

*STANDARD
DESIGN AND CONSTRUCTION
SPECIFICATIONS*



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B. BARNES SGV PUMP WIRING SCHEMATIC

SECTION 1

GENERAL ITEMS



SECTION 1 – GENERAL ITEMS

1.1. SCOPE

- 1.1.1. The standards set forth in this document are intended to provide a basis for design and construction.
- 1.1.2. Applicable Federal, State and County environmental laws and regulations shall be considered concurrently with this text.
- 1.1.3. Any variation from these standards is to be approved in advance by Inlet Beach Water System General Manager or his designated representative prior to construction.
- 1.1.4. It is intended that the requirements of this document shall be applicable in all cases where the facilities being constructed or to be constructed shall be owned and/or operated and maintained by Inlet Beach Water System. These requirements shall also be applicable to those portions of facilities which shall lie within public right-of way (ROW).
- 1.1.5. Inlet Beach Water System responsibility for ownership, operation and maintenance of water mains or water services shall end at the meter.
- 1.1.6. Inlet Beach Water System shall not be responsible for maintaining sewer services extending beyond the first cleanout which shall be located near to the Right Of Way or utility easement.
- 1.1.7. Inlet Beach Water System shall not acquire, operate or maintain any sewage facilities that are not constructed to our standards. Responsibility for these lines and/or lift stations shall remain with DEVELOPER.
- 1.1.8. It shall be the responsibility of ENGINEER to verify existing line information and design the proposed utilities in accordance with Inlet Beach Water System standard specifications.
- 1.1.9. ENGINEER may exceed Inlet Beach Water System standard specifications at their discretion.
- 1.1.10. Inlet Beach Water System shall review and approve all proposed plans prior to the commencement of construction in accordance with our Plan Review Procedure. Inlet Beach Water System Plan review Procedure may be found on our website. www.InletBeachWater.com.
- 1.1.11. Inlet Beach Water System shall enforce the approved construction plans.

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- 1.1.12. No changes shall be made to the approved plans without written consent from Inlet Beach Water System.
- 1.1.13. While every effort shall be made to ascertain that the plans are in compliance with our standard specifications as detailed herein, Inlet Beach Water System reserves the right to enforce the minimum standards as required by FDEP, USACOE, FDOT, and Walton County.
- 1.1.14. No construction shall start prior to a pre-construction conference with Inlet Beach Water System.
- 1.1.15. It shall be the responsibility of CONTRACTOR to notify Inlet Beach Water System forty-eight (48) hours in advance of all field-testing and meetings.
- 1.1.16. Inlet Beach Water System shall not be responsible for newly constructed water and sewer lines within new subdivisions or development sites until all underground utilities are in place (i.e., electric, gas, phone, and cable television, etc.).
- 1.1.17. CONTRACTOR shall be responsible for locating and protecting newly constructed water and sewer lines until all underground utilities are in place (i.e., electric, gas, phone, and cable television).
- 1.1.18. Where reference is made in these specifications to specifications compiled by other agencies, organizations or departments, such reference is made for expediency and standardization and such specifications referred to are hereby made a part of these specifications.

1.2. DEFINITIONS

- 1.2.1. The words “Inlet Beach Water System” and “Inlet Beach Water System Inc.,” as employed herein shall collectively refer to the owner and manager of the water and sewer utility system bounded by Winston Lane to the West, Bay County line to the East, the Lake Powell to the North and the Gulf of Mexico to the South.
- 1.2.2. The word "DEVELOPER," as employed herein, shall mean the owner of the project who, by way of an engineered submittal, proposes to improve a parcel or parcels of real estate by subdividing the land for the purpose of constructing habitable buildings.
- 1.2.3. The word "ENGINEER," as employed herein shall mean the licensed design professional representing DEVELOPER.

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- 1.2.4. The word "CONTRACTOR," as employed herein, shall mean the person, persons, partnership, company, or corporation entering into a contract for the performance of the work defined by the proposed engineered drawings.
- 1.2.5. The term "SUBCONTRACTOR" as employed herein includes only those having a direct contract with CONTRACTOR and it includes one who furnishes material worked to a special design according to the Drawings or Specifications of this work, but does not include one who merely furnishes material not so worked.
- 1.2.6. 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.
- 1.2.7. The word "OWNER," as employed herein, shall refer to DEVELOPER prior to FDEP CERTIFICATION, after which Inlet Beach Water System shall be referred to as OWNER.
- 1.2.8. The words "FDEP CERTIFICATION," as employed herein, shall collectively mean that in the opinion of Inlet Beach Water System 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.
- 1.2.9. The words "APPROVED DRAWINGS" shall collectively mean the project construction drawings and details provided to, and authorized for construction by, Inlet Beach Water System as part of a proposed plan to improve DEVELOPER'S real estate.

"POINT OF SERVICE" shall mean the discharge side of the Inlet Beach Water System underground gate valve, prior to the double detector check valve assembly.

SECTION 2
DESIGN GUIDELINES

SECTION 2 – DESIGN GUIDELINES

2.1. GENERAL REQUIREMENTS

- 2.1.1. The Inlet Beach Water System standards shall be followed on all plans.
- 2.1.2. One (1) set of signed and sealed hard copy and one (1) CD containing an electronic set shall be submitted for review.
- 2.1.3. Incomplete or unchecked Construction Plans submitted to Inlet Beach Water System for review shall be returned to the design Engineer without review.
- 2.1.4. Construction Plans shall be prepared on 24"x36" sheets using a scale no smaller than 1" = 50' unless specific approval for smaller scale is obtained from Inlet Beach Water System. Drawings submitted on other size sheets or on an unacceptable scale shall be returned without review.
- 2.1.5. Drawing scales shall be clearly defined and verified by way of a standard Engineer's box scale. Like scales shall be used on plan and profile drawings with corresponding grids (i.e., 1"=50' horizontal, 1"=5' vertical or 1"=40' horizontal, 1"=4' vertical). Do not interchange scales or grid count.
- 2.1.6. REGIONAL UTILITIES detail sheets are provided on our website. www.InletBeachWater.com for your use.
 - 2.1.6.1. Provide all applicable detail drawings.
 - 2.1.6.2. Details altered without the expressed written permission of Inlet Beach Water System shall not be accepted and shall be returned without review.
- 2.1.7. Clearly indicate all phase and match lines as required.
- 2.1.8. Design drawings and As-built drawings shall show proposed FFE (Finished Floor Elevation) on all proposed lots.
- 2.1.9. Show all elevations of crossing pipes indicating the top and bottom of the pipe to define a clear distance between pipes.
- 2.1.10. All sewer data, including manhole invert and rim elevations, shall be defined on the plan sheets.

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- 2.1.11. Profiles are required for all gravity sewers.
 - 2.1.11.1. Sewer profiles shall show all storm drain and water lines crossings and specify all special treatments as may be required by FDEP codes.
- 2.1.12. All pressurized pipelines shall be placed in right-of-way/utility easements unless approved in writing by Inlet Beach Water System General Manager.
- 2.1.13. All service line sizes shall be shown on the plan sheets.
- 2.1.14. Specify details for all connections to existing facilities, including double valves, as required.
- 2.1.15. Identify the number of stories and dwelling units; show zero lot lines with driveway location (if applicable).
- 2.1.16. All street names, lot and block numbers shall be as shown on proposed drawings.
- 2.1.17. Finished floor elevations must be specified at least one foot above the sewer system overflow relief elevation and clearly shown on the plan drawings.
- 2.1.18. After Inlet Beach Water System approval, all revisions shall be noted in revision block.
- 2.1.19. Drawings shall be georeferenced to the US State Plan Coordinate System, NAD 83, Florida State Planes, North Zone, US Foot, and must contain two referenced, labeled points tied to the State Plan Coordinate System.
- 2.1.20. All as-built plans submitted to Inlet Beach Water System shall be provided on Compact Disc in AutoCAD format (2013 or earlier) in addition to the standard signed and sealed hard copies.
- 2.1.21. All features depicted in the as-built drawings must be surveyed after construction, to verify accuracy. Inlet Beach Water System shall randomly spot check to ensure accuracy. Water system features must be surveyed to an accuracy of ≤ 0.3 foot. Sewer system features must be surveyed to an accuracy of ≤ 0.5 foot.
- 2.1.22. The following feature types are acceptable: *Line (Polyline), Polygon and Text.*

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2.1.23. Inlet Beach Water System shall provide a template drawing available for downloading on its web site at www.InletBeachWater.com.

2.1.24. The project boundary must be labeled on the BOUND-PROJECT-TXT layer, and the label must be within the extent of the project boundary.

2.2. EASEMENTS & SEPARATION REQUIREMENTS

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

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

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

2.2.4. A twelve (12) foot wide easement, dedicated solely to Inlet Beach Water System, shall be required to provide vehicular access to all pump stations located within a development.

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

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

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

2.2.5.3. If Inlet Beach Water System determines that there is no alternative, plantings with non-aggressive rooting systems may be placed within five (5) feet of a facility or main provided that there is at least five (5) feet of cover is provided.

2.2.6. A HOLD HARMLESS AGREEMENT is to be provided for Inlet Beach Water System in such a case, relieving Inlet Beach Water System from any responsibility for damages due to Inlet Beach Water System maintenance or construction work within the easement.

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- 2.2.7. Wider easements may be required for deeper runs per Inlet Beach Water System discretion.
- 2.2.8. A perpendicular distance of no less than ten (10) linear feet (in plan) shall be required for separation between any and all sewer and water utilities.
- 2.2.9. A perpendicular distance of no less than six (6) linear feet (in plan) shall be required for separation between any and all sewer/water utilities and underground electric utilities.
- 2.2.10. A perpendicular distance of no less than six (6) linear feet (in plan) shall be required for separation between any and all sewer/water utilities and underground natural gas utilities.
- 2.2.11. Deviations from these requirements shall be considered on a case-by-case basis and at the sole discretion at Inlet Beach Water System General Manager.

2.3. COMPUTER GENERATED DRAWINGS

- 2.3.1. Do not use computer-generated scales that cannot be read with a standard Engineer's box scale.
- 2.3.2. Show profile grade between manholes.
- 2.3.3. Use appropriate symbols for natural ground, compacted earth and pavement.
- 2.3.4. When the job is complete, submit as-built drawings on disk, in AutoCAD format (2013 or earlier).

2.3.5. LAYERING

- 2.3.5.1. Layer names must appear exactly as in Appendix A (this Section).
- 2.3.5.2. All required layers listed in Inlet Beach Water System approved CAD layers shall only contain the associated described features. For example, the BOUND-PROJECT layer shall contain only the project boundary line.
- 2.3.5.3. All required layers shall be present in the drawing except for features that do not pertain to a particular project.

Construction Specifications and Standard Details

- 2.3.5.4. All layers shall be clearly differentiated from one another. For example: two layers having the names WATER-MAIN and WATER-MAINS shall not exist in the same drawing.
 - 2.3.5.5. All text shall appear on separate layers from the layers they annotate. For example, text describing a water main shall be on the WATER-MAIN-TXT layer and not on the WATER-MAIN layer.
 - 2.3.5.6. Leaders and dimensions shall be placed on the appropriate text layer and not the feature layer. All Dimensions shall be associative. Exploded dimensions shall not be accepted.
 - 2.3.5.7. All layers shall conform to the proper geometry type (line (polyline), polygon, text, insert) as shown on Appendix A (this Section).
 - 2.3.5.8. All polygon type features shall be completely closed. Lines may need to be duplicated on more than one layer to be correctly drawn as a polygon.
 - 2.3.5.9. Gravity Sewer lines and Force Mains shall be drawn as polylines and broken only at changes in pipe type, valves, tees, crosses, manholes and reducers.
 - 2.3.5.10. All valves shall be labeled with coordinates and referenced to road centerlines, power and/or utility poles, phone boxes, or any other existing permanent above ground structure. All dimensions for valve references shall be on the appropriate Valve-Txt layer.
 - 2.3.5.11. Water lines shall be drawn as polylines and broken only at changes in pipe type, valves, tees, crosses and reducers.
 - 2.3.5.12. Pipe end points shall be snapped together at endpoints.
 - 2.3.5.13. “End-of-line” caps shall be drawn to differentiate end-of-lines from lines that extend beyond the extent of the drawing. “End-of-line” caps shall be drawn for lines that are to be permanently capped when the job is complete, not for lines that are temporarily capped pending inspection.
- 2.3.6. **SYMBOLS**
- 2.3.6.1. Symbols shall be standardized according to example System As in the Inlet Beach Water System As-built Template file. The following “point”

Construction Specifications and Standard Details

features shall be symbolized using the standard Inlet Beach Water System Symbols and inserted as blocks:

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

*See Appendix B (this Section)

2.3.7. ANNOTATION

- 2.3.7.1. All water and sewer lines shall include detail of the line diameter, material type and slope.
- 2.3.7.2. All addresses and lot numbers shall not be shown with special characters such as *, #, “, etc.
- 2.3.7.3. All required text shall be single line text.

2.3.8. FILE NAMING AND REVISIONS

- 2.3.8.1. File names shall correspond exactly to the subdivision or project name and shall be consistent from one version to the next.
- 2.3.8.2. The file name shall contain the project name and the revision date in YYYYMMDD format as part of the name.
- 2.3.8.3. There shall be no blank spaces in the name, only underscores.

2.4. DELIVERABLES

- 2.4.1. All CAD files shall be delivered on a single compact disc in AutoCAD format (2013 or earlier).
- 2.4.2. All deliverables shall be labeled with the File Name, Company Name, Contact Name, and Phone Number.

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- 2.4.3. A Transmittal letter restating this information along with a statement requesting an as-built review shall accompany the disk.
- 2.4.4. Any additional drawing files used as an external reference within the submitted drawing file shall also be included with the submitted project. Any projects which have an external reference attached and not included shall not be accepted.

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APPENDIX A

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 IDENTIFICATION	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

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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


























Construction Specifications and Standard Details

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	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER END CAPS, REDUCERS, TEES, ETC.	TEXT
WATER-LAT	130	CONTINUOUS	0.30	WATER SERVICE LINES	POLYLINE
WATER-LAT-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER SERVICE LINES	TEXT
WATER-MAIN	152	CONTINUOUS	0.40	WATER MAINS	POLYLINE
WATER-MAIN-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED TO WATER MAINS	TEXT
WATER-METER	152	CONTINUOUS	0.30	WATER METER	INSERT
WATER-STATION	152	CONTINUOUS	0.30	BOOSTER PUMPS, MONITORING WELLS, TANKS, TOWERS, ETC.	INSERT
WATER-STATION-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER STATIONS	TEXT
WATER-VALVE-TXT	7	CONTINUOUS	0.25	TEXT ASSOCIATED WITH WATER VALVES	TEXT
WATER-VAULT	152	CONT	0.30	LARGE METER OR CONNECTION	POLYGON

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		INUOUS		VAULT	
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

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

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 from \$250 to \$5,000 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. **TOPSOIL**

- 3.3.1.1. Material from the excavations suitable for topsoil shall be deposited in piles separate from other excavated material.
- 3.3.1.2. Piles of topsoil shall be located so that the material can be used readily for the finished surface grading or as directed by ENGINEER, and shall be protected and maintained until needed.
- 3.3.1.3. At the option of CONTRACTOR, topsoil material for use in grading may be obtained from other locations, upon approval prior to beginning work.

3.3.2. **BACKFILL**

- 3.3.2.1. The nature and characteristics of the materials shall govern both their placement and compaction in the backfill. The materials and method shall both be subject to the approval of Inlet Beach Water System.
- 3.3.2.2. Excavated native granular material free from perishable and objectionable objects and containing no stones larger than two inches in diameter shall be used for backfilling and such grading on the site as is required.
- 3.3.2.3. Excavated native material to be used for backfill shall be neatly deposited at the sides of the trenches where spacing is available.
- 3.3.2.4. If excavated native materials are insufficient or is considered by ENGINEER or Inlet Beach Water System as unsuitable for fill, CONTRACTOR shall furnish and place barrow material for this purpose
- 3.3.2.5. 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 Inlet Beach Water System or Engineer for miscellaneous granular backfill.
- 3.3.2.6. 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.

Construction Specifications and Standard Details

- 3.3.2.7. Rock, shell, or other base materials for roads and alleys shall be carefully selected and kept separate.
- 3.3.2.8. No excavated material shall be placed on private property without written consent from the property owner.
- 3.3.2.9. Where stockpiling of excavated material is required, CONTRACTOR shall be responsible for obtaining the sites to be used and shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
- 3.3.2.10. In lieu of the above-specified granular material for backfill and bedding, CONTRACTOR when so authorized by Inlet Beach Water System may use a good grade AASHTO Class A-3 sand, free of organic or other unsuitable material in quantities which would render the sand unsuitable for bedding use.
- 3.3.2.11. Unsuitable materials for backfill shall include pile foundations, concrete, railroad ties, debris, organic material, etc.
- 3.3.2.12. 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 Inlet Beach Water System General Manager.
- 3.3.2.13. Grade and line stakes shall be protected.
- 3.3.2.14. 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 must meet OSHA safety requirements and the Florida Trench Safety Act.
 - 3.4.2.2. All excavation for piping shall be open cut and tunneling shall not be permitted unless specifically called for on the plans.
 - 3.4.2.3. 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.
 - 3.4.2.4. 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.
 - 3.4.2.5. Trench width shall be as narrow as practicable and shall not be widened by scraping or loosening material from the sides.
 - 3.4.2.5.1. At no time shall the trench width within one (1) foot of the top of pipe exceed the external pipe diameter by more than twelve inches on either side.
 - 3.4.2.6. 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.

- 3.4.2.7. 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.
- 3.4.2.8. 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.
- 3.4.2.9. 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 the Inlet Beach Water System. 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 line.
- 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 Inlet Beach Water System 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, Inlet Beach Water System and ENGINEER may permit placement of granular material of soil groups A-1, A-2, or A-3 in lifts up to a maximum of three foot compacted thickness.

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

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

3.4.6. **COMPACTION AND TESTING**

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

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

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

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

Construction Specifications and Standard Details

- 3.4.6.5. Where pipe is laid or structures built on fill materials in lieu of undisturbed earth, the fill material shall be brought up to the bottom elevation of the pipe or structure in six inches (compacted thickness) maximum layers. Each layer shall be compacted to 98% of the maximum density as determined by the Laboratory Modified Proctor Tests.
- 3.4.6.6. The method of compacting backfill shall be at CONTRACTORS discretion, subject to the approval of ENGINEER and Inlet Beach Water System, 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 Inlet Beach Water System 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 Inlet Beach Water System. Contractor shall give Inlet Beach Water System 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 Inlet Beach Water System, 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 Inlet Beach Water System.

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 piezometric water levels in the construction area remain below the prevailing excavation surface at all times.
- 4.2.4. The contractor shall be solely responsible for the arrangement, location, and depths of the dewatering system necessary to accomplish the work described under this section of the specifications.
- 4.2.5. The supply of all labor, materials, and plans, and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by CONTRACTOR to the approval of Inlet Beach Water System 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. The DEWATERING process shall accomplish the following:
 - 4.3.4.1. Reduce the hydrostatic head below any excavation to the extent that the water level and piezometric water levels in the construction are below the prevailing excavation surface
 - 4.3.4.2. Prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata; shall maintain stability of the sides and bottom of the excavation
 - 4.3.4.3. Result in all construction operations performed in the dry.
- 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. Surface water drainage shall not be directed toward the excavations.
- 4.3.8. CONTRACTOR shall dispose of all water removed from the excavations in such a manner as shall not endanger public health, property, or any portion of the work under construction or completed either by him or SUBCONTRACTOR.

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- 4.3.9. DEWATERING shall be performed in such a manner so as to cause no inconveniences whatsoever to Inlet Beach Water System, ENGINEER, or others engaged in work about the site.
- 4.3.10. All applicable Federal, State, and Local codes shall be met.
- 4.3.11. CONTRACTOR shall provide complete standby equipment, installed and available, for immediate operation as may be required, to adequately maintain the DEWATERING on a continuous basis in the event that all or any part of the DEWATERING system may become inadequate or fail.

SECTION 5

DIRECTIONAL BORING

SECTION 5 - DIRECTIONAL BORING

5.1. SCOPE

- 5.1.1. The extent of the directional boring shall be shown on the record drawings.
- 5.1.2. The work included in this section covers the installation of carrier pipe by the directional boring (trenchless installation) method as described herein, within the limits indicated on the drawings. In general, include bore pit, pilot hole (as required), drilling fluids, carrier pipe, removal and disposal of drilling fluids and soil cuttings, soil reports as required by jurisdictional agencies beyond those already provided by the Owner, siltation and sediment control, and all other work required to install the carrier pipe as specified herein and as shown on the drawings.
- 5.1.3. The Contractor will furnish all labor, equipment, materials and supplies and will perform all work necessary to provide Owner with a complete, finished water main crossing via horizontal directional drilling.
- 5.1.4. The proposed alignment length, profile and grade to which the water main shall be installed are noted on the applicable drawings. This profile indicates the minimum grade to which the pipe will be installed.

