

GENERAL
SUMMARY OF CHANGES

Authorization #1 - Amendments Effective March 31, 2012

Chapter Three (3)	Section Name	Amendment Description
Standard Drawings	GR-14-5 Pipe Identification Raw Water Mains	Updated PVC Pipe Color to be substituted if standard color unavailable
Standard Drawings	GR-15-2 Automatic Air Release Valve (In Ground)	Clarified Specs for ARV vault lid

Authorization #2 - Amendments Effective December 15, 2012

Chapter Three (3)	Section Name	Amendment Description
Standard Drawing	GR-15-1 Automatic Air Release Valve (Above Ground)	Updated fittings/configuration on Automatic Air Release Valve (Above Ground) Drawing

Authorization #3 - Amendments Effective May 22, 2013

Chapter Three (3)	Section Name	Amendment Description
Standard Drawing	GR-21 MJ Tapping Sleeve and Gate Valve Assembly (Typical)	Updated the drawing with a note added for Flange Gasket (250 PSI WWP)

Authorization #5 - Amendments Effective September 10, 2014

Chapter Three (3)	Section Name	Amendment Description
Section 310	2.14 Salvage	Eliminated reference to specific items
Section 313	Installation of Pipe Specifications - 3.03.D Locating Wire	Changed "Tracer" to "Locating", Reword using "Continuity"
Section 314	Part 4 Installation - 4.02. Quality Assurance - E.	Add "Locating"
Standard Drawings	GR-07 Gate Valve and Box (Shallow)	Updated various notes (Locating, Test Station Box)
Standard Drawings	GR-08 Butterfly Valve and Box (Shallow) (For Storage Tank Isolation Use Only)	Updated various notes (Locating, Test Station Box)
Standard Drawings	GR-09 Plug Valve (Shallow) (For Wastewater Treatment Facility Use Only)	Updated various notes (Locating, Test Station Box)
Standard Drawings	GR-12 Valve Collar	Updated various notes (Locating, Test Station Box)

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Chapter Three (3)	Section Name	Amendment Description
Standard Drawings	GR-14-1 Pipe Tracer Wire	Updated various notes (Locating, Test Station Box)

Authorization #6 - Amendments Effective October 3, 2015

Chapter Three (3)	Section Name	Amendment Description
Section 314	Directional Drilling Standards and Specifications - C. HDPE Pipe - 3. e. Material Classification	Specified PE 3408/ PE4710 code designation for HDPE pipe and related fittings for directional drilling standards
Standard Drawings	GR-04 Restrained Pipe Table	Corrected pipe size diameters in table, included some text edits (tee, cap)

Authorization #7 - Amendments Effective August 4, 2016

Chapter Three (3)	Section Name	Amendment Description
Standard Drawing	GR-20-1 Potable Water and Reclaimed Water Services (Typical)	Deleted prohibition against service line connecting or terminating under a driveway

Authorization #8 - Amendments Effective November 5, 2017

Chapter Three (3)	Section Name	Amendment Description
Section 317	3.02 Installation; C.3	Added Wet Tap Test Report Form

Authorization #9- Amendments Effective November 16, 2018

Chapter Three (3)	Section Name	Amendment Description
Section 310	Part 2 – General Specifications, 2.09 Construction in Easements and Rights of Way	Right of way permit requirement
Section 312	Part 2 – Products, 2.01 Materials, E	Bedding rock of No. 67 aggregate alternative made available
Section 313	Part 3 – Execution, 3.05 Subaqueous Crossings	Remove fusible PVC from material alternatives
Section 314	Part 2 – Utilization, E	Clarify where directional drilling is permitted
Section 314	Part 3 – Design, J	Remove fusible PVC from material alternatives

