordance with 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 prior written approval from **REGIONAL UTILITIES**.

7.2.6. Manholes shall have a minimum depth of forty-eight inches (48").

7.2.7. Where practical, sewer design at minimum slopes and minimum cover shall incorporate a margin of error, such as:

7.2.7.1. A 0.10-foot drop through manholes,
7.2.7.2. A minimum slope of 0.42 percent,
7.2.7.3. Or a combination of both.

7.2.8. Gravity sewer mains shall not exceed a 0.5-foot internal drop. In all other cases, the maximum allowable difference between incoming and outgoing sewer elevations shall not exceed 1.0 foot unless an approved drop manhole assembly is installed.

7.2.9. The angle between intersecting gravity sewer runs shall not be less than 90 degrees unless specifically approved in writing by the **ENGINEER** and **REGIONAL UTILITIES**.

7.2.10. All materials shall be new, free from defects affecting strength or durability, and shall be of the highest commercial quality suitable for the intended application.

7.2.11. All materials shall possess structural properties sufficient to withstand anticipated service loads and stresses and shall conform accurately to specified dimensions and details.

7.2.12. All pipe and fittings shall be permanently marked with:

7.2.12.1. **MANUFACTURER'S** name or trademark
7.2.12.2. Batch number
7.2.12.3. Plant location
7.2.12.4. Strength designation
7.2.12.5. Any other required identification
7.2.12.6. Pipe color shall be as approved by the utility company.

7.2.13. Each pipe joint shall be permanently marked with:

7.2.13.1. Date of lining completion
7.2.13.2. Date of inspection
7.2.13.3. Sequential application number for that day
7.2.13.4. Markings shall be applied using a permanent marker of clearly identifiable color.

7.2.14. All pipe and fittings delivered to the project site shall be accompanied by independent laboratory test reports certifying compliance with the referenced ASTM specifications.

7.2.15. At the time of shop drawing submission, the **CONTRACTOR** shall provide a notarized certification from the pipe **MANUFACTURER** stating that the pipe and fittings conform to all referenced ASTM specifications and any modifications thereto.

7.2.16. Where a sewer force main discharges into a lift station wet well that is also connected to a gravity sewer system, a minimum of two (2) upstream manholes, or any manhole located within 400 feet of the wet well, shall receive epoxy lining in accordance with Regional Specification 9.3.1.13.

7.3. MATERIALS

7.3.1. **POLYVINYL CHLORIDE (PVC)**

7.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) suitable for gravity sewer service and shall be furnished with a bell-type coupling having a thickened wall section integral with the pipe barrel.

7.3.1.2. All referenced standards shall be the latest published edition.

7.3.1.3. PVC pipe joints shall be the manufacturer's standard push-on bell type with elastomeric rubber sealing ring for pipe sizes 2-inch and larger.

7.3.1.4. **PVC SDR 26– MAIN LINE**

7.3.1.4.1. PVC sewer pipe and fittings (6-inch through 12-inch diameter) shall conform to ASTM International D3034, latest edition, except as modified herein.

7.3.1.4.2. Pipe material shall meet or exceed cell classification 12454 in accordance with ASTM International D1784, latest edition.

7.3.1.4.3. The bell shall be extruded integrally with the pipe barrel and shall have a wall thickness equal to or greater than the barrel wall thickness.

7.3.1.4.4. Maximum laying length shall not exceed fourteen (14) feet (±1 inch) without prior written approval from **REGIONAL UTILITIES**.

7.3.1.5. **PVC SDR 35– SERVICE LATERALS**

7.3.1.5.1. PVC sewer pipe and fittings (6-inch through 12-inch diameter) shall conform to ASTM International D3034, latest edition, except as modified herein.

7.3.1.5.2. Pipe material shall meet or exceed cell classification 12454 in accordance with ASTM International D1784, latest edition.

7.3.1.5.3. The bell shall be extruded integrally with the pipe barrel and shall have a wall thickness equal to or greater than the barrel wall thickness.

7.3.1.5.4. Maximum laying length shall not exceed fourteen (14) feet (±1 inch) without prior written approval from **REGIONAL UTILITIES**.

7.3.1.6. **ELASTOMERIC GASKET JOINT**

7.3.1.6.1. Each joint shall accommodate contraction and expansion by means of a solid cross-section rubber gasket. The gasket shall be factory assembled and securely retained in the bell to prevent displacement, rolling, or extrusion during installation.

7.3.1.6.2. Field-cut pipe ends shall be prepared strictly in accordance with manufacturer's recommendations to prevent damage to the gasket and ensure proper joint sealing.

7.3.1.7. **FITTINGS**

7.3.1.7.1. All fittings and accessories shall be manufactured in accordance with ASTM D3034.

7.3.1.7.2. Saddle tees or saddle wyes shall not be permitted unless specifically approved in writing by the **ENGINEER** and **REGIONAL UTILITIES**.

7.3.1.7.3. Gravity sewer main fittings shall be bell-and-spigot type.

7.3.1.7.4. Gravity sewer service laterals shall be SDR-35 pipe with solvent weld fittings.

7.3.1.7.5. 90-degree fittings shall not be used in gravity sewer situations.

7.3.2. **DUCTILE IRON**

7.3.2.1. Ductile iron pipe, 6-inch through 48-inch diameter, shall conform to American Water Works Association C151, latest edition.

7.3.2.2. Minimum pipe class shall be Class 350.

7.3.2.3. Pipe shall have minimum design values of:

7.3.2.3.1. 60,000 psi tensile strength
7.3.2.3.2. 42,000 psi yield strength
7.3.2.3.3. 10 percent minimum elongation

7.3.2.4. Wall thickness shall comply with Tables 51.2 and 51.3 of AWWA C151, based on laying condition "b" and depth of cut as indicated on the drawings.

7.3.2.5. In addition to markings required by AWWA C151, the utility may require each pipe joint to be stenciled externally to indicate the required depth-of-cut classification.

7.3.2.6. **JOINTS**

7.3.2.6.1. Joints for ductile iron pipe shall conform to American Water Works Association C111, push-on rubber gasket type, unless otherwise specified on the Drawings.

7.3.2.7. **FITTINGS**

7.3.2.7.1. Fittings shall conform to American Water Works Association C110, 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 used for sewer service shall be furnished with factory-applied Protecto 401 ceramic epoxy exterior coating.

7.3.2.9. **LINING**

7.3.2.9.1. The interior of all ductile iron pipe and fittings shall be factory lined with Protecto 401 Ceramic Epoxy, unless otherwise directed in writing by the **ENGINEER** and approved by **REGIONAL UTILITIES**.

7.3.2.9.2. Application shall be in strict accordance with the **MANUFACTURER'S** published requirements.

7.3.2.9.3. The lining shall extend from the plain or beveled end through the gasket socket area. Surfaces shall be properly prepared prior to application.

7.3.2.9.4. Lining shall cure a minimum of five (5) days after final casting. Cure time shall be extended when ambient temperature is below 65°F.

7.3.2.9.5. The **MANUFACTURER** shall provide notarized certification confirming compliance with these lining requirements.

7.3.3. **GRAVITY SERVICE LATERAL TAP**

7.3.3.1. Connection of a 6-inch sewer service lateral to an existing gravity sewer main shall be made using the Inserta Tee Lateral Connection System appropriate for the host pipe material.

7.3.3.2. A 6-1/2-inch diameter hole shall be cut into the existing PVC main using an approved hole saw designed for the pipe material.

7.3.3.3. Installation shall strictly follow the **MANUFACTURER'S** written instructions.

7.3.4. **PRECAST CONCRETE MANHOLES**

7.3.4.1. Manholes shall conform to the latest edition of ASTM International C478, *Specification for Precast Reinforced Concrete Manhole Sections*.

7.3.4.2. Minimum wall thickness shall be five (5) inches.

7.3.4.3. Cement shall conform to the latest edition of ASTM International C150, Type II Portland Cement.

7.3.4.4. Minimum concrete strength shall be 4000 PSI at 28 days.

7.3.4.5. Concrete strength shall be verified by fabrication and testing of four (4) standard cylinders at seven (7) days and twenty-eight (28) days. Test results shall be submitted to the **ENGINEER** prior to installation of any manhole.

7.3.4.6. Manhole sections shall be custom fabricated with openings to match indicated pipe alignment and invert elevations.

7.3.4.7. All pipe openings shall be sealed with approved non-shrink grout applied and cured strictly in accordance with **MANUFACTURER'S** recommendations to ensure watertight installation with zero leakage.

7.3.4.8. Written approval from **ENGINEER** and **REGIONAL UTILITIES** shall be obtained prior to ordering or fabricating manholes.

7.3.4.9. The top of the manhole structure shall not be more than eighteen (18) inches below final grade.

7.3.4.10. The manhole channel (trough) shall have a minimum diameter of eight (8) inches.

7.3.4.11. **BASES**

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

7.3.4.11.2. The base shall be set on a twelve (12) inch thick leveling course of No. 4 or No. 57 stone, wrapped with filter fabric above and below, extending at least twelve (12) inches beyond the base perimeter.

7.3.4.11.3. 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.

7.3.4.12. **JOINTS**

7.3.4.12.1. Joint contact surfaces shall be machine-formed and parallel, with a maximum two (2) degree slope and nominal 1/16-inch clearance. Joints shall include a tongue-and-groove configuration with gasket recess designed for installation of an O-ring rubber gasket conforming to ASTM International C443, *Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets or Pre-Molded Plastic Joint Sealer*.

7.3.4.12.2. Each joint shall be internally grouted using approved materials to ensure watertight performance.

7.3.4.13. **COATING**

7.3.4.13.1. Interior and exterior surfaces of each manhole shall receive two (2) coats of waterproof bituminous coating approved by **ENGINEER** and **REGIONAL UTILITIES**.

7.3.4.13.2. Total minimum dry film thickness shall be twelve (12) mils. Each coat shall be applied at a minimum rate of one (1) gallon per 100 square feet.

7.3.4.13.3. Coating shall be applied by brush or spray in strict accordance with manufacturer instructions.

7.3.4.13.4. Adequate drying time shall be allowed between coats to prevent damage to the preceding application.

7.3.4.13.5. Primary coating shall be applied at the place of fabrication.

7.3.4.13.6. Field touch-up or additional coating shall be performed after installation if directed by **ENGINEER** or **REGIONAL UTILITIES**.

7.3.4.13.7. Where a sewer force main enters a wet well connected to a gravity sewer system, a minimum of two (2) upstream manholes, or any manhole within 400 feet of the wet well, shall receive epoxy lining in accordance with Regional Specification 9.3.2.13.