5.2. GENERAL REQUIREMENTS

- 5.2.1. Provide design engineering for the work as described in paragraph 5.1.1 and as described herein and on the contract drawings, including, but not limited to, the following elements:
 - 5.1.1.1. Bore hole diameter and length,
 - 5.1.1.2. Location of borehole entry and exit points,
 - 5.1.1.3. Drilling procedures,
 - 5.1.1.4. Pipeline pulling operations,
 - 5.1.1.5. Method of drilling fluid disposal,
 - 5.1.1.6. Area required for drilling operations and storage of pipe,
 - 5.1.1.7. Drilling fluids management plan, and
- 5.2.2. Review of plan and profile drawings and proposed horizontal and vertical alignment of the pipeline, with written certification of agreement with them, or recommended departure from them.

Construction Specifications and Standard Details

- 5.2.3. The Contractor's submitted design shall be signed and sealed by a Professional Engineer whose specialty includes design of horizontal drilling operations.
- 5.2.4. The Contractor shall be responsible for conducting the job in accordance with all applicable federal, state and local permits, codes and statutes.
- 5.2.5. The Contractor shall be responsible for keeping all driveways and roadways accessible to traffic during the pipe joining and pulling operations by bridging over the area, providing ramps or any other acceptable means approved by the Engineer. This work shall be at no additional cost to the Owner.
- 5.2.6. The Task Schedule shall conform to contract schedule as outlined in the General Provisions.

5.3. **SUBMITTALS**

- 5.3.1. Drawings: Working drawings showing in detail the size and location of boring pits together with all sheeting and shoring to be used in supporting embankments and trench walls, and any other details of the proposed methods of installation required to allow adequate review by the engineer. The Contractor shall prepare a drilling plan indicating equipment proposed for each location, pull-back forces anticipated and shall verify that the DR of the pipe specified is adequate to withstand the anticipated pull-back forces in addition to the earth, line and groundwater loads.
- 5.3.2. Shop Drawings: Complete layout and details for fabrication and installation of pipeline; including design data and calculations. Submittal shall include, but not be limited to, elements listed in paragraph 5.2.1.
- 5.3.3. Task Schedule: Detailed schedule of tasks for each stage or operation involved in the work of this section. Include as a minimum the following major tasks:
 - 5.3.3.1. Preparatory earthwork operations,
 - 5.3.3.2. Drilling rig mobilization and set-up,
 - 5.3.3.3. Pipe delivery and on-site pipe joining operations,
 - 5.3.3.4. Pilot hole drilling and reaming operations,
 - 5.3.3.5. Pipeline pulling operations,
 - 5.3.3.6. Pipeline hydrostatic testing,
 - 5.3.3.7. Drilling fluid disposal, and
 - 5.3.3.8. Restoration and demobilization.

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- 5.3.4. Disposal Plan: The plan shall describe the Contractor's plans for disposal of the drilling fluid and the names, addresses and telephone numbers of any and all subcontractors who will be performing any portion of the disposal activities. At a minimum the plan shall include:
- 5.3.4.1. Disposal method,
 - 5.3.4.2. Disposal hauler(s),
 - 5.3.4.3. Disposal locations,
 - 5.3.4.4. Estimated quantity to be disposed,
 - 5.3.4.5. Type of vehicle hauling drilling fluids,
 - 5.3.4.6. Signed statement that all hauling equipment (i.e., vehicle, tanker, dump truck, trailer, etc.) meets all requirements of state agencies, and
 - 5.3.4.7. Letter from proposed disposal site(s) accepting material.
- 5.3.5. Erosion Control Plan: The erosion control plan shall be submitted prior to the preconstruction conference. It shall be a written, detailed plan for the accomplishment of acceptable erosion control on the project. The plan shall describe all necessary temporary measures to be implemented for preventing soil erosion from the construction site until permanent erosion control and finished surfaces are installed. The plan shall comply with all state and local requirements.
- 5.3.6. MSDS (Material Safety Data Sheets): Information for the drilling slurry compounds.
- 5.3.7. Technical Data of equipment to be utilized.
- 5.3.8. Pipe Connection Procedures: The Contractor shall submit pipe connection procedures to the Engineer prior to connecting any pipe. For plastic (HDPE) pipe, the Contractor shall submit the pipe manufacturer's representative's written approval of his procedures.
- 5.3.9. As Built Drawings: On completion of pilot hole phase of each drill site, a complete set of "as-built" records shall be submitted in duplicate to the Engineer. These records shall include copies of the plan and profile drawing, as well as directional survey reports, as recorded during the drilling operation. Upon completion drawings shall be submitted to the engineer in ACAD 2010 file format.

5.4. **PERMITS**

- 5.4.1. The Owner shall obtain Corps of Engineer, FDEP wetland impact, FDEP Potable Water, FDEP Wastewater, FDOT Utility and/or Walton County Utility permits, as required by Local, State and Federal law. Copies of all permits shall be kept on-site during construction operations.

5.5. **QUALITY ASSURANCE**

- 5.5.1. Crossings must conform to applicable requirements of all utility companies affected, State Highway Department, and environmental agencies.
- 5.5.2. Qualifications: The Contractor shall be thoroughly experienced in the type construction contemplated herein.
- 5.5.3. The Contractor must demonstrate expertise in trenchless methods by providing a list of five references for whom similar work has been performed with the last two years. Two of the references shall be from projects where the SAME SIZE OR LARGER pipe than the largest carrier pipe specified in the contract documents was successfully installed at a linear distance greater than or equal to the longest bore required by the contract documents. The references shall include a name and telephone number where contact can be made to verify capability. The subcontractor must provide documentation showing successful completion of the projects used for reference. Conventional trenching experience will not be considered applicable.
- 5.5.4. Upon completion of carrier pipe installation, Contractor shall pass a mandrel through the entire length of the bore in the presence of the Owners representative to inspect for roughness and necking. The mandrel shall not be more than two-inches in diameter smaller than the ID of the carrier pipe installed. The mandrel and tow rope shall be constructed of materials that will not scar or harm the carrier pipe in any manner.
- 5.5.5. Pipe Manufacturer's Quality Control: The pipe manufacturer shall have an on-going Quality Control program for incoming and outgoing materials. High-density polyethylene (HDPE) resins for manufacturing of pipe shall be checked for density, melt flow rate, and contamination. These incoming resins shall be approved by NSF before being converted to pipe. Pipe shall be checked for outside diameter, wall thickness, length, roundness, and surface finish on the inside and outside and end cut.
- 5.5.6. Fittings Manufacturer's Quality Control: The fitting manufacturer shall have an on-going quality control program for incoming and outgoing materials. Molded fittings shall be inspected for voids and knit lines. All fabricated fittings shall be inspected for joint quality and alignment. All fabricated fitting welds shall be made using a Data Logger. A record of the temperature, pressure and graph of the fusion cycle shall be maintained by the fitting manufacturer.

5.6. **PRODUCT DELIVERY, STORAGE, AND HANDLING**

- 5.6.1. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport on commercial carriers. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations and the requirements of this specification.
- 5.6.2. Deliver and store materials within limits of rights-of-way and/or property lines as shown on the drawings as directed by the owner.
- 5.6.3. The Contractor shall be responsible for securing all project materials and shall bear the cost of replacing any materials which may become misplaced or stolen.

5.7. **JOB CONDITIONS**

- 5.7.1. The Contractor shall be held fully responsible for protecting against surface subsidence, damage, or disturbance of adjacent property and facilities from his construction methods.
- 5.7.2. Each directional boring crew shall have a reasonable proportion of experienced men. A superintendent and/or engineer experienced in directional boring methods and techniques, and who represents the boring contractor, shall be present at all times while work is proceeding. He shall also be responsible for the frequent checking of line and grade, if needed. Tolerances should be agreed to in the light gradient and easement requirements.
- 5.7.3. Contractor shall be held responsible for the coordination and scheduling of all construction work.

5.8. **SAFETY**

- 5.8.1. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
- 5.8.2. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.

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- 5.8.3. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

5.9. **MATERIALS**

- 5.9.1. Drilling fluid shall be a gel-forming colloidal fluid consisting of at least 10% of high-grade bentonite, which is totally inert and contains no environmental risk, or equal.

5.9.2. **CARRIER PIPE:**

- 5.9.2.1. Pipe and fittings shall be high-density polyethylene manufactured from NSF approved PLEXCO P34CH compound, PE 3408, or equal.
- 5.9.2.2. Pipe shall meet AWWA C-906, PE Pressure Pipe and Fittings 4" -53" for Distribution and be marked with the NSF-pw logo.
- 5.9.2.3. Hydrostatic design stress (HDS) shall be 800 psi at 73.4°F with a minimum pipe DR of 11 and operating pressure of 200 psi at 73.4°F.
- 5.9.2.4. Pipe and fittings shall be produced by the same manufacturer from identical materials meeting the requirements of this specification.
- 5.9.2.5. Molded fittings shall meet the requirements of ASTM D-3261 and this specification. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the outside diameter and minimum wall thickness specifications of ASTM F-714 for the same size of pipe.
- 5.9.2.6. Pipe shall be manufactured in accordance with ASTM F-714, ASTM D-3035, or the applicable dedicated service specification. Print line markings shall include a production code from which the location and date of manufacture can be identified. Upon request, the manufacturer shall provide an explanation of his production code.
- 5.9.2.7. Pipe Marking: HDPE color coding shall be in accordance with the marking requirements specified herein.
- 5.9.2.8. The HDPE (PE 3408) pipe O. D. equivalent to 24-inch ductile iron shall be 30-inches.

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- 5.9.2.9. The HDPE (PE 3408) pipe O.D. equivalent to 18-inch ductile iron shall be 24-inches.
- 5.9.2.10. For additional information, see “POTBALE WATER – PIPELINES” and “SEWER FORCEMAINS AND APPURTENANCES” in this specification.
- 5.9.2.11. ACCEPTABLE PIPE MANUFACTURER: Performance Pipe, Driscoplex 4000, PE 3408, AWWA C-906, DIPS sizing, Richardson TX, (800) 527-0662; Supplier: ISCO Industries, Grand Bay, AL, 1-800-345-4726, or approved equal.
- 5.9.3. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the working pressure rating of the fitting.
- 5.9.4. Butt fusion Fittings: HDPE fittings shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99, and approved for AWWA use. Butt fusion fittings shall have a manufacturing standard of ASTM D3261.
- 5.9.5. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records.
- 5.9.6. Transition Fittings: Terminate all HDPE pipe with fusion welded flanges (125 lb bolt pattern). See paragraph above for alternate fusion procedures.
- 5.10. **EQUIPMENT**
- 5.10.1. Directional Drilling Equipment
- 5.10.2. General: The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

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- 5.10.3. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.
- 5.10.4. Drill Head: The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.

5.11. GUIDANCE SYSTEM

- 5.11.1. General: An electronic walkover tracking system or a Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-foot horizontally.
- 5.11.2. Components: The Contractor shall supply all components and materials to install, operate, and maintain the guidance system.
- 5.11.3. The guidance System shall be of a proven type, and shall be set up and operated by personnel trained and experienced with the system. The operator shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

5.12. JOINING METHODS

- 5.12.1. Butt fusion joining: Plain end pipe and fittings shall be made using butt fusion. The butt fusion procedures shall be in accordance with the manufacturer or the PPL. The fusion equipment operator shall receive training using the recommended procedure. The Contractor shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been trained within the past twelve

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months. The fusion equipment shall be equipped with a Data Logger. Records of the welds (heater temperature, fusion pressure, and a graph of the fusion cycle) shall be maintained for five (5) years. Fusion beads shall not be removed.

- 5.12.2. Mechanical Joining: Polyethylene pipe and fittings may be joined together using flanges or mechanical joint adapters. These fittings shall be made from PE 3048 HDPE, with a Cell Classification of 345464C as determined by ASTM D3350-99. Flanged and MJ adapters shall have a manufacturing standard of ASTM D326 1. They shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
- 5.12.3. Electrofusion couplings: Polyethylene pipe and fittings may be joined using approved electrofusion couplings. Fittings shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the working pressure rating of the fitting.

5.13. **EXECUTION**

- 5.13.1. The Contractor shall be responsible for setting all grade stakes, lines, and levels.
- 5.13.2. Coordinate the locations of underground utilities with appropriate companies. Advise Engineer immediately if conflict exists.
- 5.13.3. Contractor shall operate and maintain all equipment as required to keep the work free from excessive spoil and environmental risks.
- 5.13.4. Install siltation fences, sediment barriers, etc., as required and shown on the Contractor's Erosion Control Plan drawings.
- 5.13.5. The Contractor shall perform the necessary general earthwork operations as required for the directional drilling and pipe pulling operations.
- 5.13.6. The Contractor shall be responsible for restoring all areas impacted by contractors work effort to pre-work conditions. The Contractor shall be responsible for constructing all means of temporary access to the designated work sites and shall be liable for all damages caused as a result of the work.

5.14. **INSTALLATION**

- 5.14.1. Installation shall be in a trenchless manner producing continuous bores. The entry point shall be where shown on the plan submitted as required in 5.1.1 above. The exit point for the drilled hole shall be within 10 feet laterally and within 20 feet longitudinally of where shown on the plan submitted as required in 5.1.1 above. No exception to this requirement will be allowed.
- 5.14.2. The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location.
- 5.14.3. Tunneling must be performed by a fluid-cutting process (high pressure-low volume) utilizing a liquid clay, i.e., bentonite. The clay lining will maintain tunnel stability and provide lubrication in order to reduce frictional drag while the pipe is being installed. In addition, the clay fluid must be totally inert and contain no environmental risk.
- 5.14.4. The Contractor must also have a mobile vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits. The spoils must then be transported from the job site and be properly disposed of. Under no circumstances will the drilling spoils be permitted to be disposed of into sanitary, storm, or other public or private drainage systems.
- 5.14.5. Mechanical, pneumatic, or water-jetting methods will be considered unacceptable due to the possibility of surface subsidence.
- 5.14.6. After an initial bore has been completed, a reamer will be installed at the termination pit and the pipe will be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel.
- 5.14.7. The Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits.
- 5.14.8. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

- 5.14.9. Contractor shall place silt fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection necessary by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Fuel may not be stored in bulk containers within 200 feet of any water body or wetland.
- 5.14.10. Readings shall be recorded after advancement of each successive drill pipe, (no more than 15') and the readings plotted on a scaled drawing of 1" = 5', both vertical and horizontal. Access to all recorded readings and plan and profile information shall be made available to the Engineer, or his representative, at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.
- 5.14.11. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to the Engineer, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the Contractor at an approved dumpsite.
- 5.14.12. The pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100-feet. In the event that pilot does deviate from the bore path more than 5-feet of depth in 100-feet, Contractor will notify Engineer and Engineer may require Contractor to pullback and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fractures, inadvertent returns or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and wait another 30 minutes. If mud fracture or returns loss continues, Contractor will discuss additional options with the Engineer and work will then proceed accordingly.
- 5.14.13. Flange/MJ Adapter Installation: Flanges/MJ Adapters shall be attached to pipe and fittings using butt fusion. The flanges/MJ adapters shall be aligned and centered relative to the pipe. Flanges/MJ adapters should be square with the valve or other flange before tightening of bolts. Bolts should not be used to draw flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be used under flange nuts. Bolts shall be tightened using a "star tightening pattern". See manufactures recommendations. Twenty-four hours after first tightening the flange bolts, they must be re-tightened using the same "star tightening patter" used above. The final tightening torque shall be as indicated by the manufacturer.

- 5.14.14. On each day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely then fusion test straps shall be cut out. The test strap shall be 12" or 30 times the wall thickness in length (minimum) and 1" or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
- 5.14.15. Socket and saddle fusions shall be tested by a bent strap test as described by the pipe manufacturer. The pipe manufacturer shall provide visual guidelines for inspecting the butt, saddle and socket fusions joints.
- 5.14.16. The Contractor shall be liable for retrieving or sealing any pipe that becomes lodged in the drill hole.

5.15. **PIPE PULLING OPERATIONS**

- 5.15.1. The full length of the pipe to be installed shall be laid out, welded and tested in one complete unit before being pulled back through the drilled hole. Once started, pipeline pullback shall be continuous unless approved otherwise in writing by the Owner or Owner's designated representative.
- 5.15.2. The pulling head shall be designed by the Contractor to withstand the continuous tensile pull stresses with intermittent sudden occasional surges. The Contractor shall be responsible for determining the pulling loads.
- 5.15.3. The pipe shall be continuously lubricated with a bentonite slurry and the assembled pipeline shall be laid on rollers, or other apparatus, to facilitate pullback and prevent damage to pipe.
- 5.15.4. The Contractor shall continue pull back until 10 linear feet (minimum) of pipe is above ground for the purpose of pipe inspection.
- 5.15.5. A blind flange shall be bolted to the fusion welded flange and the pipe shall be marked and buried with a minimum cover of 36-inches. Connections, which will be made under another contract, will require the removal of the blind flange and a flanged ductile iron adapter shall be bolted to the fusion welded flange suitable for the transitional material. Provide restrained joints or mechanical joint restraint as required.

5.16. **TESTING**

- 5.16.1. In addition to the water system testing requirements specified for the entire system, the Contractor shall conduct a low pressure air test of the HDPE water main above ground prior to pullback as follows:
- 5.16.2. Secure and brace ends of pipe to be tested.
- 5.16.3. Provide calibrated low range air pressure gauge on high end of pipe. Fill pipe to maximum pressure of 20.0 psig. Add air as necessary to compensate for internal/external pipe temperature and initial pipe expansion. Check all pipe joints and test fittings with mild soap solution. Repair or replace all leaking joints, pipe and/or fittings. Once air pressure has stabilized, pipe should hold constant air pressure for two hours. If pipe does not hold pressure, check all joints and test fittings with soap solution. Repair or replace sources of leakage and completely retest entire section.
- 5.16.4. In addition to the water system testing requirements specified for the entire system, the Contractor shall conduct a hydrostatic test of the HDPE water main in-ground after pullback as follows:
- 5.16.5. Flush the HDPE water main with potable water to remove any sediment, solids and/or foreign material prior to any in place testing. Then, fill the pipe with potable water and after all free air is removed from the test section, raise the pressure at a steady rate to the required pressure. The pressure in the section shall be measured with calibrated pressure gauges at each end of the pipe section.
- 5.16.6. Test pressure shall be 150 psi. The initial pressure test shall be applied and allowed to stand without makeup water for a sufficient time to allow for diametric expansion or pipe stretching to stabilize. This usually occurs within 2-3 hours. After this equilibrium period, the test section can be returned to 150 psi operating pressure, the pump turned off, and a final test pressure held for three hours.
- 5.16.7. Immediately following the pressure test, the results shall be furnished to the Engineer or Inspector. Leaking pipes that cannot be repaired to meet pressure test must be removed, filled with concrete, or otherwise placed out of service.

5.17. **DAMAGED OR IMPROPERLY INSTALLED PIPE**

- 5.17.1. If the pipe is damaged before installation, or does not meet the specifications, it shall be replaced at no expense to the Owner. If the pipe is damaged during

installation by the Contractor's operations, placed at the improper grade or line, or cannot be advanced because of an unseen obstruction or any other reason, it shall, at the discretion of the Engineer, be retrieved or abandoned in place and the void filled with concrete by pressure grouting as soon as possible. If it becomes necessary to drill another hole, an alternate installation shall be made as directed by the Engineer. The Contractor shall re-drill the hole and furnish all additional labor and materials required to complete the job as indicated on the plans and specifications at no additional cost to the Owner. The cost for retrieval or abandonment of pipe shall be at the expense of the Contractor. No additional payment shall be made for pipe which is retrieved, abandoned, or damaged beyond use, including dewatering, excavation, drilling, backfilling, etc.

- 5.17.2. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using one of the joining methods allowed in the Section.

SECTION 6

POTABLE WATER - PIPELINES



SECTION 6 – POTABLE WATER - PIPELINES

6.1. **SCOPE**

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

6.2. **GENERAL REQUIREMENTS**

- 6.2.1. All work shall be proved to be in first class working condition and constructed properly in accordance with the drawings and specifications.
- 6.2.2. All defects and leaks disclosed by the tests shall be remedied. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System. Water for testing shall be furnished by CONTRACTOR.
- 6.2.3. CONTRACTOR shall submit to ENGINEER for approval before work begins certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and the fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 6.2.4. All pipe joints shall be a minimum of twenty (20) feet in length.
- 6.2.5. All materials shall be free from defects impairing strength and durability and shall be the best of commercial quality for the purpose specified.
- 6.2.6. All materials have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- 6.2.7. All pipe and fittings shall be clearly marked with the name or trademark of the MANUFACTURER, the batch number, the location of the plant, and strength designation, etc. and the pipe shall be of a color approved by the utility company.
- 6.2.8. Each pipe joint shall be marked with the date of completion of lining and inspection in accordance with these specifications, and its numerical sequence of application on that date. A permanent marker of identifiable color shall be used.