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Chapter Three (3)	Section Name	Amendment Description
Section 314	Part 5 – Products, 5.03 Pipe, A-F	Remove restrained joint or fusible PVC pipe, add butt fused; remove C905, or C906 ; Delete all of B. PVC Pipe; reformat in Alpha outline C-F; Delete 6. Ductile Iron Pipe
Section 314	Part 6 – Execution, 6.04, Installation	Remove fusible PVC from material alternatives
Section 314	Part 6 – Execution, 6.05, Field Testing Installation	Delete reference to PVC Pipe (A)
Section 317	Part 3 – Execution, 3.02 Installation, C Pressure Connections, 1	Delete requirement for the contractor to provide materials; add PCU to locate and exercise isolation valves prior to tap.
Standard Drawings	GR-12 Valve Collar	Square concrete collar (inside pavement) and Round collar (outside pavement)
Standard Drawings	GR-16-1 Minimum Separation Requirements	Updated blanks with recommended values (3', 12"); revised Note #1
Standard Drawings	GR-16-2 Table of Minimum Separation Requirements	Delete
Standard Drawings	GR-19-1 SFR Utility Plan (Typical) Potable Water	Delete meter location detail (inset); all residential subdivisions have easements; two valves in the detail shown in the pavement to be relocated in the easement; 2" blow-off valve where looping is not required. (Automatic type may be required by PCU)
Standard Drawings	GR-19-2 SFR Utility Plan (Typical) Wastewater	Delete meter location detail (inset); all residential subdivisions have easements; two valves in the detail shown in the pavement to be relocated in the easement; 2" blow-off valve where looping is not required. (Automatic type may be required by PCU)
Standard Drawings	GR-19-3 SFR Utility Plan (Typical) Reclaimed Water	Delete meter location detail (inset); all residential subdivisions have easements; two valves in the detail shown in the pavement to be relocated in the easement; 2" blow-off valve where looping is not required. (Automatic type may be required by PCU)

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Chapter Three (3)	Section Name	Amendment Description
Standard Drawings	GR -20-1 Potable Water and Reclaimed Water Services (Typical)	Remove meter box from ROW (left side of diagram) and replace with meter box in easement, as on the right side of the diagram; add a sidewalk to the left side as shown on the right side of the diagram; change note #6 from Red to Orange, Change note 7 to note 6

Authorization #10 - Amendments Effective October 21, 2020

Chapter Three (3)	Section Name	Amendment Description
Section 350	General Requirements – Standard Drawings	Added GR-29 to TOC
Standard Drawings	GR-29 Bollard (Typical)	New Detail Drawing

Authorization #12 - Amendments Effective November 27, 2022

Chapter Three (3)	Section Name	Amendment Description
Section 310	Part 2 – General Specifications, 2.13 Cleaning	Contaminated pipe, material removed within 24 hours
Section 314	Part 5 – Products, Table 314-4	Establish RGB color coding
Standard Drawings	GR-12 Valve Collar	Paint valve box per RGB specification
Standard Drawings	GR-15-1 Automatic Air Release Valve (Above Ground)	Updated fittings/configuration on Automatic Air Release Valve (Above Ground) Drawing
Standard Drawings	GR-18 Residential Service Locations (Typical)	2x1x1 wye not to exceed six feet from back of curb
Standard Drawings	GR-19-1 SFR Utility Plan (Typical) Potable Water	Adjust dimensions in easement
Standard Drawings	GR -20-1 Potable Water and Reclaimed Water Services (Typical)	Delete reference to "Yolk", replace with "Y Branch"
Standard Drawings	GR -20-2 Standard Rectangular Meter Box Assembly Potable Water and Reclaimed Water	Lockable curb stop per approved material list

General Standards and Specifications

Part 1 - GENERAL

- A. This Section specifies the general design standards the DEVELOPER and ENGINEER shall comply with regarding any proposed project.
- B. Design and Plan Review:
- C. The design of potable water, wastewater and reclaimed water improvements shall be in compliance with this MANUAL. PLANS will be reviewed and approved by PCU as part of the subdivision or commercial site plan review process as specified by the LAND DEVELOPMENT CODE.
- D. Compliance with Other Regulatory Requirements:
- E. It shall be the responsibility of the DEVELOPER to obtain and comply with all applicable federal, state, and local regulatory permits.
- F. The DEVELOPER shall be financially responsible for any designs that require modification to or may adversely affect any portion of PCU's potable water, wastewater, and reclaimed water infrastructure.