7.3.4.14. **RISER ADJUSTMENT RINGS**

7.3.4.15. Adjustment rings shall be Cretex Expanded Polypropylene (EPP) rings.

7.3.4.16. Installation shall comply with the manufacturer's published instructions.

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

7.3.5.1. Frames and covers shall be U.S. Foundry Model E-170 with Non-Penetrating Pick Bar (NPPB) or approved equal.

7.3.5.2. Castings shall be strong, tough, and uniform, free of blowholes, sand holes, shrinkage cracks, or other defects.

7.3.5.3. Castings shall conform to ASTM International A48, Class 30 Gray Iron, or Grade 65-45-12 Ductile Iron.

7.3.5.4. Manhole frames and covers shall be designed to withstand HS20-44 loading in accordance with American Association of State Highway and Transportation Officials Specifications.

7.3.5.5. Prior to shipment, castings shall receive one (1) coat of coal-tar pitch varnish applied uniformly to provide a smooth, durable coating resistant to scaling.

7.3.5.6. Bearing surfaces shall be machined or ground to ensure firm seating without rocking. Non-matching sets shall be rejected.

7.3.5.7. A RainGuard ABS insert shall be installed in all manhole frames and covers to reduce stormwater inflow.

7.4. **INSTALLATION**

7.4.1. Pipe installation methods shall be subject to approval by **ENGINEER** and **REGIONAL UTILITIES**.

7.4.2. Each pipe section shall be inspected prior to installation to ensure it is sound and free from defects.

7.4.3. Pipe laying shall proceed upgrade, beginning at the downstream end, with bell ends facing upgrade.

7.4.4. Any defective pipe discovered before or after installation shall be removed and replaced immediately at no additional cost.

7.4.5. Extreme care shall be taken to maintain precise alignment and grade.

7.4.6. Pipe shall be installed to conform strictly to the lines and grades shown on the drawings.

7.4.7. The **CONTRACTOR** is solely responsible for locating existing underground utilities prior to construction.

7.4.7.1. Minor horizontal alignment adjustments (not affecting grade) may be permitted to avoid unforeseen utilities only with written approval, and provided straight alignment is maintained between manholes.

7.4.7.2. If an existing utility conflicts with proposed grade, **CONTRACTOR** shall immediately notify **ENGINEER** and provide all necessary field information for redesign and approval by **REGIONAL UTILITIES** prior to proceeding.

7.4.8. **SURVEYS AND GRADE STAKES**

7.4.8.1. The **CONTRACTOR** shall be solely responsible for providing, protecting, and maintaining the accuracy of all survey control, line, and grade stakes required for construction.

7.4.9. **LAYING AND JOINTING**

7.4.9.1. Pipe shall be laid on a firm, unyielding foundation providing uniform bearing along the full length of the pipe barrel.

7.4.9.2. Bedding shall be shaped to conform to the outside diameter of the pipe to ensure continuous and uniform support.

7.4.9.3. Excavation shall be shaped to accommodate pipe bells so that the barrel of the pipe bears uniformly, and the bell does not support the pipe load.

7.4.9.4. Adjustments to line and grade shall be made only by scraping or adding bedding material beneath the pipe barrel. Wedging, blocking, or supporting the pipe with rigid objects is prohibited.

7.4.9.5. The spigot end of each pipe shall not bear against any irregularity or projection along the trench bottom.

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. Field-cut pipe shall be cut square and beveled in strict accordance with the pipe **MANUFACTURER'S** written instructions.

7.4.9.8. Pipe jointing shall be performed in accordance with the **MANUFACTURER'S** published installation instructions for both pipe and gasket systems.

7.4.9.9. The trench shall be properly dewatered during jointing operations unless otherwise approved in writing by the **ENGINEER**. Dewatering shall continue for a sufficient period to ensure proper curing or sealing of joint materials.

7.4.9.10. The **CONTRACTOR** shall take all necessary precautions to prevent pipe flotation due to groundwater, rainfall, or trench flooding.

7.4.9.11. Pipe shall not be forced to grade by striking it with tools, timbers, or other rigid objects.

7.4.9.12. Openings such as stubs, tees, or service connections shall be securely closed with an approved gasketed, watertight stopper recommended by the pipe **MANUFACTURER**.

7.4.9.12.1. Stoppers shall be installed in a manner that allows future removal without damage to the pipe.

7.4.9.13. At the end of each workday, or whenever pipe laying is suspended, the open end of the pipe shall be securely closed with an approved watertight stopper.

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**. Services shall be constructed of SDR35 PVC pipe.

7.4.10.2. Service connections shall terminate at the property line and no more than three (3) feet from the property corner unless otherwise directed by **REGIONAL UTILITIES**.

7.4.10.3. Service connections shall utilize solvent-weld fittings beginning at the first fitting upstream of the tee wye.

7.4.10.4. Each service shall terminate with a vertical stub-up and cleanout cap at the property line in accordance with the standard detail sheet.

7.4.10.5. Service connections located within paved areas shall be provided with a brass, traffic-rated cleanout cap.

7.4.10.6. Service stub-ups shall extend not less than twenty-four (24) inches and not more than thirty-six (36) inches above final grade.

7.4.10.7. Unless specifically authorized in writing by the **ENGINEER** or shown on the Drawings, service connections shall not be connected directly to 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 face of the curb directly over each service line. Where no curb exists, the marking shall be placed in the adjacent pavement or sidewalk as approved.

7.4.11.1.1. The stamp shall be a minimum of three (3) inches in height and one-quarter (1/4) inch deep.

7.4.11.2. A green four-inch marker ball, Part No. 1404, as manufactured by 3M, shall be installed at each cleanout location at a depth not exceeding thirty-six (36) inches.

7.4.12. MANHOLE INSTALLATION

7.4.12.1. INSTALLING SECTIONS

7.4.12.1.1. Precast concrete sections shall be installed plumb and in true alignment.

7.4.12.1.2. Joint surfaces shall be cleaned, primed where required, and fitted with an O-ring gasket or approved pre-molded plastic joint sealer. Joints shall be pre-primed in accordance with manufacturer recommendations.

7.4.12.1.3. Manholes shall be installed only in properly dewatered excavations.

7.4.12.2. NON-SHRINKING MORTAR

7.4.12.2.1. Handling holes, interior and exterior joints, and annular spaces around pipes shall be sealed with approved non-

shrink mortar installed and cured per **MANUFACTURER** instructions to ensure watertight construction.

7.4.12.2.2. Mortar shall be finished smooth and flush with adjacent surfaces.

7.4.12.2.3. Within two (2) hours of mortar placement, and after initial set, an approved membrane curing compound conforming to ASTM International C309 shall be applied to all finished mortar surfaces, interior and exterior.

7.4.12.3. **GRADE ADJUSTMENT**

7.4.12.3.1. Grade adjustment shall be accomplished using Expanded Polypropylene (EPP) adjustment rings as specified in Section 7.3.4.

7.4.12.4. **SETTING MANHOLE FRAMES**

7.4.12.4.1. Frames and covers shall be set flush with finished pavement surface as shown on the drawings unless otherwise directed.

7.4.12.4.2. Frames shall be set on CRETEX EPP adjustment rings using butyl sealant between rings and between the top ring and frame.

7.4.12.5. **FLOW CHANNELS IN MANHOLE BASE**

7.4.12.5.1. Flow channels shall be constructed of Class C concrete during manhole construction.

7.4.12.5.2. Pipes shall be cut flush with the interior wall. Inverts shall match the pipe diameter and maintain continuous grade through the structure.

7.4.12.5.3. Directional changes shall be formed in smooth curves of the longest practicable radius tangent to adjoining pipelines.

7.4.12.5.4. Flow channels shall have a minimum width of eight (8) inches to permit passage of sewer inspection equipment.

7.4.12.6. **CONCRETE MANHOLE BOOTS**

7.4.12.6.1. Precast manholes shall include watertight resilient boots at all pipe penetrations.

7.4.12.6.2. Boots shall accommodate limited differential settlement.

7.4.12.6.3. All bands, bolts, and hardware shall be stainless steel.

7.4.13. **STUB-OUTS**

7.4.13.1. Stub-outs for future sewer connections shall be installed where shown on the drawings.

7.4.13.2. Each stub-out shall terminate with a bell end fitted with an approved watertight stopper.

7.4.13.3. Stub-outs shall be referenced from the center of the manhole and the invert elevation recorded on as-built drawings.

7.4.13.4. **REGIONAL UTILITIES** assumes no responsibility for the condition of stub-outs at the time of future connection.

7.4.14. **BEDDING AND BACKFILL**

7.4.14.1. Immediately after pipe jointing and inspection, sufficient backfill shall be placed to adequately protect the pipe from injury or displacement.

7.4.14.2. Where indicated on the Drawings or directed by **ENGINEER** or **REGIONAL UTILITIES**, pipe shall be supported by compacted granular fill, concrete cradle, or concrete encasement in accordance with applicable detail drawings.

7.4.14.3. Pipe bedded in compacted granular fill shall not be supported on blocking, wedges, bricks, or any material other than approved bedding. Where concrete cradle or encasement is required, pipe shall be supported on solid concrete blocks or precast concrete saddles that become integral to the completed cradle or encasement.

7.4.14.4. Where no special bedding is indicated, pipe shall be installed 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 work progresses, the sewer interior shall be kept clean of dirt, jointing material, and all superfluous materials.

7.5.3. Prior to final inspection, all sewer lines shall be flushed with clean water to remove debris and foreign material 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. Work shall be subject to visual and internal television inspection. All faults, defects, deviations, or omissions shall be corrected immediately.

7.6.2. **CONTRACTOR** shall provide all necessary testing and televising equipment as directed by **REGIONAL UTILITIES**.

7.6.3. All testing costs are the responsibility of **CONTRACTOR**.

7.6.4. CAMERA INSPECTION

7.6.4.1. 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.

7.6.4.1.1. Camera Inspection shall be scheduled with **REGIONAL UTILITIES** at least five working days prior to the inspection.

7.6.4.2. Camera inspection shall be just before final paving and after all underground utilities (conduit, gas mains) have been installed but prior to FDEP certification.

7.6.4.2.1. 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.

7.6.4.2.2. Gravity mains and laterals shall not contain bellies that hold more than ½-inch of water.

7.6.4.2.3. All joints and fittings shall have no leaks visible.

7.6.4.3. **CONTRACTOR** shall provide a color video, DVD format or USB Flash Drive, recording of all footage televised.