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- 6.2.9. All pipe and fittings delivered to the job site shall be accompanied by independent TESTING LABORATORY REPORTS certifying that the pipe and fittings conform to the above mentioned ASTM Specifications.
- 6.2.10. CONTRACTOR shall submit a NOTARIZED STATEMENT OF CERTIFICATION from the pipe MANUFACTURER as to conformance with the aforementioned ASTM Specifications and Modifications thereto, at the time of submitting shop drawing data on the pipe and fittings.

6.3. MATERIALS

6.3.1. POLY-VINYL CHLORIDE (PVC)

- 6.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) pipe for potable water and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 6.3.1.2. Pipe shall be approved for potable water by the National Sanitation Foundation. All herein referenced standards shall be of the latest edition or revision.
- 6.3.1.3. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring for pipe sizes 2-3 inch and larger.
- 6.3.1.4. Ductile iron fittings shall be used for PVC pipe 3 inches and larger.
- 6.3.1.5. The pipe material shall be NSF approved Class 12454-A or 12454-B PVC compound conforming to ASTM resin specification D-1784.
- 6.3.1.6. The pipe shall be tested at levels meeting the requirements of the U.S. Department of Commerce Public Standard 22-70, and shall conform to the physical standard specifications of the Plastic Pipe Institute.
- 6.3.1.7. **PVC SCHEDULE 40**
 - 6.3.1.7.1. Pipe shall conform to D-1785-latest, for use in sizes 2-inches and smaller.
 - 6.3.1.7.2. The sustained pressure test shall be conducted in accordance with ASTM D-1598 at test pressures given in ASTM 1785 when tested in accordance with ASTM D-2672.

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6.3.1.7.3. The burst pressure test shall be conducted in accordance with ASTM D-1599 at test pressures given in ASTM 1785, when determined in accordance with ASTM D-2672 (section 6.6).

6.3.1.7.4. The pipe shall be PVC 1120, Schedule 40, as manufactured by Ethyl Corporation or approved equal.

6.3.1.8. PVC CLASS 200 / SDR21

6.3.1.8.1. Pipe shall conform to ASTM D-2241-latest, for use in 2 inch up to 12” in size. REGIONAL UTILITIES may specifically approve use in other sizes on request.

6.3.1.8.2. Pipe is to be manufactured in I.P.S (steel) standard pipe equivalent outside diameters.

6.3.1.8.3. The pipe shall be designed for a hydrostatic working pressure of 200 psi at 73.4 degrees Fahrenheit and to pass without failure sustained pressure test of 420-psi minimum when tested in accordance with ASTM D-1598 and for a quick burst test of 630-psi minimum when tested in accordance with ASTM D-159A.

6.3.1.9. PVC C905 DR21

6.3.1.9.1. For pipe over 12 inches in diameter, pipe shall conform to AWWA Standard C-905.

6.3.1.9.2. Pipe is to be cast iron pipe (D.I.P.S.) equivalent outside diameters.

6.3.1.9.3. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and for a quick burst test of 755 psi in conformance with ASTM D1599.

6.3.1.9.4. In any case of conflict with standards specified herein, the requirements of AWWA Standard C900 shall prevail. The pipe shall be “ring tite”, Class 200, or approved equal.

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6.3.2. HIGH DENSITY POLY-ETHYLENE (HDPE)

- 6.3.2.1. Pipe shall be DR 11 or better.
- 6.3.2.2. HDPE pipe for water system use shall conform to AWWA C-901 (up to 3”) and AWWA C-906 (4” and larger).
- 6.3.2.3. Material shall be PE 4710 meeting cell classification PE445574C and Standards ASTM D2737, ASTM D2239 or ASTM D3035.
- 6.3.2.4. Pipe shall be manufactured in accordance with ASTM D3035 (up to 3”) or ASTM F714 (4” and larger) and shall be so marked.
- 6.3.2.5. All pipe shall be as manufactured by DriscoPlex® and be marked with a blue stripe.
- 6.3.2.6. Mechanical joint transitions with HDPE pipe stiffeners are not permitted.
- 6.3.2.7. All pipe joints shall be heat fused in accordance with the recommended procedures of the pipe MANUFACTURER.
- 6.3.2.8. Transitions to other types of pipe shall be by fused end transitions.
- 6.3.2.9. The fusion equipment operator shall receive training using the recommended procedure.
- 6.3.2.10. CONTRACTOR shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been trained within the past twelve months.
- 6.3.2.11. The fusion equipment shall be equipped with a Data Logger. Records of the welds (heater temperature, fusion pressure, and a graph of the fusion cycle) shall be maintained for five (5) years.
 - 6.3.2.11.1. Fusion beads shall not be removed.

6.3.3. DUCTILE IRON

- 6.3.3.1. Pipe shall be fabricated by American Cast Iron Pipe Company or approved equal Class 350.
- 6.3.3.2. Pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51.

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6.3.3.3. Push-on joints and mechanical joints for such pipes shall be in accordance with ANSI/AWWA C111/A21.11.

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

6.3.4. FITTINGS

6.3.4.1. Fittings shall be ductile iron and in accordance with the requirements of ANSI/AWWA C153/A21.53, and ANSI/AWWA C110/A21.10.

6.3.4.2. Pipe fittings shall have cement mortar lining and seal coating, where applicable, in accordance with ANSI/AWWA C104/A21.4.

6.3.4.3. Ductile fittings and special castings shall conform to the type of pipe being installed and have a minimum working pressure rating of 150 psi. Fittings shall conform to specification (AWWA C153) latest.

6.3.4.4. Short body pattern fittings shall normally be installed. Long body fittings (AWWA C110) shall be used where the drawings specifically call for long body fittings, or at the option of CONTRACTOR when the laying length is not controlled by short body patterns.

6.3.4.5. Fittings shall have joints that match the type of pipe furnished. Joints shall be made using restraint type retainer glands.

6.3.5. STANDARD JOINTS

6.3.5.1. PVC pipe joints for pipe sizes 2-1/2 inches and smaller shall be extra heavy PVC or CPVC fittings solvent welded with PVC or CPVC cement.

6.3.5.2. All mechanical joint fittings shall have mega-lug restraint type retaining glands as manufactured by EBBA IRON or FORD METER CO.

6.3.6. RESTRAINED JOINTS

6.3.6.1. In addition to concrete thrust blocks, approved cast iron or ductile iron restraint type retainer glands shall be used.

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6.3.7. TRACER WIRE

- 6.3.7.1. A 12 gauge blue-insulated copper tracer wire shall be installed with all water pipes. An extra 2 minimum feet of wire shall be accessible at all valve and air release valve boxes. Minimum wire size for directional bore shall be 10 gauge.

6.3.8. SERVICE CONNECTIONS

- 6.3.8.1. Service connections shall be FORD F202 double strap iron service saddles.
- 6.3.8.2. Where service headers are proposed for the purpose of installing a multiple meter vault (A.K.A. "meter bank"), the construction shall conform to the detail as shown on Inlet Beach Water System Standard Potable Water Detail sheet W-2.

6.3.9. SERVICE TUBING

- 6.3.9.1. One-inch service tubing shall be polyethylene (ASTM 3408) meeting AWWA specification C-906 pressure rated for 200 psi (DR9) with 1"x3/4" meter coupling curb stop. Tubing shall be black in color with a blue stripe.

6.3.10. SERVICE TUBING CASINGS

- 6.3.10.1. All service tubing under roadways shall be installed in schedule 40 PVC casing extending 4'-0" past the edge of the pavement (except for directional bores).

6.3.11. BALL MARKERS

- 6.3.11.1. Contractor is to place a 4" ball marker as manufactured by 3m, part no.1403, beside each water main valve and service and at corp stop tap at the main.

6.4. INSTALLATION

- 6.4.1. All work shall be provided to be in first class condition and constructed properly in accordance with the drawings and specifications.
- 6.4.2. CONTRACTOR shall submit to Inlet Beach Water System, for approval, shop drawings including manufactures certifications of all pipe and fittings used on this project.

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- 6.4.3. CONTRACTOR shall submit to ENGINEER and Inlet Beach Water System for approval before work begins, certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 6.4.4. All water mains, fittings, and appurtenances shall be in conformance with all applicable State of Florida Department of Environmental Protection and American Water Works Association (AWWA) Standards.
- 6.4.5. Defective, damaged or unsound pipe already laid which are found to be defective or damaged would be replaced with new pipe..
- 6.4.6. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System. Water for testing shall be furnished by CONTRACTOR.
- 6.4.7. Each section of the pipe shall rest upon the pipe bed for full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe, which has its grade or joint disturbed after lying, shall be taken up and relayed.
- 6.4.8. No pipe shall be laid when the trench conditions or weather is unsuitable for such work, except by permission of Inlet Beach Water System.
- 6.4.9. Pipe fittings shall be carefully handled to avoid damage, and if feasible while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks.
- 6.4.10. Minimum cover on all piping shall be 36".
- 6.4.11. Maximum cover on all piping shall be 48", unless approved in writing by Regional Utilities.
- 6.5. **CLEANING AND FLUSHING**
- 6.5.1. After a final inspection has been performed and has passed on the project CONTRACTOR shall be responsible for having a flush point opened and is responsible for where the water is to be dispersed. At this time the Inlet Beach Water System construction inspector shall open the main line valve to thoroughly flush out the line.

6.6. **FIELD TESTING**

- 6.6.1. All piping to be operated under liquid pressure shall be tested in sections of approved length.
- 6.6.2. All field tests shall be made in the presence of ENGINEER and Inlet Beach Water System.
- 6.6.3. Pipelines laid in excavations other than trench excavations or pipelines embedded in concrete, shall be tested prior to backfilling of the excavated material or placing of the concrete.
- 6.6.4. Hydrostatic testing shall consist of both pressure and leakage tests.
 - 6.6.4.1. Pressure Test – 2 hour duration at 150 psi.
 - 6.6.4.2. Leakage Test – 2 hour duration at 150 psi.
- 6.6.5. For these tests CONTRACTOR shall furnish clean water, suitable temporary testing plugs and other necessary equipment and all labor required.
- 6.6.6. Pressure tests shall be of 2-hour duration and leakage test shall be of 2-hour duration, unless specified otherwise or notified in writing by Inlet Beach Water System.
- 6.6.7. Pressure tests shall be conducted with a pressure loss of not more than 2 psi regardless of length of pipe being tested.
- 6.6.8. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If hydrants, blow offs, or other outlets are not available at high points for releasing air, CONTRACTOR shall make the temporary taps at such points and shall plug said holes after completion of tests.
- 6.6.9. Specified test pressures shall be applied by means of a pump connected to the pipe in a manner satisfactory to Inlet Beach Water System.
- 6.6.10. The pump, pipe connection, and all necessary apparatus, including the proper gauges, shall be furnished by CONTRACTOR and shall be subject to the approval of ENGINEER and Inlet Beach Water System.
- 6.6.11. Pressure gauges shall be calibrated by an approved testing laboratory, with increments no greater than 2 psi.

Construction Specifications and Standard Details

- 6.6.12. Gauges used shall be of such size that pressures tested shall not register less than 10% nor more than 90% of the gauge capacity.
- 6.6.13. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be performed until it is satisfactory.
- 6.6.14. Test pressures shall be based on the elevation of the highest point of the line or section under test or corrected to the elevation of the test gauge.
- 6.6.15. Leakage tests shall be conducted subsequent to the pressure tests.
- 6.6.16. Leakage is defined as the quantity of water that must be supplied to the line or section under test to maintain constant pressure throughout the duration of the test.
- 6.6.17. No pipe installation shall be accepted if the leakage is greater than determined by the following formula from ANSI/AWWA C-600-latest:

$$L = \frac{SD(P)^{1/2}}{133200}$$

L = Allowable leakage in gallons per hour

S = Length of pipeline tested in feet

D = Nominal diameter of the pipe in inches

P = Average pressure during the leakage test in pounds per square inch gauge.

- 6.6.17.1. If any test discloses leakage greater than that specified above, CONTRACTOR shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.
- 6.6.18. In the event a section fails to pass the tests, CONTRACTOR shall do everything possible to locate, uncover (even to the extent of uncovering the entire section), and repair or replace the defective pipe, fitting, or joint.
- 6.6.19. Visible leaks shall be corrected regardless of total leakage.
- 6.6.20. Lines shall be repaired and retested as necessary until test requirements are achieved.

6.7. **DISINFECTION**

- 6.7.1. All water pipes and fittings at whatever size and wherever installed on potable water lines shall be thoroughly disinfected prior to being placed into service.
- 6.7.2. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains in AWWA C-651-latest, Rule 62-555.345, F.A.C., and shall be in accordance with both Federal, State and Local requirements.

6.8. **WARRANTY**

- 6.8.1. The pipe MANUFACTURER of materials furnished on the project shall supply to Inlet Beach Water System in an approved format a ten (10) year unconditional warranty.
- 6.8.2. The warranty shall be limited to the pipe material which shall constitute complete replacement and delivery to site of materials only to replace defective pipe and fittings with new material conforming to the specifications as stated.
- 6.8.3. This warranty is contingent upon determination of pipe failure by a private independent testing laboratory.
 - 6.8.3.1. The testing shall prove that the failure was caused by failure of the pipe material.
 - 6.8.3.2. The testing laboratory shall be selected by and agreed upon by both parties involved.

6.9. **AS-BUILT WATER PLANS**

- 6.9.1. See Section 2.0 of this Specification.

SECTION 7

POTABLE WATER – VALVES & FITTINGS



SECTION 7 – POTABLE WATER – VALVES & FITTINGS

7.1. **SCOPE**

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

7.2. **GENERAL REQUIREMENTS**

- 7.2.1. All valves shall be NSF Standard 61 certified.
- 7.2.2. Valves over 12 inches shall have right angle drive assemblies.
- 7.2.3. Valves 18 inches to 30 inches in size shall be gate valves unless otherwise noted.
- 7.2.4. All water valves shall be marked with 3m water ball markers (3M part # 1403).
- 7.2.5. Valves installed within a water system shall open by turning to the left or counterclockwise, when viewed from the stem.
- 7.2.6. Where extension stems are required, substantial, adjustable wall brackets and extension stems shall be furnished and located as directed.
- 7.2.7. Extension stems shall be provided on all buried valves when the operating nut is deeper than 4 feet below final grade.
- 7.2.8. Interior and exterior of valves shall be fusion bonded epoxy coated in compliance with ANSI/AWWA C-550.

7.3. **MATERIALS**

7.3.1. **GATE VALVES**

- 7.3.1.1. All valves shall be manufactured by American Flow Control or approved equal.

Construction Specifications and Standard Details

- 7.3.1.2. All GATE VALVES shall be resilient wedge and shall meet the requirements of AWWA C-515 (sizes up to 12”) and AWWA C-550.
 - 7.3.1.3. GATE VALVE sizes 3 to 12 inches in diameter shall be designed for 250-psi minimum working pressure.
 - 7.3.1.4. GATE VALVE sizes over 12 inches in diameter shall be designed for 150-psi minimum working pressure.
 - 7.3.1.5. When fully open, all GATE VALVES shall have a clear waterway equal to the nominal diameter of the pipe.
 - 7.3.1.6. All GATE VALVE operating nuts or wheels shall have an arrow cast in the metal indicating the direction of opening.
 - 7.3.1.7. All GATE VALVES shall have the manufacture’s distinctive marking, pressure ratings, and year of manufacturing cast on the body.
 - 7.3.1.8. Prior to shipment from the factory, each GATE VALVE shall be tested by applying it to a hydraulic pressure equal to twice the specified working pressure.
 - 7.3.1.9. All buried GATE VALVES shall be resilient seat iron body non-rising stem type with two inch operating nut and adjustable valve boxes.
 - 7.3.1.10. GATE VALVES located above ground and inside structures shall be hand wheel operated, non-rising stem type with flanged ends and of the same general construction as buried valves.
- 7.3.2. **VALVE JOINTS**
- 7.3.2.1. All gate valves shall have mechanical joint ends to fit the pipe run in which they are to be used, except valves installed on slip joint pipe shall have mechanical joint ends unless otherwise specified.
 - 7.3.2.2. Joint restraint type mechanical joint gland shall be used and shall be mega-lug type or approved equal.
 - 7.3.2.3. Hydrostatic and leakage tests shall be performed to check all valve joints and conducted in strict accordance with AWWA requirements and Section 5.5 of this specification.

7.3.3. **CHECK VALVES**

- 7.3.3.1. CHECK VALVES shall conform to the requirements of AWWA C508, latest, “AWWA Standard for Swing-Check Valves for Ordinary Waterworks Service”.
- 7.3.3.2. CHECK VALVES larger than two-inch nominal size shall be iron body, flanged ends, outside lever, spring loaded, swing type with straightaway passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber faced disc.
- 7.3.3.3. CHECK VALVES shall be American Flow Control, or approved equal.
- 7.3.3.4. CHECK VALVE sizes 2-inches in diameter and smaller shall be brass swing check valves, 200 psi working pressure, American Valve M 31, or approved equal.

7.3.4. **CUSHIONED CHECK VALVES**

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

7.3.5. **HOSE VALVES**

- 7.3.5.1. All garden hose valves or bibs shall be ¾ inch, catalog No. 117, as manufactured by Crane Company or approved equal.

7.3.6. **TAPS**

- 7.3.6.1. CONTRACTOR shall perform all taps greater than or equal to 2” in diameter.
- 7.3.6.2. Inlet Beach Water System shall perform all taps less than 2” in diameter.
- 7.3.6.3. A representative of Inlet Beach Water System must be onsite prior to performing any and all taps.
- 7.3.6.4. CONTRACTOR shall provide at least five working days’ notice to Inlet Beach Water System prior to performing the work.

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- 7.3.6.5. At the time the line is to be tapped, it shall be the responsibility of CONTRACTOR to ensure that the tapping sleeve and valve is pressurized and can sustain the pressure and leakage test (See Section 6.14 of this specification).
- 7.3.6.6. In the event the line has not been tested prior to the arrival of Inlet Beach Water System 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 Inlet Beach Water System to remain on-site in preparation for the work, a service charge equal to \$50.00 an hour shall apply so long as Inlet Beach Water System is on-site.
- 7.3.6.7. All taps EQUAL TO OR GREATER THAN 4" IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SLEEVE and associated tapping valve.
- 7.3.6.7.1. The TAPPING SLEEVE and gland shall be Standard Bituminous Coated, and shall be as manufactured by FORD METER CO. (or approved equal) and shall be furnished complete with all necessary accessories.
- 7.3.6.7.2. The TAPPING SLEEVE shall have a working pressure rating of 200 psi for sizes 4" through 12" and 150 psi for sizes 14" and larger, and shall conform to the applicable sections of AWWA Standard C110 of latest revision.
- 7.3.6.7.3. The TAPPING SLEEVE shall be of the split type for assembly on the pipe and the sleeve shall be sized for use with all classes of cast iron pipe.
- 7.3.6.7.4. The outlet flange shall be Class 125 Standard, with recess for standard tapping valves.
- 7.3.6.8. All taps SMALLER THAN 4" IN DIAMETER, irrespective of the diameter of the line to which you are tapping, shall consist of a single TAPPING SADDLE and associated tapping valve.
- 7.3.6.8.1. The TAPPING SADDLE shall be Standard Bituminous Coated, and shall be as manufactured by FORD METER CO. (or approved equal) and shall be furnished complete with all necessary accessories.

Construction Specifications and Standard Details

- 7.3.6.9. The excavated area in which the tap shall be made must be a minimum of 4' below the bottom of the valve, at least seven feet in length and able to accommodate two people working.
- 7.3.6.10. The area where the tap shall be made must be completely dry. It is the responsibility of CONTRACTOR to pursue all means necessary to dewater the area in which the tap is to be made.
- 7.3.6.11. TAPPING VALVES shall meet all the requirements of Section 6.3 of this specification and shall be a mechanical joint outlet by tapping flange with a raised inner lip for alignment with the tapping sleeve.
- 7.3.6.12. Prior to tapping a potable water main, the drilling machine's pilot drill, shell cutter and cutter hub shall be sterilized in accordance with the following procedure:
- 7.3.6.13. Four gallons of potable water shall be combined with 8 oz. of sodium hypochlorite; the pilot drill, shell cutter and cutter hub shall be swabbed until clean or totally immersed in the sterilizing solution and allowed to remain wet at least five minutes before tapping operation commences. It is not necessary to rinse the sterilizing solution from the tapping components prior to use.

7.3.7. TAP HYDROSTATIC AND LEAKAGE TEST

- 7.3.7.1. After installing a tapping sleeve and valve, and prior to tapping a pressurized water main, a hydrostatic and leakage test shall be performed.
- 7.3.7.2. The test shall be conducted by introducing water into a tap or test hole located on the neck of the outlet half of the sleeve with the tapping valve in the closed position. Sleeves that do not have a tap shall be tested with water supplied through a mechanical joint tapped plug connected to the open tapping valve. Upon completion, a watertight plug shall be inserted into the test hole.
- 7.3.7.3. The sleeve and valve shall be capable of maintaining test pressure of 150 psi for 30 minutes duration, with no sign of visible leaks.
- 7.3.7.4. All leaks shall be repaired by removing and replacing defective items with items free from defect, after which the sleeve and valve shall be retested. Such repair and retesting shall be done until the installation passes the specified test.