Part 2 - GENERAL SPECIFICATIONS

2.01 GENERAL

- A. This Section specifies the general conditions the CONTRACTOR shall comply with regarding the construction site.
- B. Where PCU funds are being utilized, the CONTRACTOR shall have the project's limits of construction professionally color videoed using a DVD recording format prior to the start of any construction activities and immediately upon completion.
- C. All materials and products utilized as part of the approved WORK for all proposed water, wastewater, and reclaimed water improvements shall be in accordance with the "Approved Meters List", the "Approved Cross Connection Control Assemblies List", and the applicable "Approved Materials Checklist".

General Standards and Specifications

2.02 GRADES, SURVEY LINES, AND PROTECTION OF MONUMENTS

A. Grade:

1. All WORK shall be constructed in accordance with the lines and grades shown on the PLANS. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.
2. Benchmarks and base line controlling points shall be established prior to beginning work. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the WORK as possible. The CONTRACTOR shall also place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. CONTRACTOR shall remove any obstructions placed contrary to this provision.

B. Surveys:

1. The CONTRACTOR shall furnish and maintain stakes and other such materials, and give such assistance, including qualified helpers, for setting reference marks to the satisfaction of PCU and the ENGINEER.
2. The CONTRACTOR shall check such reference marks by such means as he may deem necessary and, before using this, shall call PCU's attention to any inaccuracies.
3. The CONTRACTOR shall, at his own expense, establish all working or construction lines and grades as required from the reference marks, and shall be solely responsible for the accuracy thereof.

C. Monument Preservation:

Property corners and survey monuments shall be preserved using care not to disturb or destroy them. If a property corner or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or required to be disturbed or destroyed by the construction WORK, said property corner or survey monument shall be restored by a SURVEYOR. All costs for this work shall be paid for by the CONTRACTOR.

General Standards and Specifications

2.03 UTILITY COORDINATION

A. Location of Utilities:

The CONTRACTOR shall ensure that all existing utilities in the areas of WORK are located in accordance with Sunshine State One Call regulations, Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act". The CONTRACTOR is responsible for subsurface verification of all existing utilities prior to construction. The CONTRACTOR shall utilize due care at all times when performing excavations as utility locates are not exact in nature.

1. The CONTRACTOR shall comply with Chapter 556, F.S., "Underground Facility Damage Prevention and Safety Act", Chapter 553, F.S., "Florida Trench Safety Act, Part IV", Chapter 368, F.S., "Florida Gas Safety Law, Part 1", and OSHA Standard 1926.651.
2. The CONTRACTOR shall take all reasonable precautions against damage to existing utilities. However, in the event of damage to an existing utility, the CONTRACTOR shall immediately notify the responsible official of the organization operating the interrupted utility. The CONTRACTOR shall lend all possible assistance in restoring services and shall assume all cost, charges, or claims connected with the interruption and repair of such services, as determined by Florida Statutes.
3. PCU may elect to facilitate the repair to its facilities with PCU forces. The CONTRACTOR shall reimburse PCU for all repair costs should the CONTRACTOR not act in a timely manner or is found to be negligible.
4. The CONTRACTOR shall not operate PCU valves.
5. All information received by the ENGINEER and CONTRACTOR through the review of PCU record drawings and project files shall not be relied upon by the CONTRACTOR without field verification.

B. Deviations Occasioned by Structures or Utilities:

Wherever obstructions are encountered during the progress of the WORK and interfere to such an extent that an alteration in the PLANS is required, PCU shall have the authority to order a deviation from the line and grade or arrange with the OWNERS of the structures for the removal, relocation or reconstruction of the obstructions. Where gas, water, telephone, electrical, hot water, steam or other existing utilities are an impediment to the vertical or horizontal alignment of a proposed main, PCU shall have the authority to

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order a change in grade or alignment of the proposed main. PCU shall have the authority to direct the CONTRACTOR to coordinate with all utilities and other users of the right-of-way to facilitate appropriate conflict resolutions. If a change in line or grade of a wastewater gravity main is necessary, PCU may require the installation of additional manholes to maintain the integrity of the wastewater collection system.