7.6.4.3.1. Video equipment used shall CLEARLY show all pipe and joints being inspected. Any pipe or fittings not clearly shown shall be rejected.

7.6.4.3.2. The speed of the camera shall not exceed 30-feet per minute.

7.6.4.4. Video equipment shall include on-screen character generation showing the following information.

7.6.4.4.1. Location of camera at all times, in reference to beginning manhole.

7.6.4.4.2. Location of entry manhole and sewer line being examined

7.6.4.4.3. Date of examination

7.6.4.5. Gravity mains and service laterals shall be jetted and clean from debris and mud prior to inspection.

7.6.4.6. Gravity mains shall be inspected upstream so that each joint can be clearly viewed.

7.6.4.7. Camera inspection shall require water to be introduced to the laterals and mains prior to the inspections to highlight deformities.

7.6.4.8. 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**.

7.6.4.9. A minimum of 500 gallons shall be added to the main lines.

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

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

7.6.4.10.1. 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.

7.6.4.11. 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.

7.6.4.12. 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.

7.6.4.13. 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.

7.6.5. MANHOLE TESTING

7.6.5.1. **REGIONAL UTILITIES** will only accept a vacuum test after the manhole has been completely constructed and final pavement installed. It is recommended that the **CONTRACTOR** vacuum tests the structures prior to final pavement to check for issues, plugging pinholes and seams with non-shrinking mortar. Any deficiencies shall be repaired before the project will be accepted.

7.6.5.2. Brace the inlet and outlet pipes/plugs to prevent movement during the test. Use air inflated plugs in good condition.

7.6.5.3. 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.

7.6.5.4. **Test Procedure**:

7.6.5.4.1. Pump down to 10 inches (250 mm) mercury.
7.6.5.4.2. Hold vacuum.
7.6.5.4.3. Begin timing once air removal stops.
7.6.5.4.4. A manhole fails if vacuum drops to 9 inches (225 mm) mercury or less
7.6.5.4.5. Minimum test duration: 2 minutes (see depth table below).

Manhole Depth	**Minimum Time**
0–10 ft	2 minutes
10–15 ft	2.5 minutes
15–20 ft	3 minutes

7.6.5.5. Vacuum testing shall comply with ASTM International Standard C1244.

7.6.6. DEFLECTION TEST

7.6.6.1. All PVC pipe shall be tested for deflection.

7.6.6.2. Maximum allowable deflection shall be equal to 5%, or manufactures recommendations, whichever is less.

7.6.6.3. **REGIONAL UTILITIES** may require mandrel testing using a mandrel sized at 95% of pipe inside diameter.

7.7. WARRANTY

7.7.1. **CONTRACTOR** shall provide a minimum one (1) year warranty on installation and workmanship beginning on 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 establishes standard specifications for the design and construction of sewage force mains and appurtenances required by **REGIONAL UTILITIES**.

8.1.2. **CONTRACTOR** shall furnish, install, test, and place into operation a complete sewage force main system including piping, valves, vents, fittings, and appurtenances.

8.2. GENERAL REQUIREMENTS:

8.2.1. All work shall be constructed in a first-class manner in strict accordance with the approved Drawings and Specifications.

8.2.2. Prior to commencement of work, **CONTRACTOR** shall submit to **ENGINEER** and **REGIONAL UTILITIES** copies of **MANUFACTURER'S** certificates confirming that all pipe and fittings were plant-inspected and comply with these Specifications.

8.2.3. All pipe and fittings shall be permanently marked with:

8.2.3.1. **MANUFACTURER** name
8.2.3.2. Batch number
8.2.3.3. Plant location
8.2.3.4. Strength designation
8.2.3.5. Pressure rating

8.2.4. **CONTRACTOR** shall maintain adequate extra fittings on-site to accommodate unforeseen vertical or horizontal adjustments due to utility conflicts.

8.2.5. All defects or leaks disclosed by testing shall be corrected. Testing shall be performed by **CONTRACTOR** and observed by **REGIONAL UTILITIES**.

8.2.6. **CONTRACTOR** shall furnish water required for testing.

8.2.7. Refer to Sections 3 and 4 of this Specification for Excavation, Backfill, and Dewatering requirements.

8.2.8. All referenced standards shall be the latest edition.

8.2.9. Materials shall be free from defects and of best commercial quality suitable for intended use.

8.2.10. All valves shall be Dezurik Plug Valves, except tapping valves which shall be manufactured by American Flow Control.

8.2.11. Materials shall possess structural properties sufficient to withstand normal operating stresses and installation loads.

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

8.2.12.1. 2-inch through 12-inch: PVC Class 200, SDR 21

8.2.12.2. 14-inch and larger: PVC DR 25, C905, 165 psi

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 within 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 line of any manufacturer or plant may be rejected if manufacturing methods fail to produce uniform quality acceptable to **ENGINEER** or **REGIONAL UTILITIES**.

8.2.14. Pipe and fittings are subject to inspection at delivery and prior to installation.

8.2.15. Nonconforming materials shall be rejected and removed by **CONTRACTOR**.

8.2.15.1. Pipes crossing ditches, culverts, rivers, creeks, or similar features shall be considered buried pipe.

8.2.15.2. After completion of any directional bore:

8.2.15.2.1. Boring **CONTRACTOR** shall run a SONDE through the installed pipe.

8.2.15.2.2. Depth measurements shall be taken at 20-foot intervals.

8.2.15.2.3. Direction of SONDE insertion shall be recorded.

8.2.15.2.4. Required for all bores 3 inches and larger.

8.2.15.2.5. Measurements shall be included on final as-built drawings.

8.3. MATERIALS

8.3.1. **MATERIAL SPECIFICATIONS**

8.3.1.1. Pipe materials shall conform to the latest editions of the following standards:

ITEM	SPECIFICATIONS	NUMBER OF TEST
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 PVC with integral bell-type coupling and thickened wall bell section.

8.3.2.2. PVC compound shall be NSF approved, cell classification 12454-0A or 12454-B, conforming to ASTM D1784.

8.3.2.3. Pipe shall meet U.S. Department of Commerce Public Standard PS 22-70 and applicable Plastic Pipe Institute requirements.

8.3.2.4. **Pressure Requirements:**

8.3.2.4.1. Working pressure: 160 psi at 73.4°F
8.3.2.4.2. Sustained pressure: 340 psi minimum (ASTM D1598)
8.3.2.4.3. Burst pressure: 500 psi minimum (ASTM D1599)

8.3.2.5. Pipe sizes 4-inch through 12-inch shall conform to ASTM D2241 (latest).

8.3.2.6. Pipe shall be bell-ring type.

8.3.2.7. Outside diameters shall be IPS (steel pipe equivalent).

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 shall conform to:

8.3.3.2.1. AWWA C901 (3-inch and smaller)
8.3.3.2.2. AWWA C906 (4-inch and larger)

8.3.3.3. Material classification: PE 3608, cell classification PE445574C per ASTM D3035 and NSF 14.

8.3.3.4. Manufacturing shall conform to ASTM F714 and shall be so marked.

8.3.3.5. Joints shall be heat fused per **MANUFACTURER** recommendations by qualified fusion technicians. Refer to section 2 for requirements.

8.3.3.6. Transitions to other pipe types shall be by fused end transitions only.

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 comply with ANSI/AWWA requirements.

8.3.4.2. Interior and exterior coating shall be Protecto 401 ceramic epoxy.

8.3.4.3. Push-on and mechanical joints shall conform to ANSI/AWWA C111/A21.11.

8.3.4.4. Pipe shall be manufactured by American Cast Iron Pipe Companyor written approved equal Class 350.

8.3.4.5. Fittings shall conform to ANSI/AWWA C153/A21.53 and ANSI/AWWA C110/A21.10.

8.3.4.6. Cement-mortar lining and coatings shall comply with ANSI/AWWA C104/A21.4 where applicable.

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 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 used.

8.3.5.5. Long body fittings shall be used where specified on drawings or when laying length requires.

8.3.5.6. Fittings shall be mechanical joint unless otherwise specified.

8.3.5.7. Restraint-type mechanical joint retainer glands (Mega-Lug or approved equal) shall be used on all mechanical joints.

8.3.5.8. Joint Restraints shall be used on all joints located in paved areas.

8.3.5.9. 90-degree fittings shall not be used except in the lift station wet well and valve vault.

8.3.6. **JOINTS**

8.3.6.1. PVC pipe joints shall be manufacturer's standard push-on bell type with rubber sealing ring installed in strict accordance with manufacturer's written instructions.

8.3.6.2. Sealing rings shall conform to ASTM International ASTM F477.

8.3.6.3. All bolts, nuts, studs, and other uncoated underground joint components shall be Type 316 stainless steel.

8.3.7. **LININGS AND COATINGS**

8.3.7.1. All ductile iron pipe, fittings, and specials used for sewer force mains shall be lined and coated (interior and exterior) with Protecto 401 Ceramic Epoxy

8.4. **INSTALLATION**

8.4.1. Force mains shall be constructed using specified materials and in accordance with the approved 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. Pipe whose alignment or joint integrity has been disturbed shall be removed and re-laid.

8.4.5. Pipe shall not be installed when trench or weather conditions are unsuitable unless approved by **REGIONAL UTILITIES**.

8.4.6. Pipe and fittings shall be handled to prevent damage. Where feasible, fittings shall be visually inspected while suspended prior to lowering into trench.

8.4.7. Damaged or defective materials shall be rejected and replaced.

8.4.8. **SURVEYS AND GRADE STAKES:**

8.4.8.1. **CONTRACTOR** shall establish and maintain grade stakes, alignment, and levels.

8.4.8.2. **CONTRACTOR** or its surveyor shall establish construction centerline and benchmark.

8.4.8.3. Disturbed reference points, benchmarks, property corners, or control points shall be restored by a Florida-registered professional land surveyor at **CONTRACTOR'S** expense.

8.4.8.4. **CONTRACTOR** assumes full responsibility for correctness of grade and alignment.

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. Minimum cover: 36 inches unless otherwise shown and approved.

8.4.10.2. Maximum cover: 48 inches unless otherwise shown and approved.

8.4.11. **THRUST BLOCKING**

8.4.11.1. Concrete thrust blocks shall be installed at all tees, plugs, caps, and bends deflecting 22-1/2° or greater on all pressure pipelines except those with screwed or flanged joints.

8.4.11.2. Concrete shall have minimum compressive strength of 2,500 psi.

8.4.11.3. Thrust block sizing and details shall conform to **REGIONAL UTILITIES** Standard Details and approved construction drawings.