7.3.7.5. CONTRACTOR shall furnish and install any necessary and temporary restraints, gauges, pumps, and other incidental and appurtenant items necessary to complete this work, and shall remove same upon completion of the test.

7.3.8. **CORPORATION STOPS**

7.3.8.1. CORPORATION STOPS shall be manufactured from cast bronze with machined fitting surfaces, and in accordance with AWWA C-800, latest, in sizes $\frac{3}{4}$ inch up to and including 2 inches.

7.3.8.2. The inlet connection shall be AWWA Standard corporation stop thread or iron pipe (I.P.) thread. CORPORATION STOPS with compression joint outlets for copper or plastic tubing shall be Ford type F 1000.

7.3.9. **CURB STOPS**

7.3.9.1. CURB STOPS shall be manufactured from cast bronze with machine fitting surfaces, and in accordance with AWWA C800, latest, in sizes $\frac{3}{4}$ inch up to and including 2 inch.

7.3.9.2. CURB STOPS shall be a straight ball meter valve with pack joint, with lock wing cast on stop body and operating tee cap to provide for locking the stop in the closed position.

7.3.9.3. CURB STOPS shall be Ford type B43 with an HB34 straight lever handle.

7.3.10. **BALL VALVES**

7.3.10.1. BALL VALVES shall be limited to $\frac{3}{4}$ inch through 2 inch in size and shall have cast bronze body, bronze tee head, stem with check, full round way opening and provisions for locking in a closed position.

7.3.10.2. BALL VALVES for use with copper services shall have an inlet connection with a flare nut fitting for type K copper tubing and an outlet connection with female iron pipe thread, FORD B-21 series or approved equal.

7.3.10.3. BALL VALVES for use with schedule 40 PVC pipe shall have inlet and outlet connections with female iron pipe threads. The latter shall

Construction Specifications and Standard Details

require the use of brass nipples and approved schedule 40 PVC adapter (female thread slip). Compression joints shall require insert stiffeners.

- 7.3.10.4. BALL VALVES used in conjunction with pitometer tap installations shall be cast bronze body with inlet and outlet opening with 1 ¼ inch female iron pipe thread. (Valve size 1 ¼ inch). The BALL VALVE shall be No. B11-455 with HP-4 handle as manufactured by Ford Meter Company, Inc., or approved equal.

7.3.11. VALVE BOXES

- 7.3.11.1. CONTRACTOR shall furnish, assemble and place a valve box for each buried valve.
- 7.3.11.2. Adjustable valve boxes with a cast iron base shall be used, each with an adjustable length center and top section with cover. The sections shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade.
- 7.3.11.3. The base shall be centered over the valve and shall be approximately on line with nut at top of the valve stem and the entire assembly shall be plumb.
- 7.3.11.4. The cover shall be marked “water” or “sewer” as appropriate.
- 7.3.11.5. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM Designation A48, Class 20 B, gray iron castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, or other harmful defects.
- 7.3.11.6. The valve boxes shall be coated with a single coat of coal tar pitch varnish before machining, so that machined seating surfaces shall be free from any coating. The seating surfaced of both the cover and the jacket shall be machined to fit so that the cover shall not rock after it has been seated in any position in its associated jacket.
- 7.3.11.7. CONTRACTOR shall mount the valve box in a concrete collar with bronze disc giving the nomenclature of the valve.

7.3.12. BACKFLOW PREVENTERS

- 7.3.12.1. All BACKFLOW PREVENTORS shall require initial testing within 30 days of line certification and meter set. This shall be the

Construction Specifications and Standard Details

responsibility of CONTRACTOR. A list of certified testers is available if needed. Anyone testing a backflow device that is not on this list shall forward proof of proper certification as well as proof of current test kit calibration to Regional Utilities prior to performing the test. A copy of the test results shall be forwarded to Regional Utilities within the time frame indicated above.

- 7.3.12.2. Reduced Pressure Zone (RPZ) BACKFLOW PREVENTORS shall consist of an automatic pressure differential relief valve located in the zone between two independently acting check valves.
 - 7.3.12.2.1. The RPZ assembly shall be complete, furnished with union connections including tight-closing ball valves before and after the device, and protected by a strainer.
 - 7.3.12.2.2. The complete RPZ assembly shall meet the requirements of ASSE Standard 1013, AWWA Standard C506 and U.S.C. Foundation for cross-connection control.
 - 7.3.12.2.3. The RPZ unit shall be a Wilkins or approved equal.
- 7.3.12.3. Double Detector Check (DDC) Assembly shall be installed on all potable water service connections with fire sprinkler systems.
 - 7.3.12.3.1. The DDC assembly shall be installed complete, furnished with flanged end OS&Y gate valves before and after the device.
 - 7.3.12.3.2. The bypass meter shall be a Sensus Remote Read Meter. The meter shall be purchased from Inlet Beach Water System.
 - 7.3.12.3.3. The complete DDC assembly shall meet the requirements of ASSE Standard 1048, AWWA Standard C510 and U.S.C. Foundation for cross-connection control.
- 7.3.12.4. All RPZ, Double Detector Check Assemblies, and Double Check BACKFLOW PREVENTORS are to be installed above final site grade with a minimum of 12" clearance and shall be insulated.
- 7.3.12.5. Insulation shall not cover the identifying information of the assembly. All identifying information must remain accessible: make, model, size, serial #.

7.3.13. **FIRE HYDRANTS**

- 7.3.13.1. The FIRE HYDRANTS shall be cast iron body, fully bronze mounted, for 150 psi working pressure, complying with AWWA C502-latest.
- 7.3.13.2. The FIRE HYDRANT inlet connection shall be mechanical joint type, with accessories for a six-inch pipe connection. The internal shutoff valve shall be five and a quarter inch diameter and the hose nozzles shall be bronze with American National Standard fire hose coupling screen threads.
- 7.3.13.3. The FIRE HYDRANT shall have two (2), two and half (2.5") inch hose nozzles and one (1) four (4.5") and half inch pumper nozzle.
- 7.3.13.4. The FIRE HYDRANT shall be American-Darling Model B-84-B or approved equal.
- 7.3.13.5. The FIRE HYDRANT shall be installed with an auxiliary six-inch gate valve conforming to the requirements of these specifications.
- 7.3.13.6. All FIRE HYDRANTS shall be restrained with the mechanical-joint type mega-lug joint restraints retainer glands referenced herein. In addition, all FIRE HYDRANTS shall be restrained through the hydrant valve to the main with no less than 2 Grade 304 stainless steel all-thread rods 3/4" diameter.
- 7.3.13.7. Thrust blocks shall be required as per Inlet Beach Water System's Standard Details.

7.3.14. **FLUSH HYDRANTS**

- 7.3.14.1. All FLUSH HYDRANTS shall be a 2" Slimline Flush Hydrant Model No. SP-GRUFH204K as manufactured by GIL Industries.
- 7.3.14.2. FLUSH HYDRANTS shall be installed below final site grade protected by a traffic rated meter box.
- 7.3.14.3. FLUSH HYDRANTS shall have a Cam & Groove Quick Connect w/ Dust Cap on the outlet for hose connection.

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- 7.3.14.4. FLUSH HYDRANTS shall be installed with an auxiliary two-inch ball valve conforming to the requirements of these specifications.
- 7.3.14.5. Thrust blocks shall be required as per Inlet Beach Water System's Standard Details.

SECTION 8
SEWER - GRAVITY



SECTION 8 – SEWER - GRAVITY

8.1. **SCOPE**

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

8.2. **GENERAL REQUIREMENTS**

- 8.2.1. All work shall be proved to be in first class working condition and constructed properly in accordance with the drawings and specifications.
- 8.2.2. All defects and leaks disclosed by the tests shall be remedied. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System. Water for testing shall be furnished by CONTRACTOR.
- 8.2.3. CONTRACTOR shall submit to ENGINEER for approval before work begins, certificates of inspection in triplicate from the pipe MANUFACTURER that the pipe and the fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 8.2.4. Excavation and backfill are specified in Section 3 of this specification, *Excavation and Backfill for Utilities*.
- 8.2.5. Avoid placing manholes and gravity sewer lines outside of paved areas.
- 8.2.6. Where feasible, allow for margin of error in design of sewers at minimum slopes and cover (i.e. 0.10 foot drop through manholes, or 0.42% slopes, or, a combination of both).
- 8.2.7. Gravity sewers with a right angle turn shall have no greater than a 0.5' inside drop. In other situations there shall be no greater than a 1.8' inside drop in incoming and outgoing sewer elevations unless a proper drop manhole assembly is used.
- 8.2.8. Gravity sewers shall have no less than a 90-degree angle between sewer runs unless specific prior approval is given and it is unavoidable.
- 8.2.9. All materials shall be free from defects impairing strength and durability and shall be the best of commercial quality for the purpose specified.

Construction Specifications and Standard Details

- 8.2.10. All materials have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- 8.2.11. All pipe and fittings shall be clearly marked with the name or trademark of the MANUFACTURER, the batch number, the location of the plant, and strength designation, etc. and the pipe shall be of a color approved by the utility company.
- 8.2.12. Each pipe joint shall be marked with the date of completion of lining and inspection in accordance with these specifications, and its numerical sequence of application on that date. A permanent marker of identifiable color shall be used.
- 8.2.13. All pipe and fittings delivered to the job site shall be accompanied by independent TESTING LABORATORY REPORTS certifying that the pipe and fittings conform to the above mentioned ASTM Specifications.
- 8.2.14. CONTRACTOR shall submit a NOTARIZED STATEMENT OF CERTIFICATION from the pipe MANUFACTURER as to conformance with the aforementioned ASTM Specifications and Modifications thereto, at the time of submitting shop drawing data on the pipe and fittings.

8.3. MATERIALS

8.3.1. POLYVINYL CHLORIDE (PVC)

- 8.3.1.1. Pipe shall be clean, virgin Polyvinyl Chloride (PVC) pipe for use in gravity sewer systems and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 8.3.1.2. All herein referenced standards shall be of the latest edition or revision.
- 8.3.1.3. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring for pipe sizes 2-3 inch and larger.
- 8.3.1.4. **PVC SDR 35**
 - 8.3.1.4.1. Polyvinyl Chloride sewer pipe for use in gravity sewer systems, shall conform to ASTM D3034-74 for PVC sewer pipe and fittings for sizes 4-inch through 12-inch in diameter, except as hereinafter modified.

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8.3.1.4.2. The pipe material shall meet or exceed the approved class 12 454-B, PVC compound conforming to ASTM D1784, latest.

8.3.1.4.3. The bell shall be extruded integral with the pipe barrel with a thickness equal to or greater than that of the barrel.

8.3.1.4.4. The laying length shall not exceed 14 foot (+/-1") without specific written approval from Inlet Beach Water System.

8.3.1.5. JOINTS

8.3.1.5.1. Joints for PVC pipe and fittings shall be in accordance with ASTM D3034.

8.3.1.6. ELASTOMERIC GASKET JOINT

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

8.3.1.7. FITTINGS

8.3.1.7.1. All fittings and accessories shall be manufactured in accordance with ASTM D3034, except that saddle TEE's or saddle WYE's shall not be permitted except by special written approval from ENGINEER and Inlet Beach Water System.

8.3.1.7.2. All fittings shall have a thickness equal to or greater than that specified in Section 7.34 of this specification and shall be of the bell and spigot configuration.

8.3.2. DUCTILE IRON

8.3.2.1. Ductile iron pipe sizes 3.0 inch through 54.0. inch diameter shall conform to ANSI Standard Specification A21.51 *Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids with the minimum rated working pressure.*

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- 8.3.2.2. Minimum pipe strength shall be Class 350.
- 8.3.2.3. The pipe shall have design values of 60,000-psi tensile strength, 42,000-psi yield strength, and 10% minimum elongation.
- 8.3.2.4. The wall thickness shall be in accordance with Table 51.2 and the corresponding class designation in Table 51.3 of the above referenced specification using wall thickness for laying condition “b” and thickness as required to the depth of cut, shown on the drawings.
- 8.3.2.5. In addition top the standard markings required by ANSI A21.51-76, the utility company may require each joint of pipe to be marked for the depth of cut it is used on the project, in which case, such markings shall be stenciled on the pipe exterior.

8.3.2.6. **JOINTS**

- 8.3.2.6.1. Joints for ductile iron pipe shall conform to ANSI Standard Specification A21.11-72, Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings, of the push-on type, unless otherwise specified or shown on the drawings.

8.3.2.7. **FITTINGS**

- 8.3.2.7.1. Fittings shall conform to ANSI Standard Specifications A21.10-71, American Standard for Cast Iron Fittings, 2.0 inch diameter through 48.0 inch diameter, for water and other liquid, Class 150, mechanical joint unless otherwise noted on the drawings.

8.3.2.8. **COATING**

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

8.3.2.9. **LINING**

- 8.3.2.9.1. The interior of all ductile iron pipe and fittings for sewer use shall be furnished with a factory applied lining. The lining material shall be Protecto 401 Ceramic Epoxy, unless otherwise directed by ENGINEER and approved by Inlet Beach Water System in writing.

- 8.3.2.9.2. The lining system shall be applied in accordance with the manufactures standard specifications and requirements.
- 8.3.2.9.3. The Lining the system shall cover the interior surface of the pipe, extending from the plain or beveled end, to the rear of the gasket socket. The surface shall be adequately prepared prior to lining.
- 8.3.2.9.4. The lining shall be allowed to cure at least 5 days after the final cast. However, the minimum time shall be increased if the drying temperature is below 65 degrees Fahrenheit.
- 8.3.2.9.5. The MANUFACTURER shall furnish notarized certificates of compliance stating that the lining conforms to all requirements of these specifications.

8.3.3. **TAPPING SADDLES**

- 8.3.3.1. TAPPING SADDLES shall conform to ANSI Standard Specifications A21.10-71, American Standard for Gray-Iron and Ductile Iron Fittings, 2.0 inch diameter through 48.0 inch diameter, for water and other liquids, Class 150, with a mechanical joint socket connection in accordance with ANSI A21.11 latest edition, Table 10.1.

8.3.4. **PRECAST CONCRETE MANHOLES**

- 8.3.4.1. MANHOLES shall meet the latest requirements of ASTM C478 *Specification for Precast Reinforced Concrete Manhole Sections*.
- 8.3.4.2. Minimum wall thickness shall be five inches.
- 8.3.4.3. Cement shall meet the latest requirements of ASTM C 150 *Specification for Portland Cement, TYPE II*.
- 8.3.4.4. Minimum concrete strength shall 4000 PSI at 28 days.
- 8.3.4.5. The required minimum strength of concrete shall be formed by making and testing four standard cylinders at seven (7) days and at (28) days.
- 8.3.4.6. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations.

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

8.3.4.8. Approval of ENGINEER and Inlet Beach Water System shall be obtained before placing any order for manholes.

8.3.4.9. **BASES**

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

8.3.4.9.2. The base section shall be set in a 2.0 inch leveling course of Class C concrete or 8-inch leveling course of granular material directly on the prepared sub grade as shown on the drawings.

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

8.3.4.10. **JOINTS**

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

8.3.4.11. **COATING**

8.3.4.11.1. The interior and exterior surfaces of each manhole shall be given two (2) coats of waterproofing paint approved by ENGINEER and Inlet Beach Water System.

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

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

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

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

8.3.4.11.6. Additional coating or touch up work shall be required after manhole installation if so directed by ENGINEER and/or Inlet Beach Water System.

8.3.4.12. **ADJUSTMENT MATERIALS**

8.3.4.13. BRICK: Sound, hard, and uniformly burned, regular and uniform in shape and size, of compact texture and meeting requirements in ASTM C32, latest Specification for Sewer and Manhole Brick (made from clay or shale), Grade MS or MM.

8.3.4.14. CEMENT: Portland, ASTM C150, latest Specification for Portland Cement, Type II.

8.3.4.15. SAND: Washed silica sand, ASTM C144, latest Specification for Masonry Mortar.

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

8.3.5.1. Shall be U.S. Foundry E 170 or approved equivalent.

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

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

8.3.5.4. Frames and Covers shall be thoroughly cleaned and subjected to a careful hammer inspection.

8.3.5.5. Castings shall meet the requirements of ASTM A48, latest Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12, Ductile Iron Castings. In either Case, manhole frame and cover

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shall be designed to withstand an HS20-44 loading defined in the AASHTO Specifications.

- 8.3.5.6. Before being shipped from the foundry, castings shall be given one (1) coat of coal-tar pitch varnish applied in a satisfactory manner so as to make a smooth coating, tough, tenacious and not brittle or with any tendency to scale off.
- 8.3.5.7. Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be rejected.

8.4. INSTALLATION

8.4.1. GENERAL REQUIREMENTS

- 8.4.1.1. The method of pipe laying shall be subject to the approval of ENGINEER and Inlet Beach Water System.
- 8.4.1.2. Each pipe length shall be inspected and tested before being laid to ensure that it is sound and of good quality.
- 8.4.1.3. The pipe laying shall proceed upgrade, beginning at the lower end of the sewer, with the pipe bell ends facing upgrade.
- 8.4.1.4. Upon identification of any defective pipe which may have been installed, CONTRACTOR shall immediate act to remove and replace the damaged or defective material with sound pipe.
- 8.4.1.5. Extreme care shall be taken to keep the pipe in exact alignment and elevation.
- 8.4.1.6. Pipe shall be laid to conform accurately to the lines and grades indicated on the drawings.
- 8.4.1.7. CONTRACTOR assumes complete responsibility for locating all underground utilities in advance of construction, to ensure that no conflicts occur with the proposed line and grade.
- 8.4.1.8. Minor changes in alignment, but not the grade, shall be permitted to avoid unforeseen underground facilities only if approved by

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ENGINEER and Inlet Beach Water System, provided that straight alignment can be maintained between manholes.

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

8.4.2. SURVEYS AND GRADE STAKES

- 8.4.2.1. Contractor is responsible for providing, protecting and the accuracy of all survey and grade stakes.

8.4.3. LAYING AND JOINTING

- 8.4.3.1. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
- 8.4.3.2. The bedding shall be shaped to conform to the outside of the pipe.
- 8.4.3.3. Suitable excavation shall be made to receive, where applicable, the bell of each pipe, which shall be carefully laid true to line and grade.
- 8.4.3.4. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging or blocking up any portion of the pipe.
- 8.4.3.5. The spigot end of each pipe shall not abut against the base of unevenness of any kind along the bottom halves of the pipe.
- 8.4.3.6. Prior to jointing the pipes, the mating ends shall be thoroughly cleaned of any debris, dirt, or foreign material.
- 8.4.3.7. The pipe shall be adjoined in accordance with the recommendations from the MANUFACTURERS of the pipe and gaskets.
- 8.4.3.8. In all jointing operations the trench must be dewatered when joints are made, unless otherwise approved in writing by ENGINEER, and kept dewatered until sufficient time has elapsed to assure efficient hardening of the jointing material, or as may be required.
- 8.4.3.9. CONTRACTOR shall make all necessary precautions to prevent floatation of the pipe due to flooding in the trench.

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8.4.3.10. The pipe shall not be driven down to grade by striking it with the end of shovel, handle, timber, rammer, or other unyielding object.

8.4.3.11. Openings such as stubs, tees or other services along the lines shall be securely closed by means of an approved gasketed leak proof STOPPER that fits into the bell of the pipe and is recommended by the pipe MANUFACTURER.

8.4.3.11.1. This STOPPER shall be jointed in such a manner that it may be removed at some future time without injury to the pipe itself.

8.4.3.12. At the close of each day's work, and at other times when pipe is not being laid, the end of the pipe shall be temporarily closed with a close-fitting STOPPER approved by ENGINEER and Inlet Beach Water System.

8.4.4. SERVICE CONNECTIONS

8.4.4.1. All gravity sewer services shall be 6" diameter single services unless otherwise approved by Inlet Beach Water System.

8.4.4.2. Although the general location of connections may be shown on the drawings, CONTRACTOR, subject to approval by ENGINEER and Inlet Beach Water System, shall determine the actual location.

8.4.4.3. Each service connection shall be accurately recorded by stationing on the as-built drawings and shall be furnished by ENGINEER and Inlet Beach Water System.

8.4.4.4. Unless authorized by ENGINEER in writing, or shown on the drawings, service connections shall not be tied into new or existing manholes.

8.4.4.5. All service connections shall be terminated at the property lines unless indicated otherwise on the drawings or directed otherwise by ENGINEER or Inlet Beach Water System.

8.4.5. MARKING SERVICE LINES

8.4.5.1. An "S" shall be cut into the curb directly over each service line or in the street or sidewalk where no curb is available.

8.4.5.2. In the event neither curb nor sidewalk is available, CONTRACTOR shall place a 4" x 4" hardwood stake on the property line directly over the service line.

8.4.5.3. The hardwood stake shall be topped with a brass marker labeled "sewer".

8.4.5.4. CONTRACTOR shall be responsible for installing a four-inch ball marker, part number 1404, as manufactured by 3m. The service ball shall be placed directly above the service and no more than 48 inches deep.