C. Subsurface Exploration:

The CONTRACTOR shall make such subsurface explorations as necessary to perform the WORK utilizing pot-holing, ground penetrating radar, soft digging, etc.

D. Test Pits:

Test pits for the purpose of locating underground pipeline, utilities, or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to PCU. The costs for such test pits shall be borne by the CONTRACTOR.

2.04 MAINTENANCE OF TRAFFIC AND CLOSING OF STREETS

- A. The requirements of the COUNTY, City, or FDOT, as appropriate, regarding maintenance of traffic and non-emergency road closures shall be adhered to in addition to the requirements as outlined below.
- B. The CONTRACTOR shall carry on the WORK in a manner that will cause a minimum of interruption to traffic. Where traffic must cross open trenches, the CONTRACTOR shall provide suitable bridges at street intersections and driveways. The CONTRACTOR shall post suitable signs indicating that a street is closed with necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets, the CONTRACTOR shall notify and obtain the approval of responsible authorities and PCU.
- C. Unless permission to temporarily close a street is received in writing from the proper authority (COUNTY, City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the CONTRACTOR's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to PCU.
- D. Detours around construction will be subject to the approval of the authority having jurisdiction and PCU. Where detours are permitted, the

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CONTRACTOR shall provide all necessary barricades and signs as required to divert the flow of traffic. The CONTRACTOR shall expedite construction operations while traffic is detoured. Time periods when traffic is being detoured will be established by COUNTY, FDOT or prevailing authority.

2.05 PROTECTION OF PUBLIC AND PROPERTY

A. Barricades, Guards and Safety Provisions:

1. The CONTRACTOR shall be solely responsible for adhering to the rules and regulations of OSHA and appropriate authorities regarding safety provisions. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, lights and guards as required shall be placed and maintained by the CONTRACTOR at his expense during the progress of the WORK and until it is safe for traffic to use the roads and streets. Material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor.
2. Signage and barricades shall be placed in accordance with the ENGINEER's Maintenance of Traffic Plan which shall comply with the provisions of Section 600 of the FDOT Design Manual, as a minimum.
3. During construction, pedestrian corridors shall be maintained in a safe, passable, and stabilized manner. Measures utilized shall include, but not be limited to, boardwalks or stabilized pathways. The CONTRACTOR shall be solely responsible for coordination with the School Board for potential construction impacts to schools and school crossings. Closure of any sidewalks and/or school crossings near schools shall require coordination with the School Board and written authorization from PCU if construction is conducted when schools are in session.

B. Protection of Utility Structures:

Temporary support, adequate protection and maintenance of all underground and surface utility structures including drains, sewers, manholes, hydrants, valves, valve covers, power poles and miscellaneous other utility structures encountered in the progress of the WORK shall be furnished by the CONTRACTOR at his expense. Any such structures that may have been disturbed shall be restored upon completion of the WORK. PCU's valves, hydrants, manholes, and other appurtenances shall be made accessible to PCU's personnel during all phases of construction.

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C. Open Excavation:

All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The CONTRACTOR shall, at his own expense, provide suitable and safe bridges with handrails and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions, but shall be limited to 300 linear feet unless otherwise approved by PCU. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, PCU may require special construction procedures such as limiting the length of open trench, fencing, prohibiting excavated material in the street and requiring that the trench shall not remain open overnight. The CONTRACTOR shall take precautions to prevent injury to the public due to open trenches. All trenches excavated material, equipment or other obstacles that could be dangerous to the public shall be barricaded and well lighted at night. OSHA Regulations shall apply to all open excavations.