8.4.11.4. All mechanical joint fittings shall utilize restraint type mechanical joint retainer glands.

8.4.12. **TAPS**

8.4.12.1. **REGIONAL UTILITIES** shall perform taps greater than 2 inches.

8.4.12.2. **CONTRACTOR** shall perform taps 2 inches and smaller.

8.4.12.3. **REGIONAL UTILITIES** representative must be onsite for 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. Taps greater than 4 Inches:

8.4.12.7.1. Single tapping sleeve and tapping valve required.

8.4.12.7.2. Stainless steel wraparound "Fast Style" sleeve manufactured by Ford Meter Box Company or approved equal.

8.4.12.7.3. Pressure rating:
8.4.12.7.4. 200 psi (4-inch to 12-inch)
8.4.12.7.5. 150 psi (14-inch and larger)

8.4.12.7.6. Split sleeve design

8.4.12.7.7. Outlet flange: Class 125 with recess for tapping valve

8.4.12.8. **Taps 2 Inches and Smaller:**

8.4.12.8.1. Single tapping saddle and corporation stop.

8.4.12.8.2. Fusion bonded epoxy coated FC202 stainless steel saddle.

8.4.12.8.3. Manufactured by Ford Meter Box Company or approved equal.

8.4.12.9. **Excavation Requirements:**

8.4.12.9.1. Minimum 4 inches below valve bottom.

8.4.12.9.2. Minimum 7 feet length.

8.4.12.9.3. Sufficient width for two workers.

8.4.12.9.4. Area must be completely dry.

8.4.12.9.5. **CONTRACTOR** responsible for dewatering.

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 comply with Section 6.3.1 and shall be mechanical joint outlet by tapping flange with raised inner lip for sleeve alignment.

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

8.4.13.1. Shall conform to **REGIONAL UTILITIES** Standard Pressure Sewer Detail Sheet PS-1.

8.4.13.2. Each service shall be pressure and flow tested to verify proper operation.

8.5. CLEANING AND FLUSHING

8.5.1. Force mains shall be flushed prior to pressure testing to remove air.

8.5.2. **CONTRACTOR** shall control flush point discharge and is responsible for disposal location of flushed water.

8.6. FIELD TESTING

8.6.1. All pressurized piping shall be hydrostatically tested in approved sections.

8.6.2. Testing shall occur in presence of **ENGINEER** and **REGIONAL UTILITIES**.

8.6.3. Pipelines not installed in trenches or embedded in concrete shall be tested prior to backfill or concrete placement.

8.6.4. Hydrostatic testing shall consist of pressure testing.

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 an 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. Maximum allowable pressure loss: 2 psi over test period, regardless of pipe length.

8.6.8. Pipe shall be completely filled and all air expelled. Temporary taps shall be installed at high points if necessary and plugged after testing.

8.6.9. Pressure shall be applied via pump connected in manner acceptable to **REGIONAL UTILITIES**. Testing apparatus shall be approved by **ENGINEER** and **REGIONAL UTILITIES**.

8.6.10. Testing apparatus shall be provided by the **CONTRACTOR** and approved by **ENGINEER** and **REGIONAL UTILITIES**.

8.6.11. Pressure gauges shall be calibrated by an approved testing laboratory. Gauges shall have scale increments not greater than 2 psi.

8.6.12. Gauges used for testing shall be sized so that the test pressure registers not less than 10 percent and not more than 90 percent of the total gauge capacity.

8.6.13. All exposed pipe, fittings, valves, hydrants, and joints shall be carefully examined during the pressure test. Any damaged or defective pipe, fittings, valves, hydrants, or joints discovered as a result of the test shall be repaired

or replaced with sound materials. The pressure test shall be repeated until satisfactory results are obtained.

8.6.14. If a section fails to pass the pressure test, the **CONTRACTOR** shall take all necessary actions to locate, uncover (including uncovering the entire section, if required), and repair or replace any defective pipe, fitting, or joint.

8.6.15. All visible leaks shall be corrected regardless of whether the pressure test results meet specified requirements.

8.6.16. Lines shall be repaired and retested as many times as necessary until all specified 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 – NON-CLOG PUMP STATIONS

SECTION 9 – SEWER – NON-CLOG PUMP STATIONS

9.1. SCOPE

9.1.1. This section contains standard specifications for the design and construction of Submersible Sewage Non-Clog Pump Stations as required by **REGIONAL UTILITIES**.

9.1.2. The **CONTRACTOR** shall furnish and install all wet wells, pumps, valves, electrical components, control panels, and all other labor, materials, testing, and equipment necessary to provide a complete and fully operational pump station.

9.2. GENERAL REQUIREMENTS:

9.2.1. All work shall be constructed in a first-class manner in accordance with the approved Drawings and these Specifications.

9.2.2. Prior to commencement of work, the **CONTRACTOR** shall submit to the **ENGINEER** of Record and **REGIONAL UTILITIES**, for approval, inspection certificates from the **SUBCONTRACTOR** certifying that materials have been inspected at their respective fabrication facilities and meet the requirements of these Specifications.

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

9.2.4. The **CONTRACTOR** shall maintain extra fittings on-site to accommodate vertical and/or horizontal adjustments due to unforeseen interferences and to avoid project delays.

9.2.5. All defects and leaks disclosed by testing shall be corrected. All tests shall be performed by the **CONTRACTOR** and observed by **REGIONAL UTILITIES**.

9.2.6. All submersible non-clog pumps shall be manufactured by **Wilo EMU**.

9.2.7. The invert entering the wet well shall be a minimum of five (5) feet above the top of the submersible pump.

9.2.8. Wet well and valve vault structures shall be constructed of fiberglass or concrete in accordance with **REGIONAL UTILITIES'** latest specifications and detail sheets.

9.2.8.1. Fiberglass wet well depths shall account for the twelve (12) inches of concrete base specified in Section 9.3.1.10.

9.2.9. To ensure proper performance and compatibility of interacting components, all submersible pumps, control panels, access frames, guide rails, and lifting systems shall be manufactured by a single **MANUFACTURER** or supplied by the submersible pump **MANUFACTURER** to ensure sole-source responsibility.

9.2.10. Water for testing shall be furnished by **CONTRACTOR**.

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

9.2.12. The face of the control panel shall be located not less than five (5) feet from the edge of the wet well.

9.2.13. Top elevation of the wet well and valve vault shall be equal to the elevation of the adjacent curb or roadway.

9.2.14. Refer to Sections 3.0 and 4.0 of these Specifications for Excavation, Backfill, and Dewatering Procedures.

9.2.15. All referenced standards shall be the latest edition or revision.

9.3. MATERIALS

9.3.1. WET WELL / VALVE VAULT – FIBERGLASS

9.3.1.1. Fiberglass non-clog pump stations shall be constructed in accordance with these Specifications and Detail Drawing LS-F.

9.3.1.2. Wet wells and valve vaults shall be designed and constructed of reinforced fiberglass with anti-flotation rings and shall comply with the latest edition of ASTM D3753, *Specification for Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Manholes and Wet Wells*.

9.3.1.3. The fiberglass structure **MANUFACTURER** shall provide a minimum twenty (20) year warranty against defects including cracking, delamination, and leakage, commencing upon final acceptance by **REGIONAL UTILITIES**.

9.3.1.3.1. The warranty shall include all labor, materials, and equipment necessary to correct defects to the satisfaction of **REGIONAL UTILITIES**. No exclusions or exceptions shall apply.

9.3.1.4. The **MANUFACTURER** or **ENGINEER** shall provide buoyancy calculations for the fiberglass structures, signed and sealed by a licensed Florida Professional **ENGINEER**.

9.3.1.5. Fiberglass wet wells shall be manufactured as a single monolithic unit.

9.3.1.5.1. The wet well and valve vault shall be separate structures.

9.3.1.6. Minimum wall thickness shall be ½ inch. Maximum wall thickness shall be determined by the **MANUFACTURER'S ENGINEER** based on project design conditions provided by the **ENGINEER** of Record.

9.3.1.7. Discharge pipe penetrations shall utilize pass-through sleeves factory-glassed into the structure by a factory-certified installer. Sleeve sizing shall be determined by the **MANUFACTURER**.

9.3.1.7.1. Openings shall be sealed using 316 stainless steel Link-Seals installed so that bolts are accessible from inside the structure. Approved non-shrink grout shall be applied externally and cured per **MANUFACTURER** recommendations to ensure zero leakage.

9.3.1.7.2. All wall penetrations—including inverts, conduits, drains, lifting eyes, bracing hardware, guide rails, and hangers—shall be glassed over externally by a factory-certified installer in accordance with the **MANUFACTURER'S** warranty requirements.

9.3.1.7.3. Cutouts shall be made using appropriate cutting tools such as hole saws or jigsaws. Impact-type tools shall not be permitted.

9.3.1.8. **ENGINEER** and **REGIONAL UTILITIES** approval shall be obtained prior to ordering structures.

9.3.1.9. Fiberglass structures shall be installed in accordance with the **MANUFACTURER'S** installation procedures.

9.3.1.9.1. External anti-flotation concrete requirements shall be determined by the **MANUFACTURER** based on the sealed buoyancy calculations.

9.3.1.10. **BASES**

9.3.1.10.1. A factory-installed, glassed-in stainless steel base plate with stainless steel threaded anchor rods shall be installed for mounting base elbows.

9.3.1.10.1.1. Plate thickness: minimum ½ inch.

9.3.1.10.1.2. Plate size: determined by **MANUFACTURER** based on base elbow dimensions.

9.3.1.10.1.3. Threaded rods: extend minimum 18 inches above plate.

9.3.1.10.1.4. Rod size and bolt pattern: determined by pump manufacturer.

9.3.1.10.1.5. Fiberglass cylinders (one per base elbow) shall be constructed around each anchor assembly.

9.1.10.1.5.1. Minimum height: 12 inches (or greater if required for pump clearance).

9.1.10.1.5.2. Diameter: sized to match base elbow footprint.

9.3.1.10.1.6. A 3-inch fiberglass water stop ring shall be installed externally on each cylinder, 3 inches above the bottom.

9.3.1.10.1.7. Cylinder interiors shall be filled with 4,000 psi concrete.

9.3.1.10.1.8. After curing, the **MANUFACTURER** shall glass over the top to fully encapsulate the concrete and anchor rods.