8.4.6. **MANHOLE INSTALLATION**

8.4.6.1. **INSTALLING SECTIONS**

8.4.6.1.1. Precast concrete sections shall be set so the manhole shall be vertical and with sections in true alignment.

8.4.6.1.2. Joint surfaces of the base or previously set section shall have an o-ring installed in the recess or shall be sealed with approved premolded plastic joint sealer. Joints shall be pre-primed.

8.4.6.2. **NON-SHRINKING MORTAR**

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

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

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

latest, to the finished mortar surface both inside and outside the manhole.

8.4.6.3. **GRADE ADJUSTMENT**

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

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

8.4.6.4. **SETTING MANHOLE FRAMES**

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

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

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

8.4.6.5. **FLOW CHANNELS IN MANHOLE BASE**

8.4.6.5.1. Shall be conformed of Class C concrete and/or brick rubble and mortar while the manholes are under construction.

8.4.6.5.2. Cut off pipes at inside face of the manholes and construct the invert to the shape and sizes of the pipe indicated. All inverts shall follow the grades of the pipe entering the manhole.

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8.4.6.5.3. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest radius possible, which is tangent to the centerline of adjoining pipelines.

8.4.6.6. DROP INLETS

8.4.6.6.1. Where shown on the drawings, drop inlets to the manholes shall be constructed as shown on the drawings and specified herein.

8.4.6.7. CONCRETE MANHOLE BOOTS

8.4.6.7.1. Precast concrete manholes shall have leak-proof boots installed where pipes enter or exit.

8.4.6.7.2. The boots shall be watertight and shall allow for a limited amount of differential settlement.

8.4.6.7.3. All boot bands, bolts, etc. shall be stainless steel.

8.4.7. STOPPERS

8.4.7.1. If the service connection is not completed at the time of construction, the opening at the property line shall be securely closed with an approved stopper that fits into the bell end of the pipe and is approved by the pipe MANUFACTURER.

8.4.8. STUB-OUTS

8.4.8.1. Where shown on the drawings, stub-outs shall be provided for the connection of future sewer lines to manholes.

8.4.8.2. The end of each stub-out shall be provided with a bell and which shall be closed by an approved stopper as specified herein before.

8.4.8.3. Each stub-out shall be accurately referenced to the center of the manhole, and the actual invert elevation of each end of the stub-out shall be accurately recorded on the as-built drawings.

8.4.9. **BEDDING AND BACKFILL**

- 8.4.9.1. Where so indicated on the drawings, or directed by ENGINEER or Inlet Beach Water System, the pipe shall be supported by compacted granular fill or concrete cradle or encasing according to the applicable detail included as part of Inlet Beach Water System STANDARD CONSTRUCTION DETAILS.
- 8.4.9.2. Pipe bedded in compacted granular fill shall not be supported on blocking, wedges, bricks, or anything except the bedding material. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or precast concrete saddles which shall become part of the completed cradle or encasement.
- 8.4.9.3. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
- 8.4.9.4. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury or movement.

8.5. **CLEANING AND FLUSHING**

- 8.5.1. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing materials into the pipelines.
- 8.5.2. As the work progresses, the interior of the sewer shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
- 8.5.3. CONTRACTOR shall flush all sewer lines constructed with clean water prior to a final inspection to assure complete removal of all debris and foreign material, and to the satisfaction of ENGINEER and Inlet Beach Water System.
- 8.5.4. A visual inspection and approval by Inlet Beach Water System shall be required.

8.6. **FIELD TESTING**

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

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- 8.6.2. All tests shall be made by CONTRACTOR who shall provide any necessary equipment for testing and televising the system as directed by Inlet Beach Water System.
- 8.6.3. All costs for testing defined within, but not limited to, this section shall be the responsibility of CONTRACTOR.
- 8.6.4. Television inspections shall be observed first hand by ENGINEER. Upon completion, each section of sewer lines shall show a straight run, free of structural defects and joint misalignment between manholes.
- 8.6.5. **LEAKAGE TEST**
- 8.6.5.1. Leakage testing may be by appropriate water or low pressure air testing.
- 8.6.5.2. When water testing is used, the range of groundwater elevations shall be considered.
- 8.6.5.3. Testing shall be made as soon as possible after construction of sufficient lines to warrant a test.
- 8.6.6. **INFILTRATION TEST**
- 8.6.6.1. This method may be used when ground water elevation provides at least 2 feet of positive head outside of the sewer line.
- 8.6.6.2. Infiltration amounts may be measured by accumulated water in the lower end manhole or lift station in the system or by installation of a V-notch sharp crested weir in a wood frame rightly secured at the low end of each sewer lateral or at locations on the main sewers as directed by FLS.
- 8.6.6.3. Maximum allowable leakage at any time shall be 200 gallons per mile per inch pipe diameter per 24 hours.
- 8.6.6.4. Any leakage in excess of that specified above shall be repaired at CONTRACTOR's expense by any means necessary and approved by Inlet Beach Water System.

8.6.7. **EXFILTRATION TEST**

- 8.6.7.1. This method may be used when groundwater elevation is low enough that filling the sewer system can provide a minimum of 2 feet of positive head within the sewer system.
- 8.6.7.2. Exfiltration amounts may be measured by the water surface drop observed in manhole(s).
- 8.6.7.3. Maximum allowable leakage at any time shall be 200 gallons per mile per inch pipe diameter per 24 hours.
- 8.6.7.4. Any leakage in excess of that specified above shall be repaired at CONTRACTOR'S expense by any means necessary and approved by Inlet Beach Water System.

8.6.8. **AIR TEST**

- 8.6.8.1. Air testing shall comply with ASTM C-828 for clay pipe, ASTM C-924 for concrete pipe, and ASTM F-1417 for plastic pipe.

8.6.9. **MANHOLE TESTING**

- 8.6.9.1. Manholes shall be inspected for water tightness prior to placing into service.
- 8.6.9.2. Inlet Beach Water System may require air testing where water tightness is questionable.
- 8.6.9.3. Air testing shall be per ASTM C-1244.

8.6.10. **DEFLECTION TEST**

- 8.6.10.1. All PVC pipe shall be inspected for deflection.
- 8.6.10.2. Maximum allowable deflection shall be equal to 5%, or manufactures recommendations, whichever is less.
- 8.6.10.3. Inlet Beach Water System may require verification of compliance with this deflection test by requiring a madrel at 95% of pipe inside diameter be pulled through the installed pipeline.

8.7. **WARRANTY**

- 8.7.1. The pipe MANUFACTURER of materials furnished on the project shall supply to Inlet Beach Water System in an approved format a ten (10) year unconditional warranty.
- 8.7.2. The warranty shall be limited to the pipe material which shall constitute complete replacement and delivery to site of materials only to replace defective pipe and fittings with new material conforming to the specifications as stated.
- 8.7.3. This warranty is contingent upon determination of pipe failure by a private independent testing laboratory.
 - 8.7.3.1. The testing shall prove that the failure was caused by failure of the pipe material.
 - 8.7.3.2. The testing laboratory shall be selected by and agreed upon by both parties involved.

8.8. **AS-BUILT SEWER PLANS**

- 8.8.1. CONTRACTOR shall provide as built plans to Inlet Beach Water System in accordance with Section 2.0 of this specification and contain, at a minimum, the following items:
 - 8.8.1.1. Lateral locations of manholes referenced to property lines. Location in two opposing direction at street intersections.
 - 8.8.1.2. Manholes shall be stationed in opposite direction of flow.
 - 8.8.1.3. Size and type of sewer line between manholes.
 - 8.8.1.4. Location and size of all house service connections (stationed from manhole in opposite direction of flow of lateral).
 - 8.8.1.5. The “S” inscribed in the curb to be directly perpendicular to service.
 - 8.8.1.6. Detail drawings of all structures, connections, etc., included in the project.
 - 8.8.1.7. Manhole inverts and top elevations.

Construction Specifications and Standard Details

8.8.1.8. Drawings shall show FFE (Finished Floor Elevation) on all proposed lots.

8.8.1.9. Special detail drawings covering installation to meet field conditions.

8.8.1.10. **PUMP STATIONS**

8.8.1.10.1. Depth and Diameter of Wet Well(s)

8.8.1.10.2. Invert elevations of all lines entering or leaving the wet well.

8.8.1.10.3. **PUMP DATA**

8.8.1.10.3.1. MANUFACTURER
and Model

8.8.1.10.3.2. Pump capacity in GPM

8.8.1.10.3.3. TDH in feet

8.8.1.10.3.4. Impeller size in inches

8.8.1.10.3.5. Pump curve chart

8.8.1.10.4. **MOTOR DATA**

8.8.1.10.4.1. MANUFACTURER
and Model

8.8.1.10.4.2. RPM

8.8.1.10.4.3. Horsepower

8.8.1.10.4.4. Voltage

8.8.1.11. Force mains located at all bends, turns and/or angles.

8.8.1.12. Reference of elevation datum

SECTION 9

SEWER - FORCE MAINS & APPURTENANCES



SECTION 9 – SEWER - FORCEMAINS AND APPURTENANCES

9.1. **SCOPE**

- 9.1.1. This section contains standard specifications for use in the design and construction of SEWAGE FORCEMAINS AND APPURTENANCES as required by Inlet Beach Water System.
- 9.1.2. CONTRACTOR shall furnish and install sewage force main piping system, valves and vents complete, tested and ready for operation.

9.2. **GENERAL REQUIREMENTS:**

- 9.2.1. All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and the specifications.
- 9.2.2. CONTRACTOR shall submit to ENGINEER and Inlet Beach Water System for approval before work begins, certificates of inspections in triplicate from the pipe MANUFACTURER that the pipe and fittings supplied have been inspected at the plant and meet the requirements of these specifications.
- 9.2.3. All pipe and fittings shall be clearly marked with the name of the MANUFACTURER, the batch number, the location of the plant, strength designation and pressure rating.
- 9.2.4. It shall be the responsibility of CONTRACTOR to keep extra fittings on hand to make vertical and/or horizontal adjustments as a result of unknown interferences to avoid unnecessary delays to the project.
- 9.2.5. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System.
- 9.2.6. Water for testing shall be furnished by CONTRACTOR.
- 9.2.7. See Section 3 and 4 of this specification for “*Excavation and Backfill*” and “*Dewatering.*”
- 9.2.8. All herein referenced standards shall be the latest edition or revision.
- 9.2.9. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.

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- 9.2.10. All valves shall be manufactured by American Flow Control.
- 9.2.11. All materials shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- 9.2.12. Unless otherwise indicated on the drawings, pipe materials for force main shall be as follows:
 - 9.2.12.1. PVC Class 200, SDR 21 or SDR 26 for pipes 2” & 3” in diameter.
 - 9.2.12.2. PVC Class 160 for pipes 4” in diameter and larger
 - 9.2.12.3. Ductile iron fittings shall be used for PVC pipe 3 inches and larger.
- 9.2.13. The entire product of any MANUFACTURER or of any one plant may be rejected when, in the opinion of ENGINEER or Inlet Beach Water System, the methods of MANUFACTURER fail to secure uniform results acceptable to the requirements of these specifications
- 9.2.14. All pipe and fittings shall be subject to the inspection at time of delivery and also in the field just prior to installation.
- 9.2.15. All pipe and fittings which in the opinion of ENGINEER or Inlet Beach Water System do not conform to these specifications shall be rejected and shall be removed by CONTRACTOR.

9.3. **MATERIALS**

9.3.1. **POLYVINYL CHLORIDE (PVC)**

- 9.3.1.1. Pipe shall be virgin Polyvinyl Chloride (PVC) pipe for and shall have a bell type coupling with a thickened wall section integral with the pipe barrel.
- 9.3.1.2. The pipe material shall be clean, virgin, NSF approved class 12454-0A or 12454-B PVC compound conforming to ASTM resin specification D-1784.
- 9.3.1.3. The pipe shall be tested at levels meeting the requirements of the U.S. department of commerce public standard 22-70, and shall conform to the physical standards and specifications of the plastic pipe institute.

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9.3.1.4. Pipe shall be green in color.

9.3.1.5. **PVC CLASS 160 / SDR 26**

9.3.1.5.1. For pipe less than 12-inches in diameter.

9.3.1.5.2. The pipe shall be designed for a hydrostatic working pressure of 160 psi at 73.4 degrees Fahrenheit and to pass without failure sustained pressure of 340-psi minimum when tested in accordance with ASTM D-1598 and for a quick burst test of 500-psi minimum when tested in accordance with ASTM D-159a.

9.3.1.5.3. Pipe shall conform to ASTM D-2241-latest, for use in sizes 4 inches up to and including 12 inches in diameter.

9.3.1.5.4. The pipe shall be “bell ring” as manufactured by Ethyl Corporation, “ring tite” as manufactured by Johns-Manville, or approved equal.

9.3.1.5.5. Pipe shall be manufactured in I.P.S. (steel) standard pipe equivalent outside diameters.

6.1.1.1. **PVC C905 / DR25**

6.1.1.1.1. For pipe over 12-inches and greater in diameter, pipe shall conform to AWWA Standard C-905.

6.1.1.1.2. Pipe is to be cast iron pipe (D.I.P.S.) equivalent outside diameters.

6.1.1.1.3. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and for a quick burst test of 755 psi in conformance with ASTM D1599.

6.1.1.1.4. In any case of conflict with standards specified herein, the requirements of AWWA Standard C900 shall prevail.

9.3.2. **HIGH DENSITY POLYETHYLENE PIPE (HDPE)**

9.3.2.1. Pipe shall be DR11 or better.

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- 9.3.2.2. HDPE pipe for water system use shall conform to AWWA C-901 (up to 3”) and AWWA C-906 (4” and larger).
 - 9.3.2.3. HDPE pipe for force main system use shall be PE 3608 meeting cell classification PE445574C per ASTM D3035 and NSF 14.
 - 9.3.2.4. Pipe shall be manufactured in accordance with ASTM F714 and shall be so marked.
 - 9.3.2.5. All pipe joints shall be heat fused in accordance with the recommended procedures of the pipe MANUFACTURER.
 - 9.3.2.6. Transitions to other types of pipe shall be by fused end transitions.
 - 9.3.2.7. Mechanical joint transitions with HDPE pipe stiffeners shall not be allowed.
 - 9.3.2.8. All pipe shall be as manufactured by Plexco or approved equal.
- 9.3.3. **DUCTILE IRON, CLASS 350**
- 9.3.3.1. Pipe shall be ductile iron manufactured in accordance with the requirements of ANSI.
 - 9.3.3.2. Pipe shall be Protecto 401 ceramic epoxy coated inside and out.
 - 9.3.3.3. Push-on joints and mechanical joints for such pipes shall be in accordance with ANSI/AWWA C111/A21.11.
 - 9.3.3.4. Pipe shall be Griffin or equal Class 350.
 - 9.3.3.5. Fittings shall be ductile iron and in accordance with the requirements of ANSI/AWWA C153/A21.53, and ANSI/AWWA C110/A21.10.
 - 9.3.3.6. Pipe fittings shall have seal coating, where applicable, in accordance with ANSI/AWWA C104/A21.4.
 - 9.3.3.7. Mechanical joints shall conform to ANSI/AWWA C111/A21.11. Fittings shall be Griffin or equal.

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9.3.4. **FITTINGS**

- 9.3.4.1. Ductile iron fittings and special castings, shall conform to the type for pipe being installed and have a minimum working pressure of 350 psi.
- 9.3.4.2. Fittings shall conform to ANSI specification A21.10 (AWWA C110) latest.
- 9.3.4.3. Short body pattern fittings shall normally be installed.
- 9.3.4.4. Long body fittings shall be used where the drawings specifically call for long body fittings, or at the option of CONTRACTOR when the laying length is not controlled by short body patterns.
- 9.3.4.5. Fittings shall be mechanical joint fittings unless otherwise specified or indicated on the drawings.
- 9.3.4.6. Restraint type mechanical joint retainer glands shall be used on all mechanical joints. These shall be mega-lug restraints or approved equal.

9.3.5. **JOINTS**

- 9.3.5.1. PVC pipe joints shall be the manufacture's standard push-on bell type with rubber sealing ring installed in strict accordance with the pipe manufacture's recommendations.
- 9.3.5.2. Sealing rings shall be in conformance with ASTM F477.

9.3.6. **LININGS AND COATINGS**

- 9.3.6.1. All ductile iron pipe, fittings and specials for sewer use shall have an exterior coating of and shall be lined with Protecto 401 Ceramic Epoxy or equal.
- 9.3.6.2. All bolts, nuts, studs and other uncoated parts of joints for underground installation shall be coated with asphalt or coal tar prior to backfilling.
- 9.3.6.3. Pipes crossing ditches, culverts, rivers, creeks, etc., shall be considered as buried pipe.

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9.3.7. **TRACER WIRE**

- 9.3.7.1. Green insulated No. 12 copper wire shall be installed above all force main pipe work.
- 9.3.7.2. Attach copper wire to all metal fittings with good electrical connection.
- 9.3.7.3. Leave enough copper wire in valve boxes to reach 2 feet above final grade.

9.3.8. **LABORATORY OR PLANT TESTS**

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

<u>ITEM</u>	<u>SPECIFICATIONS</u>	<u>NUMBER OF TEST</u>
DUCTILE IRON PIPE AND FITTINGS	ANSI A21.50 (AWWA C150) ANSI A21.51 (AWWA C151) ANSI A21.10 (AWWA C110)	Sworn Statement
POLYVINYL CHLORIDE PIPE	ASTM D-1598 ASTM D-1599 ASTM D-1784 ASTM D-2122 ASTM D-2241 ASTM D-2837 PS-22-70	Sworn Statement

9.4. **INSTALLATION**

9.4.1. **GENERAL REQUIREMENTS**

- 9.4.1.1. Force mains shall be constructed of the materials specified and as shown on the drawings.
- 9.4.1.2. Pipe shall be laid with spigot ends pointing in the direction of flow.
- 9.4.1.3. 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.

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- 9.4.1.4. Any pipe which has its grade or joint disturbed after lying shall be taken up and relayed.
 - 9.4.1.5. No pipe shall be laid when the trench conditions or weather is unsuitable for such work, except by permission by Inlet Beach Water System.
 - 9.4.1.6. Pipe fittings shall be carefully handled to avoid damage, and if feasible while they are suspended over the trench before lowering they shall be inspected to detect defects and cracks.
 - 9.4.1.7. Defective, damaged, or unsound pipe or fittings shall be rejected. Any section of pipe already laid, which is found to be defective or damaged, shall be replaced.
- 9.4.2. **SURVEYS AND GRADE STAKES:**
- 9.4.2.1. CONTRACTOR shall be responsible for setting grade stakes, lines, and levels.
 - 9.4.2.2. CONTRACTOR or Contractor's surveyor shall provide centerline of construction and shall establish a benchmark.
 - 9.4.2.3. Any reference points, points of intersections, property corners, or bench marks, which are disturbed during construction, shall be restored by a land surveyor registered to practice in the State of Florida, and all cost thereof shall be borne of CONTRACTOR.
 - 9.4.2.4. CONTRACTOR shall assume all responsibility for the correctness of the grade and alignment stakes.
- 9.4.3. **PIPE BEDDING & BACKFILL**
- 9.4.3.1. Where so indicated on the drawings, or directed by ENGINEER or Inlet Beach Water System, the pipe shall be supported by compacted granular fill or concrete cradle or encasing according to the applicable detail included as part of Inlet Beach Water System STANDARD CONSTRUCTION DETAILS.
 - 9.4.3.2. Pipe bedded in compacted granular fill shall not be supported on blocking, wedges, bricks, or anything except the bedding material. Where concrete cradle or encasement is required, the pipe shall be

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supported on solid concrete blocks or precast concrete saddles which shall become part of the completed cradle or encasement.

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

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

9.4.4. **PIPE COVER**

9.4.4.1. The minimum cover over all piping shall not be less than 36 inches except where specifically shown on the construction drawings and approved by Inlet Beach Water System.

9.4.4.2. The maximum cover over all piping shall not be greater than 48 inches except where specifically shown on the construction drawings and approved by Inlet Beach Water System.

9.4.5. **THRUST BLOCKING**

9.4.5.1. Suitable concrete reaction or THRUST BLOCKING shall be applied on all pressure pipe lines (except for those having screwed or flanged joints) at all tees, plugs, caps, and at bends deflecting 22-1/2 degrees or more.

9.4.5.2. Concrete used for THRUST BLOCKS shall be 2,500-psi minimum.

9.4.5.3. Schedule and details for required thrust blocks are included on Inlet Beach Water System standard details and shall be required as part of the approved drawings.

9.4.5.4. All mechanical joint fittings shall have restraint type mechanical joint retainer glands.

9.4.6. **TAPS**

9.4.6.1. Tapped connections in the barrel of the pipe shall not exceed 1.0 inch in diameter.

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9.4.6.1.1. Where the size of the connection exceeds the given above for the pipe in question, a solid mechanical tapping sleeve or saddle shall be provided on the pipe barrel.

9.4.6.2. Where taps are made on cast iron fittings, the tap shall be made in the flat part of the intersection of the run and branch of the tee or cross, or by way of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping valve and shall be approved by ENGINEER and Inlet Beach Water System.