D. Protection of Trees and Shrubs:

The CONTRACTOR, at his expense, shall protect all trees and shrubs not shown to be removed on the PLANS, in accordance with COUNTY regulations. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the CONTRACTOR or his employees shall be replaced in accordance with COUNTY regulations at the sole expense of the CONTRACTOR.

E. Protection of Lawn Areas:

Lawn areas shall be left in as good or better condition as before starting of the WORK. Where sod is to be removed it shall be carefully restored with new sod of the same type.

F. Restoration of Fences:

Any fence, or part thereof, that is damaged or removed during the course of the WORK shall be replaced or repaired by the CONTRACTOR and shall be left in as good a condition as before the starting of the WORK. The manner in which the fence is repaired or replaced and the materials used shall be subject to the approval of PCU.

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G. Protection Against Siltation and Bank Erosion:

The CONTRACTOR shall follow federal, state and local permit requirements.

2.06 ACCESS TO PUBLIC SERVICES

- A. Neither the materials excavated nor the materials or equipment used in the construction of the WORK shall be so placed as to prevent free access to public services. All excavated material shall be piled in a safe manner that will not endanger the WORK and that will avoid obstructing streets, sidewalks and driveways. Excavated material suitable for backfilling shall be stockpiled separately on the site. No material shall be placed closer than two feet from the edge of an excavation. Fire hydrants, valve pit covers, valve boxes, curb stop boxes or other utility controls shall be left unobstructed, staked with silt fencing to properly identify, and remain accessible during construction. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural watercourses shall not be obstructed or polluted. Surplus material and excavated material unsuitable for backfilling shall be transported and disposed of off the site in disposal areas obtained by the CONTRACTOR.

2.07 PUBLIC NUISANCE

- A. The CONTRACTOR shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands or excessive noise or dust. The CONTRACTOR shall eliminate noise to as great an extent as practicable at all times.

2.08 CONSTRUCTION HOURS

WORK shall be performed during NORMAL WORKING HOURS unless written authorization has been granted by PCU. The CONTRACTOR shall reimburse PCU for overtime pay resulting from inspection activities conducted after NORMAL WORKING HOURS. Prior to the start of any WORK, written notification shall be provided to PCU a minimum of two NORMAL WORKING DAYS.

2.09 CONSTRUCTION IN EASEMENTS AND RIGHTS-OF-WAY

- A. Construction within Easements:
1. In easements across private property, the CONTRACTOR shall confine all operations within the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or

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other type of surface improvements located in easements will require protection during construction. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement.

2. In general, the easement area is intended to provide reasonable access and working area for efficient operation by the CONTRACTOR. Where easement space for efficient operation is not provided, the CONTRACTOR shall be responsible for organizing his operations to perform within the restrictions shown on the PLANS.

B. Construction in FDOT Right-of-Way:

The CONTRACTOR shall strictly adhere to the requirements of the FDOT permit conditions where construction work is in a right-of-way under the jurisdiction of the State of Florida and shall take care to avoid any unreasonable traffic conflicts due to the WORK in road right-of-way.

C. Construction in COUNTY Right-of-Way:

WORK performed within a COUNTY maintained public right-of-way or easement shall be governed by the COUNTY UTILITY PERMIT. In areas where project has Level 2 approval, a COUNTY right-of-way permit is not required.

2.10 SUSPENSION OF WORK DUE TO WEATHER

During inclement weather, all WORK shall be suspended which might be damaged or rendered inferior by such weather conditions. The WORK shall be suitably covered, protected and/or backfilled to protect the WORK and public from damage or injury.

2.11 USE OF CHEMICALS

Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must indicate approval of either United States Environmental Protection Agency, National Safety Foundation, or United States Department of Agriculture. Use of such chemicals and disposal of residues shall be in strict conformance with label instructions. Material Safety Data Sheets (MSDS) for chemicals used during project construction shall be submitted to PCU for approval and then located within the construction trailer or with the project superintendent throughout the construction period.

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2.12 COOPERATION WITH OTHER CONTRACTORS AND FORCES

During construction progress, it may be necessary for other contractors and persons employed by PCU to work in or about the site. The CONTRACTOR shall not impede or interfere with the work of such other contractors and shall cooperate with the other contractor(s) for proper prosecution of the work.