9.3.1.10.2. A 3-inch fiberglass water stop ring shall be installed inside the wet well, 3 inches above the bottom.

9.3.1.10.3. After placement, the **CONTRACTOR** shall pour 12 inches of 4,000 psi concrete in the bottom of the wet well.

9.3.1.10.3.1. Cement shall comply with the latest edition of ASTM C150 Type II.

9.3.1.10.3.2. Reinforcement: #5 rebar at 6 inches on center each way (single mat), placed on top of the water stop ring.

9.3.1.10.3.3. Upon curing, a sloped taper shall be constructed to direct solids toward the pump intake.

9.3.1.11. **TOPS**

9.3.1.11.1. Fiberglass structures shall include a raised collar around hatch openings with a minimum height of 12 inches.

9.3.1.11.2. A 12-inch-thick reinforced concrete slab shall be poured over the wet well, valve vault, and control panel area, extending at least 3 feet beyond the structure perimeter and finished flush with hatch tops.

9.3.1.12. **ACCESS HATCH**

9.3.1.12.1. Refer to section 9.3.2.12

9.3.1.13. **VALVE VAULT**

9.3.1.13.1. Valve vaults shall meet the same construction requirements specified for wet wells in Section 9.3.1.2.

9.3.1.13.2. The Valve Vault shall be a separate structure from the Wet Well.

9.3.1.13.3. All penetrations shall comply with Section 9.3.1.7.

9.3.1.13.4. The valve vault shall utilize the same hatch type specified for the wet well.

9.3.1.13.5. Valve vault dimensions shall provide adequate space for safe worker access and tool operation.

9.3.2. **WET WELL - CONCRETE**

9.3.2.1. Concrete Non-Clog Pump Stations shall be designed and constructed of reinforced concrete in accordance with these Specifications and Detail Drawing LS-C.

9.3.2.2. Wet wells shall comply with the latest edition of ASTM C478, *Specification for Precast Reinforced Concrete Manhole Sections*.

9.3.2.3. Minimum wall thickness shall be seven (7) inches.

9.3.2.4. Cement shall comply with the latest edition of ASTM C150, Type II Portland Cement.

9.3.2.5. Minimum compressive strength of concrete shall be 4,000 psi at 28 days.

9.3.2.6. Concrete strength shall be verified by casting and testing four (4) standard cylinders at seven (7) days and twenty-eight (28) days. Test results shall be submitted to the **ENGINEER** prior to installation of any manhole section.

9.3.2.7. Precast rings shall be custom fabricated with openings to accommodate required pipe alignments and invert elevations.

9.3.2.8. Pipe penetrations shall be sealed using watertight boots or approved non-shrink grout installed and cured in strict accordance with manufacturer recommendations to ensure zero leakage.

9.3.2.9. **ENGINEER** and **REGIONAL UTILITIES** approval shall be obtained prior to ordering precast manholes.

9.3.2.10. **BASES**

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

9.3.2.10.2. The base section shall be installed on a twelve (12) inch leveling course of No.4 or No. 57 stone with filter fabric placed above and below the stone, extending a minimum of twelve (12) inches beyond the base perimeter.

9.3.2.10.3. To ensure full bearing and allow for proper adjustment, the precast base section shall be placed immediately prior to initial set.

9.3.2.10.4. Installation shall occur in a properly dewatered environment.

9.3.2.11. **JOINTS**

9.3.2.11.1. Joint contact surfaces shall be machine-cast, parallel, and formed with a 2-degree slope and nominal 1/16-inch clearance. The tongue shall include a recess for installation of a rubber O-ring gasket conforming to the latest edition of ASTM C443, *Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets or Pre-Molded Plastic Joint Sealer*.

9.3.2.11.2. Exterior joints shall be grouted with approved materials. Interior joints and holes shall be filled in accordance with Section 9.3.2.13 (Interior Coating Requirements).

9.3.2.12. **ACCESS HATCH**

9.3.2.12.1. **CONTRACTOR** shall furnish and install one (1) access door on wet well.

9.3.2.12.2. The access door shall be Model APS300 as manufactured by **USF Fabrication, Inc.**, with size determined by the pump manufacturer based on pump dimensions.

9.3.2.12.3. Door leaf shall be 0.250-inch-thick aluminum floor plate reinforced to support a minimum 300 psf live load.

9.3.2.12.4. The access door shall include:

9.3.2.12.4.1. Flush aluminum drop handle (non-protruding)

9.3.2.12.4.2. Automatic hold-open arm

9.3.2.12.4.3. Red vinyl-grip release handle

9.3.2.12.5. Hinges shall be stainless steel with tamper-proof stainless steel hardware and shall be removable after installation for maintenance.

9.3.2.12.6. Door shall include padlock staple only for security.

9.3.2.12.6.1. Finish shall be mill finish aluminum.

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

9.3.2.12.8. Access door on the wet well shall open toward the control panel as shown on detail sheet LS-1.

9.3.2.13. **INTERIOR COATING – CONCRETE WET WELL**

9.3.2.13.1. Interior of the wet well shall be coated with no less than 125-MIL of GREEN MONSTER LINER.

9.3.2.13.2. Coating shall be applied by authorized applicators in accordance with manufacturer specifications and the following surface preparation requirements:

9.3.2.13.2.1. Entire interior sandblasted to minimum Concrete Surface Profile (CSP) 5.

9.3.2.13.2.2. All blasting media and any other debris shall be removed from the structure.

9.3.2.13.2.3. The interior shall be hydro-blasted at a minimum of 4,000 psi to remove all dust and sand.

9.3.2.13.2.4. All infiltration eliminated prior to coating.

9.3.2.13.2.5. All joints in the structure shall be filled and patched with the COATING **MANUFACTURER'S** approved cementitious product.

9.3.2.13.2.6. A MINIMUM of ½" underlayment of the COATING **MANUFACTURER'S** approved cementitious product shall be applied to the entire interior surface.

9.3.2.13.2.7. Hydro-blast again at minimum 4,000 psi to achieve CSP 5 profile.

9.3.2.13.2.8. **REGIONAL UTILITIES** inspection required after underlayment and prior to liner installation.

9.3.2.13.3. Final coating shall be flash (spark) tested in accordance with manufacturer requirements. Test results shall be submitted to **REGIONAL UTILITIES**.

9.3.2.13.4. **CONTRACTOR** shall provide applicator certification and warranty documentation from both applicator and manufacturer.

9.3.2.13.5. Wet well shall be fully constructed and plumbed prior to coating application.

9.3.2.14. **EXTERIOR COATING – CONCRETE STRUCTURES**

9.3.2.14.1. Exterior surfaces shall receive two (2) coats of KOP-COAT Coal Tar Epoxy 300-M, applied at 9 mils per coat.

9.3.2.14.2. Waterproofing materials shall be applied by brush or spray in accordance with **MANUFACTURER** instructions.

9.3.2.14.3. Adequate curing time shall be provided between coats.

9.3.2.14.4. Initial coating shall be applied at place of fabrication.

9.3.2.14.5. Touch-up or additional coating shall be performed after installation if directed by **ENGINEER** or **REGIONAL UTILITIES**.

9.3.3. VALVE VAULTS - CONCRETE

9.3.3.1. Valve vaults shall comply with Section 9.3.2 concrete requirements.

9.3.3.2. Valve vault interior and exterior shall receive two (2) coats of KOP-COAT Coal Tar Epoxy 300-M at 9 mils per coat.

9.3.3.3. Valve vault shall utilize the same hatch type specified for the wet well.

9.3.3.4. Vault dimensions shall provide adequate space for safe worker access and tool operation.

9.3.4. VALVES AND FITTINGS

9.3.4.1. Refer to Section 8 and Detail Drawing LS-1 for valve and fitting specifications.

9.3.5. SUBMERSIBLE NON-CLOG PUMP

9.3.5.1. Submersible Non-Clog Pumps shall be Model FA as manufactured by **Wilo EMU**.

9.3.5.2. Pumps shall be designed to handle sewage, stormwater, sludge, and other water-based liquids without damage during operation.

9.3.5.3. Pumps shall pass a minimum 3-inch diameter non-deformable solid without clogging.

9.3.5.4. Pumps shall be rated for continuous submerged operation to depths of 65 feet without leakage.

9.3.5.5. 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.

9.3.5.5.1. Volute: Centerline discharge with ANSI 125-lb compatible flange capable of withstanding 150% of shutoff head per Hydraulic Institute Standards.

9.3.5.5.2. The interfaces between the major castings shall be machined for metal-to-metal interfaces with Buna-N O-rings.

9.3.5.5.3. All the nuts, bolts, washers and other fastening devices shall be constructed of type 316 stainless steel.

9.3.5.5.4. All exposed surfaces of the castings shall be coated with a single coat of PVC type varnish that is resistant to sewage.

9.3.5.6. 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.

9.3.5.6.1. The NON-CLOG PUMP impeller shall be constructed of ASTM A339 ductile cast iron.

9.3.5.6.2. 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.

9.3.5.6.3. Pump-out vanes shall be located on the backside of the NON-CLOG PUMP impeller to help reduce pressure on the lower mechanical seal.

9.3.6. **MOTOR**

9.3.6.1. Motor shall have a minimum service factor of 1.25 above nameplate horsepower.

9.3.6.2. 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.

9.3.7. **PUMP GUIDE RAIL**

9.3.7.1. Furnish a minimum of one (1) GUIDE RAIL for each pump to permit raising and lowering.

9.3.7.1.1. Guide rails shall be constructed of Type 316L stainless steel and shall extend from the top of the base elbow to the upper guide rail bracket located on the access frame or on the vertical face of the concrete opening.

9.3.7.1.2. The single GUIDE RAIL system shall be supplied by the pump manufacturer.

9.3.7.1.3. Guide rails exceeding ten (10) feet in length shall be provided with a cross-brace support system.

9.3.8. **PUMP POWER & CONTROL CABLES**

9.3.8.1. Power supply for pumps up to 25 horsepower shall be 120/208/240 volt, Delta configuration, three-phase, four-wire, 60 Hertz.

9.3.8.2. Power supply for pumps greater than 25 horsepower shall be 277/480 volt, three-phase, wye configuration, 60 Hertz, with soft starters.

9.3.8.3. Soft starters shall be acceptable for pumps rated 20 horsepower and larger.

9.3.8.4. Power and control cables shall enter the motor housing through an isolated cable entry chamber fully separated from the oil-filled stator chamber.

9.3.8.5. Hypalon-jacketed power and control cables shall be sealed by a compressible Buna-N grommet flanked by washers to form the first isolation barrier.