9.4.6.2.1. Allowable size of taps in fittings shall be in accordance with DIPRA Standards.

9.4.6.2.2. All drilling and tapping of cast iron fittings shall be completed in accordance with DIPRA standards.

9.4.6.2.3. Drilling and tapping shall be done by skilled mechanics.

9.4.6.2.4. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch and taper.

9.4.7. FORCEMAIN CONNECTION TO EXISTING MANHOLE

9.4.7.1. Where a new force main is connected into an existing manhole, the manhole shall be properly prepared to receive the new force main and repaired and restored to its original condition, as shown on the drawings, using brick masonry to provide watertight joints with the new pipes.

9.4.7.2. Manhole inverts shall be reshaped as required by the new connection to provide a smooth flowing channel of the exact shape of the sewer to which it connects.

9.5. CLEANING AND FLUSHING

9.5.1. After passing the final inspection all force mains shall be flushed out.

9.5.2. At the time of flushing the line CONTRACTOR shall responsible for having a flush point opened and shall be responsible for where the water is to be dispersed.

9.6. **FIELD TESTING**

- 9.6.1. All piping to be operated under liquid pressure shall be tested in sections of approved length.
- 9.6.2. All field tests shall be made in the presence of ENGINEER and Inlet Beach Water System.
- 9.6.3. Pipelines laid in excavations other than trench excavations or pipelines embedded in concrete, shall be tested prior to backfilling of the excavated material or placing of the concrete.
- 9.6.4. Hydrostatic testing shall consist of pressure tests.
 - 9.6.4.1. Pressure Test -2 hour duration at 120 psi.
 - 9.6.4.2. Leakage Test – 2-hour duration at 120 psi.
- 9.6.5. For these tests CONTRACTOR shall furnish clean water, suitable temporary testing plugs and other necessary equipment and all labor required.
 - 9.6.5.1. In no case shall CONTRACTOR connect the force main to any water main to obtain water for testing.
 - 9.6.5.2. Water may be obtained via a jumper meter with a RPZ and there shall be an AIR GAP between the two mains.
 - 9.6.5.3. Water must be re-pumped from a holding tank into the force main so as to eliminate any cross-connection or potential backflow.
- 9.6.6. Pressure tests shall be of 2-hour duration and leakage test shall be of 2-hour duration, unless specified otherwise or notified in writing by Inlet Beach Water System.
- 9.6.7. Pressure tests shall be conducted with a pressure loss of not more than 2 psi regardless of length of pipe being tested.
- 9.6.8. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If hydrants, blow offs, or other outlets are not available at high points for releasing air, CONTRACTOR shall make the temporary taps at such points and shall plug said holes after completion of tests.

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- 9.6.9. Specified test pressures shall be applied by means of a pump connected to the pipe in a manner satisfactory to Inlet Beach Water System.
- 9.6.10. The pump, pipe connection, and all necessary apparatus, including the proper gauges, shall be furnished by CONTRACTOR and shall be subject to the approval of ENGINEER and Inlet Beach Water System.
- 9.6.11. Pressure gauges shall be calibrated by an approved testing laboratory, with increments no greater than 2 psi.
- 9.6.12. Gauges used shall be of such size that pressures tested shall not register less than 10% nor more than 90% of the gauge capacity.
- 9.6.13. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be performed until it is satisfactory.
- 9.6.14. Test pressures shall be based on the elevation of the highest point of the line or section under test or corrected to the elevation of the test gauge.
- 9.6.15. Leakage tests shall be conducted subsequent to the pressure tests.
- 9.6.16. Leakage is defined as the quantity of water that must be supplied to the line or section under test to maintain constant pressure throughout the duration of the test.
- 9.6.17. No pipe installation shall be accepted if the leakage is greater than determined by the following formula from ANSI/AWWA C-600-latest:

$$L = \frac{SD(P)^{1/2}}{133200}$$

L = Allowable leakage in gallons per hour

S = Length of pipeline tested in feet

D = Nominal diameter of the pipe in inches

P = Average pressure during the leakage test in pounds per square inch gauge.

- 9.6.18. If any test discloses leakage greater than that specified above, CONTRACTOR shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

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

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

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

9.7. WARRANTY

9.7.1. The pipe MANUFACTURER of materials furnished on the project shall supply to Inlet Beach Water System in an approved format a ten (10) year unconditional warranty.

9.7.2. The warranty shall be limited to the pipe material which shall constitute complete replacement and delivery to site of materials only to replace defective pipe and fittings with new material conforming to the specifications as stated.

9.7.3. This warranty is contingent upon determination of pipe failure by a private independent testing laboratory.

9.7.3.1. The testing shall prove that the failure was caused by failure of the pipe material.

9.7.3.2. The testing laboratory shall be selected by and agreed upon by both parties involved.

SECTION 10

SEWER - NONCLOG PUMP STATIONS

SECTION 10 – SEWER – NON CLOG PUMP STATIONS

10.1. **SCOPE**

10.1.1. This section contains standard specifications for use in the design and construction of SUBMERSIBLE SEWAGE NON-CLOG PUMP STATIONS as required by Inlet Beach Water System.

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

10.2. **GENERAL REQUIREMENTS:**

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

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

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

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

10.2.5. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System.

10.2.6. All SUBMERSIBLE PUMPS shall be manufactured by Wilo EMU or equal.

10.2.7. In order to insure proper performance and compatibility of interacting components within these specifications; all submersible pumps, control panels, access frames, guide rails, and lifting systems shall be the product of

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one MANUFACTURER or furnished by the SUBMERSIBLE NON-CLOG PUMP MANUFACTURER for sole source responsibility.

- 10.2.8. Water for testing shall be furnished by CONTRACTOR.
- 10.2.9. See Section 3.0 and 4.0 of this specification for “*Excavation and Backfill Procedures*” and “*Dewatering Procedures.*”
- 10.2.10. All herein referenced standards shall be the latest edition or revision.

10.2.10.1. LEVEL SWITCH SETTINGS

- 10.2.10.1.1. The FIRST LEVEL SWITCH (lowest) stops the lead pump and the lag pump if it is energized, when the level drops below this point, and triggers the alternator.
- 10.2.10.1.2. The SECOND LEVEL SWITCH (lead) starts one pump as the liquid rises to close this circuit. Which pump starts at this level is determined by the lead pump selector switch or the alternator.
- 10.2.10.1.3. The THIRD LEVEL SWITCH (lag) causes both pumps to run as the liquid level rises to this point.
- 10.2.10.1.4. The FOURTH LEVEL SWITCH (highest) illuminates the alarm indicator.

10.3. MATERIALS

10.3.1. WET WELL

- 10.3.1.1. All NON-CLOG PUMP STATIONS located in a public and/or FDOT Right-of-Way must be designed and constructed of reinforced concrete as per detail drawing LS-1.
- 10.3.1.2. Regional Utilities requires that all lift stations are constructed as per these specifications and detail drawing LS-1.

10.3.2. SUBMERSIBLE NON-CLOG PUMP

- 10.3.2.1. All SUBMERSIBLE NON-CLOG PUMPS shall be *Wilco EMU Model FA Pumps or equal.*

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- 10.3.2.2. The NON-CLOG PUMPS shall be designed and constructed to pump sewage, storm water, sludge, and other water based liquids without injurious damage during operation.
- 10.3.2.3. The NON-CLOG PUMPS shall be capable of passing 3-inch diameter solid non-deformable without clogging.
- 10.3.2.4. The NON-CLOG PUMPS shall be designed for continuous operation under submerged conditions without leakage to a depth of up to 65 feet.
- 10.3.2.5. 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.
- 10.3.2.6. The volute shall be of centerline discharge design and shall be fitted with ANSI 125 pound compatible discharge flange which shall be capable of withstanding 150% of the pump shutoff head in accordance with the Hydraulic Institute Standards.
- 10.3.2.7. The interfaces between the major castings shall be machined for metal contact and shall be additionally protected with circular cross section Buna-N o-rings.
- 10.3.2.8. All the nuts, bolts, washers and other fastening devices shall be constructed of type 316 stainless steel.
- 10.3.2.9. All exposed surfaces of the castings shall be coated with a single coat of PVC type varnish that is resistant to sewage.
- 10.3.2.10. 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.
- 10.3.2.11. The NON-CLOG PUMP impeller shall be constructed of ASTM A339 ductile cast iron.
- 10.3.2.12. 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.
- 10.3.2.13. Pump-out vanes shall be located on the backside of the NON-CLOG PUMP impeller to help reduce pressure on the lower mechanical seal.

10.3.3. **MOTOR**

- 10.3.3.1. The motor shall be designed with a service factor of 1.25 over and above the nameplate horsepower as standard.
- 10.3.3.2. 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.

10.3.4. **PUMP GUIDE RAIL**

- 10.3.4.1. Furnish a minimum of one (1) GUIDE RAIL for each pump to permit raising and lowering.
- 10.3.4.2. The GUIDE RAIL shall be constructed to type 304 stainless steel that shall reach from the top of the discharge elbow to the upper guide rail holder on the access frame or on the vertical face of the concrete opening.
- 10.3.4.3. The single GUIDE RAIL system shall utilize a T-bar type structural shape.

10.3.5. **PUMP POWER & CONTROL CABLES**

- 10.3.5.1. The power supply shall be: 120/208/240 volt, 3 phase, 4 wire, 60 hertz for pumps up to 25 hp.
- 10.3.5.2. The power supply shall be 277/480 volt, 3 phase, wye, 60 hertz for pumps over 25 hp with VFD or soft start.
- 10.3.5.3. The power and control cables shall enter the motor housing through an isolated chamber that is completely isolated from the oil filled stator chamber.
- 10.3.5.4. The Hypalon power and control cable jackets shall be sealed via a compressible Buna-N grommet flanked by washers forming the first isolation point of the assembly.
- 10.3.5.5. The cables shall be terminated on the individually o-ringed brass terminal lugs of the terminal board thereby sealing the cable entry chamber completely from the stator housing to the extent that any and

all moisture that happens to find its way into the cable entry chamber is trapped there.

- 10.3.5.6. The terminal board is designed to short out in the event that moisture has found its way into the cable entry chamber thus signaling that the motor must have service without the costly complete overhaul that occurs with pumps that do not have isolated terminal boards.

10.3.6. **PUMP POWER & CONTROL PANEL**

- 10.3.6.1. Monitoring and control system to be designed to function with pumping units and to be factory wired and tested.

- 10.3.6.2. Each panel shall be supplied with an electrical schematic permanently fastened to the inside of the enclosure door.

- 10.3.6.3. All internal wiring shall be neat and concealed in 1” x 2” tall white wireway.

- 10.3.6.3.1. Control wiring shall be red 14-gauge minimum.

- 10.3.6.3.2. Power and lighting shall be black 10-gauge minimum.

- 10.3.6.3.3. Neutral wiring shall be white.

- 10.3.6.3.4. Ground wiring shall be green.

- 10.3.6.3.5. Each wire shall terminate in screw or lug terminal connection.

- 10.3.6.4. Every panel shall be tested to perform as designed through the entire sequence of operation before it leaves the factory.

- 10.3.6.5. Every panel shall include a permanent sticker that is signed by the person who built, wired, and tested the panel.

10.3.6.6. **ENCLOSURE**

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

- 10.3.6.6.2. Door shall be fastened securely with pad-lockable stainless steel draw latches, spring loaded for smoother action.

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

10.3.6.7. **DEADFRONT**

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

10.3.6.8. **ALARM SYSTEM**

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

10.3.6.8.2. ALARM shall be 90 decibels in sound, with a silence push button.

10.3.6.8.3. ALARM shall be supplied with a battery back-up power system. Conditions that shall cause alarm activation include: Power Failure, Pump Failure, Use of Lag Pump, and High Water Elevation.

10.3.6.8.4. ALARMS for Large Collection Pumping Stations shall be telemetered, including identification of the alarm condition, to a municipal facility that is manned 24 hours a day. If such a facility is not available and 2-hour holding capacity is not provided, the alarm shall be telemetered to city offices during normal working hours and to the home of the person(s) in responsible charge of the lift station during off-duty hours.

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

10.3.6.8.6. The ALARM LIGHT shall be a red lexan (polycarbonate) material. The light shall be 3” high by 3 ½” diameter, the globe shall be mounted on top of the enclosure with a

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neoprene gasket. The LED light shall be easily replaced from the inside of the control panel.

10.3.6.8.7. The AVOID ALARM shall be provided in addition to the ALARM LIGHT.

10.3.6.8.8. ALARM LADDER DIAGRAM shall show, and construction shall be, that all the alarm conditions (phase failure, power failure, pump failure, use of lag pump, unauthorized entry or any case of pump station malfunction) engage the audible and visual alarm system. If telemetered, the telemetry shall report all the required alarm conditions.

10.3.6.9. **SURGE SUPPRESSER**

10.3.6.9.1. Manufacturer shall be confirmed by Inlet Beach Water System prior to order.

10.3.6.10. **PHASE FAILURE RELAY**

10.3.6.10.1. Shall be a Universal Phase Monitor.

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

10.3.6.11. **TRANSFER SWITCH**

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

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

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

10.3.6.12. **PLUG IN CONTROLLER**

10.3.6.12.1. Shall be Data Flow Systems or equal (see section 13) for stations with 15 horsepower pumps and larger.

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10.3.6.12.2. Shall provide for each pump: run lights, H.O.A., seal failure lights, seal failure test switch, alarm test switch, lead pump selector switch, alternation and pilot light indication for each level control switch.

10.3.6.12.3. Shall be of the plug in design to allow for ease of service.

10.3.6.12.4. Stations with less than 15 horsepower pumps shall be controlled by relay logic as installed by the panel manufacturer.

10.3.6.13. GENERATOR RECEPTACLE

10.3.6.13.1. Shall be a Hubbell Pin and Sleeve type Model 4100R9W for 240 volt, 3 phase, and equivalent type for 460 volt, 3 phase.

10.3.6.13.2. Shall be weather proof and mounted on the exterior of the enclosure.

10.3.6.14. MOTOR CIRCUIT PROTECTORS

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

10.3.6.15. MOTOR STARTERS

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

10.3.6.15.2. The overload shall be thermal melting alloy type. IEC rated starters shall not be accepted.

10.3.6.15.3. VFD or Soft Start starter are required on pumps over 25 horse power.

10.3.6.16. ELAPSED TIME METERS

10.3.6.16.1. Shall be 6 digit non re-settable.

10.3.6.16.2. The meters shall be mounted on the deadfront for each pump to record hours of operation.

10.3.6.17. **GROUND FAULT INTERRUPTER**

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

10.3.6.18. **TRANSFORMER**

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

10.3.7. **DIESEL POWERED BACK-UP PUMP**

- 10.3.7.1. DIESEL POWERED BACK-UP PUMPS shall be required by REGIONAL UTILITIES on Pump Stations greater than 8'-0" in diameter OR at the direction of the Florida Department of Environmental Protection (FDEP).
- 10.3.7.2. All DIESEL POWERED BACK-UP PUMPS shall be *Thompson 6JSVE-DJDST-4045D, 6" Solids Handling Vacuum-Assisted Jet Pumps*.
- 10.3.7.3. The DIESEL POWERED BACK-UP PUMPS shall be designed and constructed to pump sewage, storm water, sludge, and other water based liquids without injurious damage during operation.
- 10.3.7.4. The DIESEL POWERED BACK-UP PUMPS shall be capable of passing 3-inch diameter solid non-deformable without clogging.
- 10.3.7.5. The DIESEL POWERED BACK-UP PUMPS shall include a MANUFACTURER approved weather shield, starter battery and solar battery charger.

10.4. **INSTALLATION**

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

- 10.4.1.1. The COUPLING shall be capable of sliding down the pump guide rail and attaching to the base DISCHARGE ELBOW that shall be also constructed of ASTM A48, Class 30 gray cast iron so that no personnel entry into the wet pit is required to connect the pump coupling to the DISCHARGE ELBOW.
- 10.4.2. The pump SEAL to the elbow shall be accomplished by the cantilevered effect of the COUPLING being suspended by the rounded fit on top of the DISCHARGE ELBOW.
 - 10.4.2.1. The effect shall be such that sealing forces of the COUPLING to DISCHARGE ELBOW are 1.5 times higher than the weight of the pump and coupling alone.
 - 10.4.2.2. The cantilever effect also requires that no part of the PUMP rest directly on the floor of the sump to obstruct flow into the suction eye of the pump.
- 10.4.3. The SEAL at the COUPLING to DISCHARGE ELBOW interface shall be made by a replaceable Buna-N sealing rubber.
 - 10.4.3.1. Machined metal-to-metal sealing surface is not considered an equal and is not acceptable.
 - 10.4.3.2. The SEAL rubber shall be constructed so that it comprises the flat gasket between the PUMP and COUPLING and the seal at the COUPLING to DISCHARGE ELBOW connection.
 - 10.4.3.3. This sealing system must guarantee a positive leak proof seal in the wet pit PUMP installation.
- 10.5. **FIELD TESTING**
 - 10.5.1. Each pump and motor shall be given the following tests at the factory prior to shipment:
 - 10.5.1.1. The mechanical and electrical integrity of the pump shall be established by the use of physical inspection and the use of a megger of verification of the stator resistance to short circuit.

Construction Specifications and Standard Details

- 10.5.1.2. The power leads shall be connected to the motor in accordance to the jobsite voltage and the pump started to verify rotation and no load amp readings.
- 10.5.1.3. Any undue noise or vibration shall be cause for discontinuing the test and further investigation.
- 10.5.1.4. If requested, the pump shall be installed in the test tank on a wet pit discharge elbow and complete hydraulic tests conducted.
- 10.5.1.5. The KW input, power factor, flowrate and head shall be measured and recorded.
- 10.5.1.6. The pump shall be operated at the duty point for the project and checked for compliance with Hydraulic Institute Standards prior to being certified.
- 10.5.1.7. The pump shall then be removed and given a physical inspection and additional megger insulation test to reverify the mechanical and electrical integrity.
- 10.5.1.8. Copies of hydraulic test results are maintained at the factory and supplied when requested.

10.6. WARRANTY

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

SECTION 11

SEWER - GRINDER PUMP STATIONS



SECTION 11 – SEWER - GRINDER PUMP STATIONS

11.1. SCOPE

- 11.1.1. This section contains standard specifications for use in the design and construction of SUBMERSIBLE SEWAGE GRINDER PUMP STATIONS as required by Inlet Beach Water System.
- 11.1.2. CONTRACTOR shall furnish and install WET PITS, PUMPS, VALVES, ELECTRICAL CONTROL PANELS complete, tested and ready for operation.
- 11.1.3. GRINDER PUMPS are defined as centrifugal submersible pumps designed to reduce all material found in normal domestic and light industrial sewage, including plastics, rubber, sanitary napkins, and disposable diapers into a finely ground slurry.
 - 11.1.3.1. The slurry produced by a GRINDER PUMP is then pumped through small diameter piping into a gravity interceptor or wastewater treatment facility.
 - 11.1.3.2. The temperature of the liquid being pumped is 104 degrees F continuous, 160 degrees F intermittent and shall be capable of running dry for extended periods.

11.2. GENERAL REQUIREMENTS

- 11.2.1. All GRINDER PUMPS shall be *Barnes SGV Double Seal, Oil Filled Motor Grinder Pumps*, or approved equal.
- 11.2.2. All work shall be proved to be in first class condition and constructed properly in accordance with the drawings and the specifications.
- 11.2.3. CONTRACTOR shall submit to ENGINEER OF RECORD and Inlet Beach Water System for approval before work begins, certificates of inspections in triplicate from the SUBCONTRACTOR that the materials supplied have been inspected at the respective places of fabrication and meet the requirements of these specifications.
- 11.2.4. All materials including, but not limited to, concrete structures, pumps, pipes, valves, fittings, lids, panels and electrical equipment shall be clearly marked with the name of the MANUFACTURER, batch/serial number, strength/capacity designation and/or pressure rating.

- 11.2.5. It shall be the responsibility of CONTRACTOR to keep extra fittings on site to make vertical and/or horizontal adjustments as a result of unknown interferences so as to avoid any unnecessary delays to the project.
- 11.2.6. All defects and leaks disclosed by any test shall be remedied. All tests shall be performed by CONTRACTOR and observed by Inlet Beach Water System.
- 11.2.7. In order to insure proper performance and compatibility of interacting components within these specifications; all submersible pumps, control panels, access frames, guide rails, and lifting systems shall be the product of one MANUFACTURER or furnished by the GRINDER PUMP MANUFACTURER for sole source responsibility.
- 11.2.8. Water for testing shall be furnished by CONTRACTOR.
- 11.2.9. See Section 3 and 4 of this specification for “*Excavation and Backfill*” and “*Dewatering*.”
- 11.2.10. All herein referenced standards shall be the latest edition or revision.

11.2.11. **LEVEL SWITCH SETTINGS**

- 11.2.11.1. The FIRST LEVEL SWITCH (lowest) stops the lead pump and the lag pump if it is energized, when the level drops below this point, and triggers the alternator.
- 11.2.11.2. The SECOND LEVEL SWITCH (lead) starts one pump as the liquid rises to close this circuit. Which pump starts at this level is determined by the lead pump selector switch or the alternator.
- 11.2.11.3. The THIRD LEVEL SWITCH (lag) causes both pumps to run as the liquid level rises to this point.
- 11.2.11.4. The FOURTH LEVEL SWITCH (highest) illuminates the alarm indicator

11.3. **MATERIALS**

11.3.1. **WET WELL**

11.3.1.1. All GRINDER PUMP STATIONS located in a public and/or FDOT Right-of-Way must be designed and constructed of reinforced concrete as per detail drawing GS-1.

11.3.1.2. Inlet Beach Water System requires that all GRINDER PUMP STATIONS are constructed as per these specifications and detail drawing GS-1.

11.3.1.3. **DUPLEX WET WELL**

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

11.3.1.3.2. The access door shall be Type ASP300 as manufactured by U.S. Foundry and Manufacturing Corp., Miami, FL with the size being 36" X 36" and an actual opening of 32" X 35".

11.3.1.3.3. Door leaf shall be .250" thick aluminum floor plate reinforced to 300 p.s.f. live load.

11.3.1.3.4. The access door shall be equipped with a flush aluminum drop handle which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle.

11.3.1.3.5. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place.

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

11.3.1.3.7. Access door shall be furnished with mill finish.

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

11.3.2. **SUBMERSIBLE GRINDER PUMP**

- 11.3.2.1. The volute, seal plates, impeller and motor housing shall be constructed of high quality ASTM 48 Class 30 cast iron.
- 11.3.2.2. Pump(s) shall be painted with a water based air-dry enamel of 2.0 mil minimum thickness.
- 11.3.2.3. All exposed hardware shall be 300 series stainless steel.
- 11.3.2.4. The pump construction shall contain no points of critical clearance nor require periodic adjustment or replacement to maintain reasonable operating efficiency.
- 11.3.2.5. Discharge connection shall be a standard 2” NPT in the vertical position. All gaskets shall be of the compression square ring type eliminating critical slip fits and the possibility of damage during service associated with sliding “O”-Ring sealing arrangements.
- 11.3.2.6. The impeller shall be of the recessed vortex design.
- 11.3.2.7. Pumps with standard centrifugal semi open impeller designs shall not be acceptable.
- 11.3.2.8. The impeller shall be of 85-5-5-5 bronze construction and machined for threading to the motor shaft. The impeller shall be capable of being trimmed to meet specific performance characteristics.
- 11.3.2.9. The grinder mechanism shall consist of a radial cutter threaded and locked on the motor shaft by a washer in conjunction with a countersunk flat head cap screw, and a shredding ring containing a minimum of fifteen flow passages with cutting edges.
- 11.3.2.10. 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.
- 11.3.2.11. Two stage cutter mechanisms requiring external adjustment for proper clearance are not acceptable.
- 11.3.2.12. The unit shall utilize a tandem mechanical shaft seal arrangement and shall operate in an oil atmosphere.

Construction Specifications and Standard Details

- 11.3.2.13. The seal shall be commercially available and not a proprietary design of the MANUFACTURER.
- 11.3.2.14. The materials of construction shall be carbon for the rotating face and ceramic for the stationary face, lapped and polished to a tolerance of one light band, 300 series stainless steel hardware, and all elastomer parts to be Buna-N.
- 11.3.2.15. The pump shall have a three bearing design consisting of an upper ball bearing, an intermediate ball bearing restrained for the purpose of carrying the thrust loads, and a lower bronze sleeve bearing to carry radial loads and prevent shaft deflection imposed by the pump impeller and grinder operation.
- 11.3.2.16. Bearings shall operate in an oil bath atmosphere for superior life.
- 11.3.2.17. Permanently lubricated bearings are not acceptable.

11.3.3. PUMP MOTOR

- 11.3.3.1. The pump shall be designed to be non-overloading throughout the entire pump curve.
- 11.3.3.2. Three phase motors shall be of the dual voltage 230/460 design.
- 11.3.3.3. Motor designs incorporating shrink or press fit assembly between the stator and motor housing shall not be acceptable.
- 11.3.3.4. The rotor and stator assembly shall be of the standard frame design and secured to the pump seal plate by four threaded fasteners allowing for easy serviceability.
- 11.3.3.5. The motor shall be constructed with the windings operating in a sealed environment containing clean dielectric oil, making it capable of operating in a totally, partially or non submerged condition for extended periods of time without damage to the heat being generated.
- 11.3.3.6. Air filled motors shall not be acceptable.
- 11.3.3.7. The motor windings shall be Class B insulation.
- 11.3.3.8. The motor shall meet the standard NEMA design B for three phase. The motor shaft shall be of 416 stainless steel.

- 11.3.3.9. 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.

11.3.4. PUMP GUIDE RAIL

- 11.3.4.1. The guide rail assemblies shall consist of 304 stainless steel upper guide rail brackets and pump guide brackets with the slide rail assemblies of 14 gauge 304 stainless steel.
- 11.3.4.2. The stationary and moveable portions of the hydraulically sealed discharge coupling assemblies shall be machined cast iron.
- 11.3.4.3. The upper guide rail bracket(s) shall mount to the basin cover and position the lower end of the guide rail.
- 11.3.4.4. The stainless steel rail shall support the pump at a distance of four (4) inches from the basin floor to provide unrestricted flow of material into the pump.
- 11.3.4.5. Stainless steel guide brackets shall be attached to the pump for positioning of the unit on the guide rail during installation or removal of the unit within the basin.

11.3.5. PUMP POWER & CONTROL CABLES

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

11.3.6. **PUMP POWER & CONTROL PANEL**

- 11.3.6.1. Monitoring and control system to be designed to function with pumping units and to be factory wired and tested.
- 11.3.6.2. Each panel shall be supplied with an electrical schematic permanently fastened to the inside of the enclosure door.
- 11.3.6.3. All internal wiring shall be neat and concealed in 1” x 2” tall white wireway.
 - 11.3.6.3.1. Control wiring shall be red 14-gauge minimum.
 - 11.3.6.3.2. Power and lighting shall be black 10-gauge minimum.
 - 11.3.6.3.3. Neutral wiring shall be white.
 - 11.3.6.3.4. Ground wiring shall be green.
 - 11.3.6.3.5. Each wire shall terminate in screw or lug terminal connection.
- 11.3.6.4. Every panel shall be tested to perform as designed through the entire sequence of operation before it leaves the factory.
- 11.3.6.5. Every panel shall include a permanent sticker that is signed by the person who built, wired, and tested the panel.

11.3.6.6. **ENCLOSURE**

- 11.3.6.6.1. Shall be a NEMA 4X stainless steel construction to provide protection against rain, sleet and snow.
- 11.3.6.6.2. Door shall be fastened securely with pad-lockable stainless steel draw latches, spring loaded for smoother action.
- 11.3.6.6.3. Standard size shall be 36” high x 24” wide and 10” deep unless larger panel is warranted by component sizes or heat generation considerations.

11.3.6.7. **DEADFRONT**

- 11.3.6.7.1. Shall be clear plexi-glass see through design to give operator visual inspection of panel without opening

DEADFRONT or interrupting operation of pumping station.

11.3.6.8. **ALARM SYSTEM**

- 11.3.6.8.1. An ALARM SYSTEM shall be provided for all pumping stations.
- 11.3.6.8.2. The Alarm system shall be activated in cases of power failure, use of the lag pump, unauthorized entry, or any cause of pump station malfunction.
- 11.3.6.8.3. Alarm shall be 90 decibels in sound, with a silence push button.
- 11.3.6.8.4. Alarm shall be supplied with a battery back-up power system. Conditions that shall cause alarm activation include: Power Failure, Pump Failure, Use of Lag Pump, and High Water Elevation.
- 11.3.6.8.5. ALARMS for Large Collection Pumping Stations shall be telemetered, including identification of the alarm condition, to a municipal facility that is manned 24 hours a day. If such a facility is not available and 2-hour holding capacity is not provided, the alarm shall be telemetered to city offices during normal working hours and to the home of the person(s) in responsible charge of the lift station during off-duty hours.
- 11.3.6.8.6. Audio visual Alarm systems with a self-contained power supply may be acceptable in some cases in lieu of the telemetering system outlined above, depending upon location, station holding capacity, and inspection frequency.
- 11.3.6.8.7. The Alarm Light shall be a red lexan (polycarbonate) material. The light shall be 3” high by 3 ½” diameter, the globe shall be mounted on top of the enclosure with a neoprene gasket. The LED light shall be easily replaced from the inside of the control panel.
- 11.3.6.8.8. The Avoid Alarm shall be provided in addition to the alarm light.

11.3.6.8.9. ALARM Ladder diagram shall show, and construction shall be, that all the alarm conditions (phase failure, power failure, pump failure, use of lag pump, unauthorized entry or any case of pump station malfunction) engage the audible and visual alarm system. If telemetered, the telemetry shall report all the required alarm conditions.

11.3.6.9. **SURGE SUPPRESSER**

11.3.6.9.1. Shall be confirmed by Inlet Beach Water System prior to design.

11.3.6.10. **PHASE FAILURE RELAY**

11.3.6.10.1. Shall be universal phase monitor.

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

11.3.6.11. **TRANSFER SWITCH**

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

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

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

11.3.6.12. **PLUG IN CONTROLLER**

11.3.6.12.1. Shall be Controls of Houston Model No. 200SF.

11.3.6.12.2. Shall provide for each pump: run lights, h.o.a., seal failure lights, seal failure test switch, alarm test switch, lead pump selector switch, alternation and pilot light indication for each level control switch.

11.3.6.12.3. Shall be of the plug in design to allow for ease of service.

11.3.6.13. **GENERATOR RECEPTACLE**

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

11.3.6.14. **MOTOR CIRCUIT PROTECTORS**

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

11.3.6.15. **MOTOR STARTERS**

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

11.3.6.16. **ELAPSED TIME METERS**

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

11.3.6.17. **GROUND FAULT INTERRUPTER**

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

11.3.6.18. **TRANSFORMER**

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

11.4. **INSTALLATION**

- 11.4.1. The stationary fitting shall have a Neoprene diaphragm clamped between the stainless steel rail and the stationary cast iron discharge.
- 11.4.2. The cast iron moveable fitting, when in position, shall be held against the stationary fitting by the construction of the stainless steel rail, aligning the movable fitting to the flexible diaphragm for proper sealing of the two surfaces under pressure.
- 11.4.3. 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.
- 11.4.4. The discharge piping shall consist of 2 inch Schedule 40 stainless steel pipe. A ball check valve shall be installed in the vertical position between the pump discharge and the moveable fitting.
- 11.4.5. Each valve shall be 2 inches in size and shall consist of three major components; body, access plug, and ball.
- 11.4.6. The design of the valve shall be such that it keeps solids, stringy material, grit, rags, etc. moving without the need for back flushing.
- 11.4.7. In the operating mode, the ball shall not impede flow through the valve.
- 11.4.8. The operating flow area shall be equal to the nominal size of the valve. The ball shall clear the waterway providing “full flow” equal to the nominal size. It shall be non-clog design.
- 11.4.9. There shall not be outside levers, weights, springs, dashpots or other accessories required for a swing (clapper) type check valve.
- 11.4.10. The ball shall be natural rubber and be resistant to material normally found in sewage. The body and access plug shall be gray cast iron, ASTM Class 30. All fasteners shall be stainless steel. Inlet and outlet ports shall be 2 inch NPT threaded.
- 11.4.11. A 2-inch brass true union ball valve shall be installed in the discharge piping of each pump to provide shut-off capabilities during pump removal. Each valve shall be mounted in a separate valve box adjacent to the wet well for ease of access and maintenance.

11.5. TESTING

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

11.6. WARRANTY

- 11.6.1. The MANUFACTURER shall WARRANT the pump to be supplied to the OWNER for a period of five (5) years under normal use.
- 11.6.2. 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.
- 11.6.3. This WARRANTY shall not be limited by duty cycle or hours of running time.
- 11.6.4. The applicable WARRANTY shall be in preprinted form and shall be a part of these specifications.

SECTION 12

SEWER – CONCRETE WET WELL COATING SYSTEM

SECTION 12 – SEWER – CONCRETE WET WELL COATING SYSTEM

12.1. **SCOPE**

- 12.1.1. All interior concrete vertical, overhead and floor surfaces, shall receive the specified RAVEN LINING SYSTEMS, all exposed ferrous metals within structures to receive the U.S. PAINT system.
- 12.1.2. The purpose of these specifications is to provide guidelines regarding installation of a spray-applied reinforced epoxy coating system for all interior concrete surfaces.
- 12.1.3. Unless indicated otherwise, application to any other substrate is not intended.
- 12.1.4. Referenced documents such as manufacturer’s instructions, not listed in this section shall also apply, and are incorporated into the specification requirements by reference.
- 12.1.5. The following codes and standards shall be referenced and adhered to in the design and application of the WET WELL COATING SYSTEM.
 - 12.1.5.1. ACI 515.1R-79: *A Guide to the Use of Waterproofing, Damp proofing, Protective and Decorative Barrier Systems for Concrete.*
 - 12.1.5.2. ASTM D 4258: *Standard practice for Surface Cleaning Concrete for Coating.*
 - 12.1.5.3. ASTM D 4138: *Standard Test Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means.*
 - 12.1.5.4. ASTM D 4263: *Standard Test Method for Indicating Moisture in Concrete by The Plastic Sheet Method.*
 - 12.1.5.5. ASTM D 4285: *Standard Test Method for Indicating Oil or Water in Compressed Air.*
 - 12.1.5.6. ASTM D 4414: *Standard Practice for Measurement of Wet Film Thickness by Notch Gages.*
 - 12.1.5.7. ASTM D 4541: *Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester.*

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12.1.5.8. ASTM D 4259: *Standard Practice for Abrading Concrete*.

12.1.5.9. NACE RP0188: *Discontinuity (Holiday) Testing of Protective Coatings*.

12.1.5.10. NACE RP0288: *Inspection of Linings on Steel and Concrete*.

12.1.5.11. SSPC-PA Guide 3: *A Guide to Safety in Paint Application*.

12.2. EXECUTION

12.2.1. COATING SEQUENCE

12.2.1.1. Properly prepare concrete surfaces, patch/fill voids or bug holes using QUADDEX HYPERFORM, and apply one 100 mil coat of RAVEN MOISTURE TOLERANT BLUE EPOXY RESIN.

12.2.1.2. After concrete coating apply 2 coats of U.S. Paint to all ferrous metals within structure.

12.2.1.3. Do not coat stainless steel.

12.2.2. HANDLING AND MIXING

12.2.2.1. Part A and B components shall be delivered to job site in their original un-opened containers with labels intact.

12.2.2.2. Material shall be stored indoors, off the floor, in cool and dry conditions, protected against excessive moisture, heat, or cold, in accordance with manufacture's recommendations.

12.2.3. RIGGING AND SCAFFOLDING

12.2.3.1. Rigging or scaffolding, if used, shall be set up permitting ease of operation of surface preparation and application equipment, and shall provide safe and clear access to all surfaces to be coated.

12.2.4. DECONTAMINATION

12.2.4.1. Before abrasive cleaning, all algae, oil, grease, dirt, loose matter and other contaminants shall be removed by high-pressure water blasting, steam cleaning or any other acceptable method, to satisfy ASTM D-4258 "*Surface Cleaning Concrete for Coating*" and insure the ability

of the lining system to penetrate and adhere properly to the concrete substrate.

- 12.2.4.2. Biodegradable detergents may be used; however, they shall be completely rinsed off with plenty of fresh, clean water.

12.2.5. **SURFACE PREPARATION**

- 12.2.5.1. All surfaces shall be prepared according to MANUFACTURER'S recommendations and approved by the MANUFACTURER'S representative prior to the application of coatings.

- 12.2.5.2. Surfaces shall be clean, dry and oil-free before coating.

- 12.2.5.3. Existing coatings shall be removed by abrasive cleaning or any other approved method.

12.2.5.4. **ABRASIVE CLEANING**

- 12.2.5.4.1. Concrete shall be abrasive blast cleaned to satisfy ASTM D-4259 "Abrading Concrete", producing a surface with a roughened texture resembling (80 grit) coarse sandpaper.

- 12.2.5.4.2. Concrete shall be free of crusts, soft or weak matter, loose aggregate, and all contaminants.

- 12.2.5.4.3. Sharp edges shall be rounded or trimmed by chipping, wire brushing, or any other acceptable method.

- 12.2.5.4.4. Wet abrasive blasting shall be allowed, provided that the surface is pressure washed to remove any cement paste or dust.

- 12.2.5.4.5. Water blasting alone shall not be allowed, except for decontamination.

- 12.2.5.4.6. Acid etching shall not be acceptable.

- 12.2.5.4.7. CONTRACTOR is encouraged to experiment with different abrasives and nozzles to achieve the desired result without excessive damage to the substrate.

12.2.5.5. **REPAIR OF SUBSTRATE OR EXISTING SURFACE**

- 12.2.5.5.1. Contractor shall repair the substrate or existing surface before application of new coatings.
- 12.2.5.5.2. Concrete repair and/or surface patching materials shall be fully cured before final surface preparation or coating application. Follow manufacture's cure schedule before over coating.
- 12.2.5.5.3. Contractor may use any of the products described below or pre-approved equals.

12.2.5.6. **SUBSTRATE MOISTURE**

- 12.2.5.6.1. If present, all leaks and infiltration shall be eliminated as directed by ENGINEER, using a product suitable for the intended result.
- 12.2.5.6.2. All surfaces shall be free of condensation and visible moisture, prior to application of the new lining system.
- 12.2.5.6.3. CONTRACTOR shall continuously record the air temperature, surface temperature, dew point temperature, and relative humidity within the tolerances specified herein at all times during concrete drying, coating applications and curing.
- 12.2.5.6.4. The air temperature in the containment structure shall be maintained between 60°F and 85°F at all times, and the relative humidity shall not exceed 85% during the application of coatings.
- 12.2.5.6.5. The surfaces to be coated shall be *at least 10°F* above the dew point temperature, based on calculations using U.S. Psychometric Tables, before and during the application of coatings.
- 12.2.5.6.6. CONTRACTOR shall monitor and record the air temperature, surface temperature, dew point, and relative humidity at two-hour intervals during all coating applications and initial curing.

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12.2.5.6.7. CONTRACTOR shall post the log of environmental conditions where it is accessible to the OWNER and Inlet Beach Water System at all times.

12.2.5.6.8. CONTRACTOR shall immediately remedy any environmental conditions that are not in compliance with this specification.

12.2.5.7. FINAL CLEANING

12.2.5.7.1. All surfaces to be coated shall be free of dust, moisture, and condensation.

12.2.5.7.2. Nearby surfaces shall be cleaned to prevent contamination of the substrate or freshly applied coatings.

12.2.6. EPOXY APPLICATION

12.2.6.1. The U.S. paint material for metals may be applied by brush, roller or spray.

12.2.6.2. Concrete liner coating shall be spray-applied by qualified technicians, using high-pressure, airless spray equipment.

12.2.6.3. Air and surface temperatures shall be between 60° and 85° F, and the surface temperature shall be at least 10° F above the dew point.

12.2.6.4. Relative humidity shall not exceed 85%.

12.2.6.5. Each coat shall be applied at specified film thickness in a single application, which may consist of several increments, accomplished by one or more passes of the spray gun, all applied within recommended recoat times to a specific area.

12.2.6.6. High profile areas shall be coated using 4-way passes of the spray gun to ensure complete coverage.

12.2.6.7. If necessary, film thickness may be increased as needed, until a holiday-free membrane is achieved.

12.2.6.8. **EPOXY RECOATING/ TRANSITIONS**

- 12.2.6.8.1. Fresh coating may be sprayed over previously applied coating as long as it is within 24 hours since application and no amine blush is evident on existing previously liner.
- 12.2.6.8.2. Higher temperatures shorten the recoat window, and colder temperatures extend the recoat window.
- 12.2.6.8.3. If recoat time is exceeded, undercoat shall be brush blasted to remove gloss, then vacuumed or solvent –wiped to dust-free condition, allowing all solvent to dry, before application of fresh coating.
- 12.2.6.8.4. Coating applied to improperly prepared surfaces shall be removed immediately.

12.2.6.9. **EPOXY SERVICE**

- 12.2.6.9.1. The epoxy coating system may be placed in service upon satisfactory inspection, as required.
- 12.2.6.9.2. Minimum cure time for immersion is 24 hours at 75 degrees F.

12.2.7. **LINING APPLICATION**

- 12.2.7.1. Coating shall be spray-applied by qualified technicians, using high-pressure airless spray equipment, approved by material MANUFACTURER.
- 12.2.7.2. Air and surface temperatures shall be between 60° and 85° F, and surface temperature shall be at least 10° F above the dew point.
- 12.2.7.3. Relative humidity shall not exceed 85% during product application.

12.2.7.4. **LINING RECOATING/ TRANSITIONS**

- 12.2.7.4.1. Fresh coating may be sprayed over previously applied coating as long as undercoat remains wet to tacky to the touch, or has not exceeded 24 hours at 70° F (21° C) since application.