9.3.8.6. Cables shall terminate on individually O-ringed brass terminal lugs mounted on a terminal board, completely isolating the cable entry chamber from the stator housing so that any moisture entering the cable chamber remains contained.

9.3.8.7. The terminal board shall be designed to short upon moisture intrusion within the cable entry chamber, thereby signaling service is required while preventing catastrophic motor failure.

9.3.9. **CONTROL PANEL**

9.3.9.1. The monitoring and control system shall be factory wired, tested, and designed to operate with the specified pumping units.

9.3.9.2. **LEVEL SWITCHES**

9.3.9.2.1. Primary level control shall utilize relay logic with Level Measurement Probes (LMP) as the primary control and float level switches as backup.

9.3.9.2.2. Float level switches shall automatically activate via relay upon failure of the Level Measurement Probe or via a manual selector switch mounted on the clear plexiglass deadfront to switch from LMP to float control.

9.3.9.2.3. The Level Measurement Probe shall be manufactured by Motor Protection Electronics, LLC, and shall be either a 61-inch (#61-10-50) or 97-inch (#97-10-50) probe, as required by design. The LMP shall be installed by the

CONTRACTOR at elevations determined by the **ENGINEER**.

9.3.9.2.3.1. The LMP shall be controlled by the LPC420R-RM Probe Converter installed within the control panel by the pump **MANUFACTURER**.

9.3.9.2.3.2. The LMP shall be suspended from a dedicated hanger separate from float switches and located on the opposite side of the wet well to prevent entanglement.

9.3.9.2.4. First Level Switch (Lowest): Stops lead and lag pumps when liquid drops below this elevation and initiates alternator sequencing.

9.3.9.2.5. Second Level Switch (Lead): Starts one pump as liquid rises. Pump selection determined by alternator.

9.3.9.2.6. Third Level Switch (Lag): Starts both pumps when liquid reaches this elevation.

9.3.9.2.7. Fourth Level Switch (High Level): Activates audible and visual alarm.

9.3.9.2.8. All panels shall be pre-wired to operate using relay logic and to accommodate a Data Flow telemetry unit.

9.3.9.2.9. A manual selector switch shall be mounted on the deadfront to switch between:

9.9.2.9.1.1. REMOTE (Data Flow Telemetry)

9.9.2.9.1.2. LOCAL (Float Control)

9.3.9.2.9.2. A cutout shall be provided in the deadfront to allow installation of the Data Flow Telemetry Control Unit (TCU).

9.3.9.3. **WIRING**

9.3.9.3.1. An electrical schematic shall be permanently affixed to the inside of the enclosure door.

9.3.9.3.2. Internal wiring shall be neatly installed within 1-inch x 2-inch white wireway.

9.3.9.3.3. Control wiring: minimum 14 AWG, red insulation.

9.3.9.3.4. Power wiring: minimum 10 AWG, black insulation.

9.3.9.3.5. Neutral wiring: white.

9.3.9.3.6. Ground wiring: green.

9.3.9.3.7. All conductors shall terminate with screw or lug-type connections.

9.3.9.3.8. Each panel shall be factory tested through its complete sequence of operation prior to shipment.

9.3.9.3.9. Each panel shall include a permanent label signed by the individual who assembled, wired, and tested the panel.

9.3.9.4. **ENCLOSURE**

9.3.9.4.1. Shall be a NEMA 4X 316 stainless steel construction to provide protection against rain, sleet and snow.

9.3.9.4.2. Door shall be secured with stainless steel padlockable 3-point latch.

9.3.9.4.3. Standard enclosure size shall be 36 inches high x 24 inches wide x 10 inches deep, unless increased size is required due to component dimensions or heat dissipation requirements.

9.3.9.4.4. An air gap shall be installed at the bottom of the panel by the manufacturer, constructed of 316 stainless steel or aluminum. The air gap enclosure shall not include lockable access and shall only be accessible by removal of stainless steel screws.

9.3.9.5. **DEADFRONT**

9.3.9.5.1. Deadfront shall be clear plexiglass, allowing visual inspection of internal components without opening the deadfront or interrupting pump station operation.

9.3.9.6. **ALARM SYSTEM**

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

9.3.9.6.2. The ALARM SYSTEM shall be activated in cases of power failure, high water elevation.

9.3.9.6.3. Alarm shall be audible at a minimum of 90 decibels and shall include a silence push button located inside the enclosure (not accessible from exterior).

9.3.9.6.4. Alarm shall include battery backup power supply.

9.3.9.6.5. For large collection pumping stations, alarms shall be telemetered to **REGIONAL UTILITIES'** office during normal working hours and to responsible personnel during off-duty hours.

9.3.9.6.6. Self-contained audio-visual alarm systems with internal power supply may be acceptable in certain cases depending upon station location, holding capacity, and inspection frequency.

9.3.9.6.7. Alarm light shall be a red StreamLine strobe manufactured by Federal Signal Corporation, clearly visible above surrounding obstructions.

9.3.9.6.8. The alarm light shall be mounted to the left side wall of the panel enclosure using a Myers hub, ½-inch rigid aluminum conduit, and 90-degree LB fitting. The light shall be mounted on the conduit riser using a neoprene gasket and shall extend a minimum of 12 inches above the top of the enclosure.

9.3.9.6.9. The alarm ladder diagram and panel construction shall ensure that all alarm conditions—including phase failure, power failure, pump failure, high level, and any other malfunction—activate both audible and visual alarms.

9.3.9.6.10. If telemetered, the telemetry system shall transmit all required alarm conditions.

9.3.9.7. **SURGE SUPPRESSER**

9.3.9.7.1. The Surge Protection Device (SPD) shall be ASCO Power Technologies Model APT TE Series.

9.3.9.7.2. The SPD shall be rated to operate up to 136,500 amps total peak surge current.

9.3.9.8. **PHASE FAILURE RELAY**

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

9.3.9.8.2. Upon detection of a failure condition, the relay shall interrupt the control circuit and disable the control panel.

9.3.9.9. **TRANSFER SWITCH**

9.3.9.9.1. The Transfer Switch shall be mounted inside the control panel and visible through the Lexan deadfront door.

9.3.9.9.2. The Transfer Switch shall be:

9.3.9.9.2.1.100 amp or 200 amp (as required by pump horsepower)

9.3.9.9.2.2. 3-pole

9.3.9.9.2.3. Rated for 600 volts

9.3.9.9.3. The switch handle shall mechanically interlock with the Lexan door such that the door cannot be opened while the switch is in the energized position.

9.3.9.10. **PUMP CONTROLS**

9.3.9.10.1. Pump control shall be by relay logic utilizing a Time Mark Corporation Model 2611-120 alternating relay for non-telemetered stations.

9.3.9.10.2. Pump control shall be by Data Flow Systems, Inc. controller with relay logic backup for telemetered stations.

9.3.9.10.3. All control panels shall be constructed and factory wired to accommodate both telemetered and non-telemetered configurations.

9.3.9.11. **GENERATOR RECEPTACLE**

9.3.9.11.1. The generator receptacle shall be Hubbell Incorporated Pin and Sleeve type Model 4100R9W for 240-volt, 3-phase service.

9.3.9.11.2. An equivalent Hubbell model shall be provided for 460-volt, 3-phase service.

9.3.9.11.3. Shall be weatherproof and mounted on the exterior of the enclosure.

9.3.9.12. **MOTOR CIRCUIT PROTECTORS**

9.3.9.12.1. Motor Circuit Protectors shall be Square D Type FAL, 100-amp frame, or sized as required for each pump.

9.3.9.12.2. Each protector shall provide instantaneous trip protection for short circuit faults.

9.3.9.13. **MOTOR STARTERS**

9.3.9.13.1. MOTOR STARTERS shall be Square D NEMA rated, sized to match pump horsepower.

9.3.9.13.2. 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.

9.3.9.13.3. Soft-start starters are required for pumps rated 20 horsepower and larger.

9.3.9.14. **ELAPSED TIME METERS**

9.3.9.14.1. Shall be 6 digit non-re-settable.

9.3.9.14.2. Meters shall be mounted on the deadfront panel, one per pump, to record cumulative operating hours.

9.3.9.15. **GROUND FAULT INTERRUPTER**

9.3.9.15.1. A 15-amp, 120-volt Ground Fault Interrupter (GFI) shall be provided for a convenience outlet.

9.3.9.15.2. The GFI shall be mounted on the deadfront and protected by a single pole, 15A circuit breaker mounted on the back plate.

9.3.9.16. **TRANSFORMER**

9.3.9.16.1. Shall be a 1 KVA, 460/240 – 120-volt, single phase.

9.3.9.16.2. The transformer shall provide all 120-volt power to operate the control circuit and the GFI receptacle.

9.4. **INSTALLATION**

9.4.1. Each pump shall be provided with a universal coupling constructed of ASTM A48, Class 30 gray cast iron. The coupling shall:

9.4.1.1. Bolt to the pump discharge flange

9.4.1.2. Slide down the guide rail

9.4.1.3. Connect automatically to the discharge elbow

9.4.1.4. No personnel entry into the wet well shall be required for pump connection.

9.4.1.5. The discharge elbow shall be constructed of ASTM A48, Class 30 gray cast iron.

9.4.2. Sealing between the coupling and discharge elbow shall occur by cantilever effect.

9.4.2.1. The sealing force shall be not less than 1.5 times the combined weight of the pump and coupling.

9.4.2.2. No portion of the pump shall rest directly on the sump floor, ensuring unobstructed flow into the suction eye.

9.4.3. The seal between the coupling and discharge elbow shall be replaceable Buna-N sealing rubber.

9.4.3.1. Machined metal-to-metal sealing surfaces are not acceptable.

9.4.3.2. The Buna-N rubber shall serve as:

9.4.3.2.1. The flat gasket between pump and coupling

9.4.3.2.2. The seal at the coupling to discharge elbow interface

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 undergo the following factory tests prior to shipment:

9.5.1.1. Physical inspection and megger testing to verify stator insulation resistance.

9.5.1.2. Connection to jobsite voltage and startup to verify rotation and no-load amp readings.

9.5.1.3. Monitoring for undue noise or vibration; testing shall cease if abnormal conditions occur.

9.5.1.4. When requested, installation in a test tank on a wet pit discharge elbow for full hydraulic testing.

9.5.1.5. The KW input, power factor, flowrate and total dynamic head shall be measured and recorded.

9.5.1.6. Operation at project duty point and verification of compliance with Hydraulic Institute Standards.

9.5.1.7. Post-test physical inspection and additional megger testing.

9.5.1.8. Hydraulic test documentation maintained at factory and supplied upon request.

9.6. PUMP WARRANTY

9.6.1. The **MANUFACTURER** shall warrant the pump for a period of five (5) years under normal operating conditions.

9.6.2. The WARRANTY includes 100% coverage for 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 establishes the design, material, and construction requirements for Submersible Sewage Grinder Pump Stations required by **REGIONAL UTILITIES**.

10.1.2. The **CONTRACTOR** shall furnish and install complete, operational pump stations including:

10.1.2.1. Wet pits
10.1.2.2. Grinder pumps
10.1.2.3. Valves and fittings
10.1.2.4. Electrical control panels
10.1.2.5. Appurtenances
10.1.2.6. All equipment shall be fully assembled, tested, and ready for service.

10.1.3. Grinder pumps are centrifugal submersible pumps designed to reduce solids found in normal domestic and light industrial wastewater into a finely ground slurry suitable for conveyance through small diameter force mains.

10.1.3.1. 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 pump stations shall be duplex (two pumps minimum).

10.2.2. All GRINDER PUMPS shall be either Zoeller 71 Series, or Barnes SGV Series, 5hp minimum, 3 phase power.

10.2.2.1. Pumps shall be Double Sealed, Explosion Proof Oil Filled Motors, with 2-inch vertical discharge.

10.2.3. The influent invert entering the wet well shall be a minimum of five (5) feet above the top of the pump.

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

10.2.5. Prior to construction, **CONTRACTOR** shall submit to the **ENGINEER** of Record and **REGIONAL UTILITIES**:

10.2.5.1. Certificates of inspection from the **MANUFACTURER** or **SUBCONTRACTOR.**

10.2.5.2. Documentation verifying compliance with these specifications.

10.2.6. All materials shall be permanently marked with:

10.2.6.1. **MANUFACTURER** name
10.2.6.2. Batch or serial number
10.2.6.3. Strength or capacity designation
10.2.6.4. Pressure rating (where applicable)

10.2.7. **CONTRACTOR** shall maintain sufficient fittings on site to accommodate vertical and horizontal adjustments due to unforeseen interferences.

10.2.8. All defects or leaks revealed by testing shall be corrected. All tests shall be performed by **CONTRACTOR** and observed by **REGIONAL UTILITIES**.

10.2.9. To ensure compatibility and performance, the following components shall be supplied by a single **MANUFACTURER** or furnished through the grinder pump **MANUFACTURER**:

10.2.9.1. Submersible pumps
10.2.9.2. Control panels
10.2.9.3. Access frames
10.2.9.4. Guide rails
10.2.9.5. Lifting systems

10.2.10. Water for testing shall be furnished by **CONTRACTOR**.

10.2.11. The control panel shall be located not less than five (5) feet from the edge of the wet well.

10.2.12. Top elevation of the wet well and valve vault shall be equal to the elevation of the curb or adjacent roadway.

10.2.13. Refer to Sections 3 and 4 for Excavation, Backfill, and Dewatering requirements.

10.2.14. The overall depth of the wet well shall be calculated to include the 12-inches of concrete required in 10.3.1.10.11.

10.2.15. All referenced standards shall be the latest edition in effect at time of construction.

10.3. MATERIALS

10.3.1. WET WELL

10.3.1.1. Fiberglass grinder pump stations shall be constructed in accordance with these specifications and Detail Drawing GS-F1 and GS-F2.

10.3.1.2. Wet wells and valve vaults shall be designed and constructed of reinforced fiberglass with anti-flotation rings and shall comply with the latest edition of ASTM D3753, *Specification for Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Manholes and Wet Wells*.

10.3.1.3. The fiberglass structure **MANUFACTURER** shall provide a minimum twenty (20) year warranty against defects including cracking, delamination, and leakage, commencing upon final acceptance by **REGIONAL UTILITIES**. The warranty shall include all labor, materials, and equipment necessary to correct defects to the satisfaction of **REGIONAL UTILITIES**. No exclusions or exceptions shall apply.

10.3.1.4. **MANUFACTURER** or **ENGINEER** shall provide buoyancy calculations signed and sealed by a Florida licensed Professional **ENGINEER**.

10.3.1.5. Fiberglass wet wells shall be manufactured as a single monolithic unit.

10.3.1.5.1. The wet well and valve vault shall be separate structures.

10.3.1.6. Minimum wall thickness shall be ½-inch. Maximum wall thickness shall be determined by the **MANUFACTURER'S ENGINEER** based on the design conditions provided by the **ENGINEER** of Record.

10.3.1.7. Discharge pipe penetrations shall utilize pass-through sleeves factory-glassed into the structure by a factory-certified installer. Sleeve sizing shall be determined by the **MANUFACTURER**.

10.3.1.7.1. Openings shall be sealed using 316 stainless steel Link-Seals installed so that bolts are accessible from inside the structure. Approved non-shrink grout shall be applied externally and cured per **MANUFACTURER** recommendations to ensure zero leakage.

10.3.1.7.2. All wall penetrations—including inverts, conduits, drains, lifting eyes, bracing hardware, guide rails, and hangers—shall be glassed over externally by a factory-certified installer in accordance with the **MANUFACTURER'S** warranty requirements.

10.3.1.7.3. Cutouts shall be made using appropriate cutting tools such as hole saws or jigsaws. Impact-type tools shall not be permitted.

10.3.1.8. **ENGINEER** and **REGIONAL UTILITIES** approval shall be obtained prior to ordering structures.

10.3.1.9. Fiberglass structures shall be installed in accordance with the **MANUFACTURER'S** installation procedures.

10.3.1.9.1. External anti-flotation concrete requirements shall be determined by the **MANUFACTURER** based on the sealed buoyancy calculations.

10.3.1.10. **BASES**

10.3.1.10.1. A factory-installed, glassed-in stainless steel base plate with stainless steel threaded anchor rods shall be installed for mounting base elbows.

10.3.1.10.2. Plate thickness: minimum ½ inch.

10.3.1.10.3. Plate size: determined by **MANUFACTURER** based on base elbow dimensions.

10.3.1.10.4. Threaded rods: extend minimum 18 inches above plate.

10.3.1.10.5. Rod size and bolt pattern: determined by pump manufacturer.

10.3.1.10.6. Fiberglass cylinders (one per base elbow) shall be constructed around each anchor assembly.

10.3.1.10.6.1.1. Minimum height: 12 inches (or greater if required for pump clearance).

10.3.1.10.6.1.2. Diameter: sized to match base elbow footprint.

10.3.1.10.7. A 3-inch fiberglass water stop ring shall be installed externally on each cylinder, 3 inches above the bottom.

10.3.1.10.8. Cylinder interiors shall be filled with 4,000 psi concrete.

10.3.1.10.9. After curing, the **MANUFACTURER** shall glass over the top to fully encapsulate the concrete and anchor rods.

10.3.1.10.10. A 3-inch fiberglass water stop ring shall be installed inside the wet well, 3 inches above the bottom.

10.3.1.10.11. After placement, the **CONTRACTOR** shall pour 12 inches of 4,000 psi concrete in the bottom of the wet well.

10.3.1.10.12. Cement shall comply with the latest edition of ASTM C150 Type II.

10.3.1.10.13. Reinforcement: #5 rebar at 6 inches on center each way (single mat), placed on top of the water stop ring.

10.3.1.10.14. Upon curing, a sloped taper shall be constructed to direct solids toward the pump intake.

10.3.1.11. **TOPS**

10.3.1.11.1. Fiberglass structures shall include a raised collar around hatch openings with a minimum height of 12 inches.

10.3.1.11.2. A 12-inch-thick reinforced concrete slab shall be poured over the wet well, valve vault, and control panel area, extending at least 3 feet beyond the structure perimeter and finished flush with hatch tops.

10.3.1.12. **HATCHES**

10.3.1.12.1. **CONTRACTOR** shall furnish and install one (1) access door on wet well.

10.3.1.12.2. The access door shall be Model APS300 as manufactured by **USF Fabrication, Inc.**, with size determined by the pump manufacturer based on pump dimensions.

10.3.1.12.3. Door leaf shall be 0.250-inch-thick aluminum floor plate reinforced to support a minimum 300 psf live load.

10.3.1.12.4. The access door shall include:

10.3.1.12.4.1. Flush aluminum drop handle (non-protruding)

10.3.1.12.4.2. Automatic hold-open arm

10.3.1.12.4.3. Red vinyl-grip release handle

10.3.1.12.5. Hinges shall be stainless steel with tamper-proof stainless steel hardware and shall be removable after installation for maintenance.

10.3.1.12.6. Door shall include padlock staple only for security.

10.3.1.12.7. Finish shall be mill finish aluminum.

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

10.3.1.12.9. Access door on the wet well shall open toward the control panel as shown on detail sheet GS-F1.

10.3.2. **VALVE VAULT**

10.3.2.1.1. Valve vaults shall meet the same construction requirements specified for wet wells in Section 10.3.1.

10.3.2.1.2. The Valve Vault shall be a separate structure from the Wet Well.

10.3.2.1.3. All penetrations shall comply with Section 10.3.1.7.

10.3.2.1.4. The valve vault shall utilize the same hatch type specified for the wet well.

10.3.2.1.5. Valve vault dimensions shall provide adequate space for safe worker access and tool operation.

10.3.3. **VALVES AND FITTINGS**

10.3.3.1. Refer to detail drawing GS-F1 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 with a minimum thickness of 2.0 mils.

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. The discharge connection shall be a standard 2-inch NPT in the vertical position. All gaskets shall be 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 constructed of 85-5-5-5 bronze 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 onto 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 operating in an oil atmosphere.

10.3.4.13. The seal shall be commercially available and shall not be a proprietary design of the **MANUFACTURER**.

10.3.4.14. Materials of construction shall be: carbon for the rotating face; ceramic for the stationary face, lapped and polished to a tolerance of one light band; 300 series stainless steel hardware; and Buna-N elastomer components.

10.3.4.15. The pump shall have a three-bearing design consisting of:

10.3.4.15.1. One upper ball bearing.

10.3.4.15.2. One intermediate ball bearing restrained to carry thrust loads.

10.3.4.15.3. One lower bronze sleeve bearing to carry radial loads and prevent shaft deflection imposed by the impeller and grinder operation.

10.3.4.16. Bearings shall operate in an oil bath for extended service 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 dual voltage, 230/460V.

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 standard frame design and secured to the pump seal plate by four threaded fasteners to allow easy serviceability.