- 12.2.7.4.2. Higher temperatures shorten the recoat window, and colder temperatures extend the recoat window.
- 12.2.7.4.3. If recoat time is exceeded, undercoat shall be brush lasted to remove gloss, then vacuumed or solvent-wiped to dust-free condition, allowing all solvent to dry, before application of fresh coating.
- 12.2.7.4.4. For transitions between coating sections applied on different days, a minimum 12 inches (30 cm) of the undercoat shall be brush blasted and prepared as described above, and fresh coating shall be feathered in at least 6 inches (15 cm).
- 12.2.7.4.5. Avoid application to glossy surfaces, making sure there is plain evidence of brush blast beyond leading edge of fresh coating.
- 12.2.7.4.6. Coating applied to improperly prepared surfaces shall be removed immediately.

12.2.8. **PATCHING AND REPAIRS**

12.2.8.1. **SURFACE PREPARATION**

- 12.2.8.1.1. Repair area shall be decontaminated and deficient sections shall be removed until properly applied, firmly adhered coating materials are reached.
- 12.2.8.1.2. Exposed surfaces shall be treated to satisfy applicable requirements.
- 12.2.8.1.3. Coating material surrounding repair area shall be abraded to remove gloss, then wiped to a dust-free condition and allowed to dry, before application of repair materials.
- 12.2.8.1.4. Extent of abraded area shall depend on whether repair materials are spray or hand applied. In either case, no repair material shall be applied beyond abraded areas.

12.2.8.2. **MATERIAL AND APPLICATION**

12.2.8.2.1. Repair material shall not extend beyond surrounding abraded area. Any repair material applied to glossy or improperly prepared surfaces shall be removed immediately.

12.2.8.2.2. Larger repairs may require spray-application.

12.2.9. **INSPECTION**

12.2.9.1. CONTRACTOR shall provide full inspection of all surface preparation and coating applications to ensure the requirements of this specification are fully complied with.

12.2.9.2. Any deviation from the specified requirements shall be reported to the OWNER and Inlet Beach Water System for concurrence with CONTRACTOR'S proposed corrective action.

12.2.9.3. OWNER and Inlet Beach Water System reserves the right to assign an inspector to monitor any or all of the work and enforce the requirements of the specifications.

12.2.9.4. OWNER and Inlet Beach Water System inspector may perform any inspections that are deemed necessary to determine compliance with the requirements defined in this specification.

12.2.9.5. CONTRACTOR shall provide OWNER and Inlet Beach Water System inspector with safe access to all work areas.

12.2.9.6. The presence of the OWNER and Inlet Beach Water System's inspector in no way relieves CONTRACTOR of his responsibility for quality assurance and inspection.

12.2.9.7. In-process inspections performed by OWNER and Inlet Beach Water System inspector shall not be construed by CONTRACTOR as final acceptance of the work.

12.2.9.8. CONTRACTOR shall be responsible for the satisfactory repair of any areas that are found to be defective, regardless of whether any preliminary inspections by OWNER, Inlet Beach Water System and/or MANUFACTURER were performed.

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- 12.2.9.9. Final acceptance of the completed work by OWNER and Inlet Beach Water System shall not relieve CONTRACTOR of any warranty obligations.
- 12.2.9.10. CONTRACTOR is responsible for ensuring that the MANUFACTURER's designated technical representative is present for questions and technical direction at all critical points in the project, such as but not limited to pre-construction, post-surface preparation, and holiday detection.
- 12.2.9.11. CONTRACTOR shall advise the OWNER and Inlet Beach Water System at least 24 hours in advance of each manufacturer's representative visit, in order that the OWNER and Inlet Beach Water System's representative(s) can plan to attend the meeting.
- 12.2.9.12. Environmental conditions shall be monitored and maintained according to this specification, and be within the material manufacturer's recommended tolerances.
- 12.2.9.13. Dew points shall be monitored per ASTM E-337 "Measuring Humidity with Psychrometer", to determine wet and dry-bulb temperatures.
- 12.2.9.14. Thermometers shall be used to measure temperatures of coating materials, the air and surfaces to be coated.
- 12.2.9.15. Inspection shall verify that the coating is applied using spray equipment approved by the coating MANUFACTURER, monitoring its operation to verify that materials are applied with not evidence of streaks or uneven coloring.
- 12.2.9.16. Film thickness may be measured per ASTM D-4414 "Measure of Wet Film Thickness of Organic Coatings by Notched Gages. A NACE Level III Inspector, representing Inlet Beach Water System may use a Tooke Gauge, shall any coated area need thickness verification.
- 12.2.9.17. CONTRACTOR shall be responsible for the satisfactory repair of any coatings damaged by destructive tests, up to a maximum of 15 spots.
- 12.2.9.18. CONTRACTOR shall be responsible to insure all areas meet the specified thickness.

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- 12.2.9.19. Any re-coating necessary due to insufficient film thickness of the coating shall be done at CONTRACTOR'S expense.
- 12.2.9.20. Inspection shall verify that any recoating is accomplished within recommended recoat times.
- 12.2.9.21. Inspection shall verify that no fresh coating is applied to glossy or improperly prepared surfaces, and that any coating so applied is completely removed.
- 12.2.9.22. The thickness requirement for the coating systems shall apply to the minimum material thickness over the peaks of the substrate.
- 12.2.9.23. The coating shall be visually inspected for blisters, poor adhesion, or improper cure.
- 12.2.9.24. Deficiencies shall be marked and repaired per the coating manufacture's recommendation at CONTRACTOR'S expense.
- 12.2.9.25. The coating shall be inspected per NACE RPO188 and ASTM D-4787 "Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates", using high-voltage spark testing equipment with variable settings.
- 12.2.9.26. Test voltage shall be set at an initial 100 volts per mil (4,000 volts per mm) of total system thickness, and then increased as needed to compensate for relative conductivity of the concrete substrate by spark testing an induced holiday at furthest extension of test probe from grounding location.
- 12.2.9.27. Once test voltage is determined, it shall be used throughout that area, and then re-determined again every time a new ground is made.
- 12.2.9.28. Detected holidays shall be marked and repaired per coating manufacture's recommendations.
- 12.2.9.29. Contractor shall be responsible to provide necessary Holiday Testing equipment for final inspection.

SECTION 13

SEWER – LIFT STATION TELEMTRY UNIT



SECTION 13 – SEWER – LIFT STATION TELEMETRY UNIT

13.1 SCOPE

- 13.1.1 The specific attention of the Contractor is directed to the fact that the owner, Inlet Beach Water System, has an existing TAC II SCADA System manufactured by Data Flow Systems, Inc. (DFS), of Melbourne, Florida (321) 259-5009. For compatibility purposes, the Contractor will be required to obtain the Remote Terminal Unit (RTU) specified herein from DFS.
- 13.1.2 The Contractor shall coordinate tower and antenna requirements with DFS and shall provide station(s) physical location information to DFS for radio communication study purposes. Information shall be provided in the form of GPS readings or street map with actual site location(s) clearly marked. A complete radio survey shall be conducted by DFS to verify antenna and tower height requirements. DFS shall license the new RTU with the FCC for operation under the existing radio frequency.
- 13.1.3 The RTU (TAC Pack TCU) shall be mounted inside the Lift Station’s Motor Control Panel as provided by others.
- 13.1.4 These specifications are intended to cover the furnishing, the shop testing, the delivery, complete installation and field testing of all equipment and appurtenances for the complete RTU system herein specified, whether specifically mentioned in the Specifications or not.
- 13.1.5 The unit shall be furnished and installed with all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these specifications or not. This installation shall include field-testing of the entire installation.

13.2 PRODUCTS

13.2.1 REMOTE TERMINAL UNIT (RTU)

- 13.2.1.1 The Remote Terminal Unit (RTU) shall be the pump-controller based Telemetry Control Unit with Integrated Radio (DFS model: TAC Pack TCU). The RTU shall be housed in the Motor Control Panel and powered by 120 VAC commercial power. The RTU shall provide local and automatic pump station control functions, monitor local statuses and transmit those statuses to the TAC II SCADA System central site when polled by the master radio. An

Construction Specifications and Standard Details

Uninterruptible Power Source (UPS) shall be an integral part of the RTU. The TCU shall include an integrated radio as specified in paragraph 2.02. The TCU shall incorporate the following features:

- 13.2.1.2 On-Board 12-button operator interface keypad and 4x20-character LCD display. Configuration parameters shall be adjustable via the 12-button operator interface keypad or required RS-232 service port.
- 13.2.1.3 The LCD display shall provide the elapsed runtime of each pump, the average runtime of each pump, the flow of each pump, the flow of the station and the time of day.
- 13.2.1.4 Triplex/Duplex/Simplex configurable. The device shall have the capability of easily being configured for one, two or three pumps via the on-board keypad.
- 13.2.1.5 Three (3) on-board HOA switches. Local manual control provided by the HOA switches. Each HOA switch shall be fail safe and operate in the OFF and HAND position without power. Alarms shall indicate that an HOA switch has been left in the HAND or OFF position.
- 13.2.1.6 Integrated pump alternation. The pump alternation function will operate based on the number of pumps configured. Automatic alternation around non-operational pumps shall be provided.
- 13.2.1.7 Pumps/Starter/Breaker Fault alarms shall be determined by the unit automatically. These alarms shall be activated when a pump is called to run, but fails to run, or if the pump is turned off by the TCU, but continues to run.
- 13.2.1.8 Multiple level control input options. The unit shall provide local automatic level control from float, bubbler, transducer, or ultrasonic inputs. Redundancy of level control input shall be supported. An alarm shall be generated when floats are operating out of sequence.
- 13.2.1.9 On-board 240 / 480 VAC three-phase-power monitor. The phase monitor shall be transformer-isolated and detect loss of phase, phase reversal, low phase and high phase faults. All phase monitor adjustments shall be adjustable from the keyboard. Phase voltages from phase A to B and from phase A to C shall be transmitted to the central site computer.

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- 13.2.1.10 Integrated Alarm Light output and Alarm Horn output, each capable of driving 120 VAC loads to ½ amp. An input shall be supplied for external alarm silence button, which shall be used to silence the Alarm Horn.
- 13.2.1.11 All inputs and outputs shall be optically or magnetically isolated and surge suppressed.
- 13.2.1.12 Multiple staged surge protection shall be provided for all power supply and power monitoring circuits. One stage of protection shall be equipped with both energy limiting and clamping circuits with slow blow fuses designed for overload conditions. This design shall provide a very high level of non-destructive transient immunity. With the exception of a direct lightning strike, the device shall protect the RTU power supply and power monitoring circuits from damage due to voltage transients. The surge protection shall provide circuit protection to withstand multiple transients in excess of 6,500 volts, 3,250 amps, without damage. Damage shall be limited to a blown fuse when exposed to larger transients. The surge protection shall be transient-tested to ANSI standard C62.41.
- 13.2.1.13 Supply voltage shall be 115 VAC. Ambient operating temperature shall be -100C to 600C (140F to 1400F). The upper temperature limit is 500C (1220F) when using the backup battery. Unit shall be UL Listed and surge tested for EMI Susceptibility to IEC 61000-4-5 Surge Immunity Tests.
- 13.2.1.14 The TCU shall include a 3.0 amp-hour backup battery. The battery shall provide 12V nominal voltage. The TCU shall incorporate a battery charging system. The battery shall not be damaged by deep discharges.
- 13.2.1.15 A local RS-232 service port shall be provided for local access to all the functions of the unit.
- 13.2.1.16 A local RS-485 serial interface shall be provided for connection to external devices that support the serial Modbus RTU protocol. Standard 5 digit registers shall be used and formatted with 0XXXX for digital outputs, 1XXXX for digital inputs, 3XXXX for analog inputs, and 4XXXX for analog outputs. Packing Modbus digital input, digital output, and analog input registers into the 4XXXX

range will not be permitted. Addressing of Modbus registers shall be contiguous in their associated address ranges. All analog points from the external device shall be 0-20ma signals spanned across 0-4095(12 bit) or 0-32767(15 bit) with a working range 4-20ma representing 0-100%. All analog outputs shall be 0-20ma signals spanned across 0-32767 with a working range of 4-20ma representing 0-100%.

- 13.2.1.17 The TCU shall be easily removed/replaced by removing two industry standard wire terminal connectors. Wire terminals shall be used as an interface between the TCU and field wiring. Fuses and voltage reducing resistors shall be used where required by the manufacturer. Wire terminals shall be housed in the same enclosure as the TCU.

13.2.2 **INTEGRATED RADIO**

- 13.2.2.1 The Integrated Radio shall function as the interface between the TCU and TAC II central site. The Integrated Radio shall incorporate a radio transceiver and associated electronics. The Integrated Radio shall be mounted inside the TCU radio compartment. The combination of the TCU / Integrated Radio is referred to as model TAC Pack TCU. At a minimum, the Integrated Radio shall have the following features: Surge protected radio power, On board communications and functional firmware, Watchdog Timer, On board voltage regulation and radio power supply control, Radio current, receiver sensitivity and operating temperature are monitored for system diagnostics.

13.2.3 **RTU MONITOR AND CONTROL REQUIREMENTS:**

- 13.2.3.1 The RTU shall provide the following monitor and control capability.

- 13.2.3.2 Monitor and Control Points

- 13.2.3.2.1 The following points shall be monitored by the RTU. On, Off, or Fault condition shall be indicated locally at the RTU and remotely at any SCADA Workstation Computer. Any monitoring point shall have the capability of being configured as an alarm in the SCADA software. Any unused monitor points listed, i.e., there is no 3rd pump, shall be capable of being used to monitor other discrete devices.

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13.2.3.2.2	Pump 1 Status
13.2.3.2.3	Pump 1 Start Fault
13.2.3.2.4	Pump 1 Stop Fault
13.2.3.2.5	Pump 2 Status
13.2.3.2.6	Pump 2 Start Fault
13.2.3.2.7	Pump 2 Stop Fault
13.2.3.2.8	Pump 3 Status
13.2.3.2.9	Pump 3 Start Fault
13.2.3.2.10	Pump 3 Stop Fault
13.2.3.2.11	Pump 1 HOA in HAND
13.2.3.2.12	Pump 1 HOA in AUTO
13.2.3.2.13	Pump 1 HOA in OFF
13.2.3.2.14	Pump 2 HOA in HAND
13.2.3.2.15	Pump 2 HOA in AUTO
13.2.3.2.16	Pump 2 HOA in OFF
13.2.3.2.17	Pump 3 HOA in HAND
13.2.3.2.18	Pump 3 HOA in AUTO
13.2.3.2.19	Pump 3 HOA in OFF
13.2.3.2.20	Low Well Level Float
13.2.3.2.21	Off Well Level Float
13.2.3.2.22	Lead Well Level Float
13.2.3.2.23	Lag Well Level Float
13.2.3.2.24	Lag2 Well Level Float
13.2.3.2.25	High Well Level Float
13.2.3.2.26	Float Sequence Fault
13.2.3.2.27	Well Level Transducer (4-20 mA)
13.2.3.2.28	Well Level Transducer Input Fault
13.2.3.2.29	Water Pressure Transducer (4-20 mA)
13.2.3.2.30	Water Pressure Transducer Input Fault
13.2.3.2.31	Auxiliary Discrete Input (discrete or pulse)
13.2.3.2.32	Phase Voltage Fault
13.2.3.2.33	Phase Sequence Fault
13.2.3.2.34	Phase AB Voltage
13.2.3.2.35	Phase AC Voltage
13.2.3.2.36	RTU Memory Fault
13.2.3.2.37	AC Power Fault
13.2.3.2.38	DC Bias Voltage Fault
13.2.3.2.39	Alarm Silence Button
13.2.3.2.40	Alarm Horn Status
13.2.3.2.41	Alarm Light Status

Construction Specifications and Standard Details

13.2.3.3 The following discrete control points shall be provided with the RTU. On or Off condition shall be indicated locally at the RTU and remotely at any SCADA Workstation Computer. Any unused control points listed, i.e., there is no 3rd pump, shall be capable of being used as a general purpose discrete outputs.

- 13.2.3.3.1 Pump 1 Control
- 13.2.3.3.2 Pump 1 Disable
- 13.2.3.3.3 Pump 2 Control
- 13.2.3.3.4 Pump 2 Disable
- 13.2.3.3.5 Pump 3 Control
- 13.2.3.3.6 Pump 3 Disable
- 13.2.3.3.7 Total Station Disable
- 13.2.3.3.8 Alarm Horn Control
- 13.2.3.3.9 Alarm Horn Disable
- 13.2.3.3.10 Alarm Light Control
- 13.2.3.3.11 Alarm Light Disable
- 13.2.3.3.12 Auxiliary Output
- 13.2.3.3.13 Auxiliary Output Override
- 13.2.3.3.14 Auxiliary Output Disable

13.2.4 **FLOAT BACKUP SYSTEM**

13.2.4.1 The control panel fabricator shall include a relay-based float backup system with a two-position selector switch. The selector switch shall be labeled TCU and FLOAT BACKUP for the appropriate position.

13.2.5 **ANTENNA SUBSYSTEM**

13.2.5.1 A high gain directional antenna shall be used to transmit and receive data at the RTU. It shall be supported on a mast/pole and have DC grounding for lightning protection. The antenna mast/pole shall be hot dipped galvanized for corrosion protection. All mounting hardware shall be made of stainless steel. The mast shall meet or exceed the quality and reliability of the G series as manufactured by Rohn or equal.

13.2.5.2 The coax cable shall be the type that utilizes an inert semi-liquid compound to flood the copper braid. The coax cable shall be of the RG-8 construction type and have the RF loss characteristic of foam flex. The coax cable shall be RTC 400 as supplied by Data Flow Systems, Inc. or equal.

Construction Specifications and Standard Details

- 13.2.5.3 Type N connectors shall be utilized at both ends of the coax. The Type N connectors shall be sealed with 3-inch sections of Alpha FIT321-1-0 sealant shrink tubing. The coax cable shall be secured to the mast/pole with stainless steel cable ties. The cable ties shall meet or exceed the quality, reliability and performance of cable ties manufactured by Band-It.
- 13.2.5.4 The antenna shall be an all welded aluminum elements. The antenna shall have a single radiator element connected to a type N female connector. The antenna shall be the RTA series as supplied by Data Flow Systems, Inc. or equal.
- 13.2.5.5 A coaxial surge protector model IS-B50LN-C2 as manufactured by Polyphaser shall be supplied with the RTU or equal.

13.3 EXECUTION

13.3.1 INSTALLATION

- 13.3.1.1 Install and place into operation a complete new RTU System at the site. This work shall include the new antenna system, all interconnecting wiring, conduit, and circuitry necessary to provide the owner with a fully operable RTU.
- 13.3.1.2 Include the services of a factory trained, qualified representative of the equipment manufacturer to inspect the complete equipment installation to assure that it's installed in accordance with the manufacturer's recommendations, make all adjustments necessary to place the system into trouble-free operation.
- 13.3.1.3 All workmanship utilized in the manufacture and installation of this system shall be of the highest quality and performed in a manner consistent with all accepted industry practices.
- 13.3.1.4 The Central Site SCADA Server shall be modified to incorporate a new HMI graphical screen for this station. The graphical screen shall be consistent with existing lift station screens.

13.3.2 WARRANTY

- 13.3.2.1 The manufacturer shall warrant all hardware and software provided under this contract against all defects in material and workmanship for a period of one year. The TAC Pack TCU shall carry an

additional 2-year return-to-factory warranty. The TAC Pack TCU warranty shall also cover damage due to lightning the entire three year period.

13.3.3 **SERVICE**

13.3.3.1 The manufacturer shall offer full factory support of the installed system through the use of factory employees. Service representatives who are not direct employees of the manufacturer, or who are not specifically trained in the service of the owner's existing SCADA System shall be unacceptable. The customer shall have 24 hour per day access to service personnel.

APPENDIX A
UTILITY CONTACT INFORMATION



APPENDIX A – UTILITY CONTACT INFORMATION

- A.1. AT&T Florida (formerly Bellsouth)
2221 Industrial Drive
Panama City, Florida 32405
(850) 913-3703
www.att.com

- A.2. Choctawhatchee Electric Cooperative, Inc.
1350 W. Baldwin Avenue
DeFuniak Springs, Florida 32435
(800) 892-5069
www.chelco.com

- A.3. Cox Communications
320 Racetrack Rd., NW
Ft. Walton Beach, Florida 32547
(850) 314-8163
www.cox.com

- A.4. Century Link (formerly Embarq)
650 Denton Boulevard
Ft. Walton Beach, Florida 32547
(850) 664-3751
www.centurylink.com

- A.5. Gulf Power
PO Box 1388
DeFuniak Springs, Florida 32435
(850) 892-2154
www.southernco.com

- A.6. Mediacom
2814 E. County Hwy 390
Suite D
Panama City, FL 32405
(850) 271-9815
www.medicomcc.com

- A.7. Okaloosa Gas District
P.O. Box 548
Valparaiso, Florida 32580
(850) 729-4870
www.okaloosagas.com

Construction Specifications and Standard Details

- 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

APPENDIX B

BARNES SGV PUMP WIRING SCHEMATIC

Construction Specifications and Standard Details