10.3.5.5. The motor windings shall operate in a sealed environment containing clean dielectric oil, allowing operation in totally, partially, or non-submerged conditions for extended periods without damage from generated heat.

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 NEMA Design B standards for three-phase operation. The motor shaft shall be 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. Guide rail assemblies shall consist of 316 stainless steel upper guide rail brackets and pump guide brackets, with slide rail assemblies constructed of 1-inch diameter Schedule 40, 316 stainless steel pipe.

10.3.6.1.1. Barnes pumps shall use the Barnes Break Away Fittings without a check valve.

10.3.6.1.2. Zoeller pumps shall use the Zoeller Z-Rail Disconnect System.

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. Upper guide rail brackets shall mount to the basin cover and properly position the lower end of the guide rail.

10.3.6.4. Stainless steel guide brackets shall be attached to the pump to properly position the unit on the guide rail during installation or removal within the basin.

10.3.7. **PUMP POWER & CONTROL CABLES**

10.3.7.1. Pump power supply shall be 120/208/240 Volts, Delta, three-phase, four-wire, 60 Hertz.

10.3.7.2. Each pump shall be equipped with 25 feet of Type S spliced power cable and 25 feet of Type SO sensor cable.

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 individual strands to prevent water entry into the motor housing.

10.3.7.5. A secondary rubber pressure grommet shall provide an additional sealing point and strain relief at the cable entry location.

10.3.8. **CONTROL PANEL**

10.3.8.1. The monitoring and control system shall be designed to function with the pumping units and shall be factory wired and tested.

10.3.8.2. **LEVEL SWITCHES**

10.3.8.2.1. The primary control system shall operate by RELAY LOGIC using Level Measurement Probes (LMP) as primary control and float level switches as backup.

10.3.8.2.2. Float level switches shall be activated automatically by relay upon failure of the Level Measurement Probe, or by manual

selector switch from LMP to Float. The manual selector switch shall be mounted on the plexiglass deadfront.

10.3.8.2.3. The Level Measurement Probe shall be manufactured by Motor Protection Electronics, LLC, and shall be either a 61-inch (#61-10-50) or 97-inch (#97-10-50) probe, as required by design. The LMP shall be installed by the **CONTRACTOR** at elevations determined by the **ENGINEER**.

10.3.8.2.4. The LMP shall be controlled by an LPC420R-RM Probe Converter installed in the control panel by the pump manufacturer.

10.3.8.2.5. The LMP shall be suspended on a separate hanger from the float switches and installed on the opposite side of the wet well to prevent entanglement.

10.3.8.2.6. FIRST LEVEL SWITCH (Lowest): Stops lead and lag pumps when liquid drops below this elevation and initiates alternator sequencing.

10.3.8.2.7. SECOND LEVEL SWITCH (Lead): Starts one pump as liquid rises. Pump selection determined by alternator.

10.3.8.2.8. THIRD LEVEL SWITCH (Lag): Starts both pumps when liquid reaches this elevation.

10.3.8.2.9. FOURTH LEVEL SWITCH (High Level): Activates audible and visual alarm.

10.3.8.2.10. All panels shall be constructed and pre-wired to accommodate both relay logic and a data flow telemetry unit.

10.3.8.2.11. A manual selector switch shall be mounted on the deadfront to switch between:

10.3.8.2.11.1. REMOTE (Data Flow Telemetry)

10.3.8.2.11.2. LOCAL (Float Control)

10.3.8.2.12. A cutout shall be provided in the deadfront to allow installation of the Data Flow Telemetry Control Unit (TCU).

10.3.8.3. **WIRING**

10.3.8.3.1. Each panel shall be supplied with an electrical schematic permanently fastened to the inside of the enclosure door.

10.3.8.3.2. All internal wiring shall be neat and concealed within 1-inch by 2-inch white wireway.

10.3.8.3.3. Control wiring: minimum 14 AWG, red insulation.

10.3.8.3.4. Power wiring: minimum 10 AWG, black insulation.

10.3.8.3.5. Neutral wiring: white.

10.3.8.3.6. Ground wiring: green.

10.3.8.3.7. All conductors shall terminate with screw or lug-type connections.

10.3.8.4. Each panel shall be fully tested to verify proper performance through the entire sequence of operation prior to shipment.

10.3.8.5. Each panel shall include a permanent label signed by the individual who built, wired, and tested the panel.

10.3.8.6. **ENCLOSURE**

10.3.8.6.1. The enclosure shall be NEMA 4X, constructed of 316 stainless steel to provide protection against rain, sleet, and snow.

10.3.8.6.2. Door shall be secured with stainless steel padlockable 3-point latch.

10.3.8.6.3. Standard enclosure size shall be 36 inches high by 24 inches wide by 10 inches deep, unless larger dimensions are required due to component size or heat dissipation requirements.

10.3.8.6.4. 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. Box shall be constructed so that there is NO lockable access. Box shall only be accessible by panels attached by stainless steel screws.

10.3.8.7. **DEADFRONT**

10.3.8.7.1. The deadfront shall be clear plexiglass, allowing visual inspection of panel components without opening the deadfront or interrupting pumping station operation.

10.3.8.8. **ALARM SYSTEM**

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

10.3.8.8.2. The alarm system shall activate in the event of power failure, high water level, phase failure, pump failure, or any other pump station malfunction.

10.3.8.8.3. The alarm shall be audible at a minimum of 90 decibels and shall include a silence push button. The silence push button shall not be mounted on the exterior of the enclosure.

10.3.8.8.4. The alarm system shall include battery backup power.

10.3.8.8.5. For large collection pumping stations, alarms shall be telemetered to **REGIONAL UTILITIES'** office during normal working hours and to responsible personnel during off-duty hours.

10.3.8.8.6. Self-contained audio-visual alarm systems with internal power supply may be acceptable in certain cases depending upon station location, holding capacity, and inspection frequency.

10.3.8.8.7. Alarm light shall be a red StreamLine strobe manufactured by Federal Signal Corporation, clearly visible above surrounding obstructions.

10.3.8.8.8. The alarm light shall be mounted to the left side wall of the panel enclosure using a Myers hub, ½-inch rigid aluminum conduit, and 90-degree LB fitting. The light shall be mounted on the conduit riser using a neoprene gasket and shall extend a minimum of 12 inches above the top of the enclosure.

10.3.8.8.9. The ladder diagram and panel construction shall ensure that all alarm conditions engage both audible and visual alarms. If telemetered, telemetry shall report all required alarm conditions.

10.3.8.9. **SURGE SUPPRESSER**

10.3.8.9.1. Surge suppressor shall be ASCO APT TE Series rated for up to 136,500 amps total peak surge current

10.3.8.10. **PHASE FAILURE RELAY**

10.3.8.10.1. Phase failure relay shall be Time Mark Model 257B, plug-in, 8-pin design.

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

10.3.8.11. **TRANSFER SWITCH**

10.3.8.11.1. The transfer switch shall be mounted inside the control panel and accessible through the Lexan door.

10.3.8.11.2. The switch shall be rated 100 or 200 amp (as required by horsepower), 3-pole, 600 volts.

10.3.8.11.3. The switch handle shall interlock with the Lexan door so the door cannot be opened while power is energized.

10.3.8.12. **PUMP CONTROLS**

10.3.8.12.1. Pump controls shall operate by relay logic using a Time Mark 2611-120 alternating relay.

10.3.8.13. **GENERATOR RECEPTACLE**

10.3.8.13.1. Generator receptacle shall be Hubbell Pin and Sleeve Model 4100R9W, 240-volt, three-phase, rated 100 amps.

10.3.8.13.2. Receptacle shall be weatherproof and mounted on the exterior of the enclosure.

10.3.8.14. **MOTOR CIRCUIT PROTECTORS**

10.3.8.14.1. Motor circuit protectors shall be Square D Type FAL, 100-amp frame or as required, and provided for each pump for instantaneous trip under short circuit fault conditions.

10.3.8.15. **MOTOR STARTERS**

10.3.8.15.1. Motor starters shall be Square D, nema rated, sized to match pump horsepower.

10.3.8.15.2. Overloads shall be thermal melting alloy type. IEC rated starters are not acceptable.

10.3.8.16. **ELAPSED TIME METERS**

10.3.8.16.1. Shall be 6 digit non-re-settable.

10.3.8.16.2. Meters shall be mounted on the deadfront for each pump to record hours of operation.

10.3.8.17. **GROUND FAULT INTERRUPTER**

10.3.8.17.1. A 15-amp, 120-volt GFI device shall be provided for a convenience outlet.

10.3.8.17.2. The GFI shall be mounted on the deadfront and protected by a single-pole 15-amp circuit breaker mounted on the backplate.

10.3.8.18. **TRANSFORMER**

10.3.8.18.1. Transformer shall be 1 KVA, 460/240–120 volt, single-phase.

10.3.8.18.2. The transformer shall provide all 120-volt power for the control circuit and 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 movable cast iron fitting shall be held against the stationary fitting by the stainless steel guide rail assembly, aligning the movable fitting to the flexible diaphragm for proper sealing 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. Discharge piping shall be 2-inch Schedule 40 stainless steel.

10.4.5. A 2-inch brass true union ball valve shall be installed in the discharge piping of each pump to provide shut-off capability during pump removal. Each valve shall be installed in a separate valve box adjacent to the wet well.

10.4.5.1. Valve design shall allow solids, stringy materials, grit, and rags to pass without requiring back flushing.

10.4.5.2. In the operating mode, the ball shall not impede flow.

10.4.5.3. The operating flow area shall be full port equal to nominal pipe size and shall be non-clog design.

10.4.6. A 2-inch brass swing check valve shall be installed in the valve vault upstream of the pressure gauge and ball valve.

10.4.6.1. Swing check valves shall not require external levers, weights, springs, dashpots, or accessories.

10.5. TESTING

10.5.1. The pump manufacturer shall perform inspections and tests in accordance with Hydraulic Institute Type B standards prior to shipment.

10.5.2. Motor voltage and frequency shall be verified per nameplate data.

10.5.3. Motor and cable insulation shall be tested for moisture content and insulation defects in accordance with UL criteria.

10.5.4. The pump shall be completely submerged and operated to verify compliance with predetermined hydraulic performance points.

10.5.5. A written test report documenting compliance shall be provided.

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 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-TXT	211	CONTINUOUS	0.25	TEXT ASSOCIATED TO RECLAIM WATER MAIN LINES	POLYLINE
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
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	CONTIUNOUS	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 – 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. Choctawhacthee 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
wwwcenturylink.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