2.13 CLEANING

A. During Construction:

During construction the CONTRACTOR shall, at all times, keep the construction site and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of PCU, such material, debris, or rubbish constitutes a nuisance or is objectionable. Contaminated pipe material removed during construction such as force main and/or gravity sewer pipes must be removed from the site no later than 24 hours after excavation and disposed of in accordance with applicable regulations.

B. Final Cleaning:

At the conclusion of the WORK, all tools, temporary structures and materials belonging to the CONTRACTOR shall be promptly taken away. The CONTRACTOR shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

2.14 SALVAGE

Any existing PCU owned equipment or material which is removed or replaced as a result of construction, may be designated as salvage by PCU, and if so, shall be carefully excavated if necessary and delivered to PCU at a location designated by PCU.

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GENERAL REQUIREMENTS

Section 311

Site Preparations, Surface Removal, and Restoration Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section covers clearing, grubbing, and stripping of the construction sites. The CONTRACTOR shall clear and grub all of the area within the limits of construction as shown on the PLANS and approved by PCU prior to the beginning any WORK. All site WORK shall conform to the applicable COUNTY site clearing ordinance and landscaping and tree ordinances.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

- A. Clearing:

The surface of the ground for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish, and all other objectionable obstructions resting on or protruding through the surface of the ground. Clearing operations shall be conducted so as to prevent damage to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

Trees and shrubs that are designated to remain shall be protected as specified in the Section entitled "General Standards and Specifications".

- B. Grubbing:

Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris resting on, under, or protruding through the surface of the ground. Such deleterious materials shall be removed up to one foot below the bottom or the perimeter of any slab or structure. Water, wastewater, or reclaimed water mains shall not be installed within one foot of such deleterious materials. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

- C. Disposal of Cleared and Grubbed Material:

The CONTRACTOR shall, at his expense, dispose of all material and debris from

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Section 311

Site Preparations, Surface Removal, and Restoration Specifications

the clearing and grubbing operation in accordance with all STATE, COUNTY, and local regulations.

3.02 STRIPPING OF TOPSOIL WITHIN A COUNTY EASEMENT OR RIGHT-OF-WAY

- A. In areas so designated, topsoil shall be stripped and stockpiled. Stockpiled topsoil shall be protected until it is placed as specified. The CONTRACTOR, at the discretion of PCU, shall dispose of any remaining topsoil after all WORK is in place.

3.03 DUST CONTROL

- A. The CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. The CONTRACTOR shall use dust control methods and materials approved by PCU.

3.04 SURFACE REMOVAL

- A. The CONTRACTOR shall remove the surface materials along the proposed pipe lines, as indicated on the PLANS, only to such widths as will permit a trench to be excavated which will afford sufficient room for efficient and proper construction. Pavement removal shall be saw cut with straight lines prior to excavation. All applicable COUNTY and FDOT regulations shall be followed. Where sidewalks, driveways, pavements and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. All fractured, broken or disturbed surfaces shall be restored to their original or better condition prior to completion of the WORK.

3.05 RESTORATION

- A. Restoration of all surfaces including road subbase, soil cement, limerock base, asphaltic concrete surface, portland cement concrete pavement and driveways, sidewalks, concrete curbs, existing walls, fences, and irrigation systems shall be in strict accordance with applicable requirements of the LAND DEVELOPMENT CODE and STANDARD FDOT SPECIFICATIONS. In addition, the CONTRACTOR shall restore all storm drains, culverts, inlets and storm manholes to equal or better condition in accordance with applicable road construction specifications.
- B. All sodding, landscaping, grassing, and mulching shall be done as specified in the LAND DEVELOPMENT CODE and STANDARD FDOT SPECIFICATIONS.

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Site Preparations, Surface Removal, and Restoration Specifications

Solid sodding shall be placed on all slopes steeper than four to one, within 10 feet of all proposed structures, the two (2) feet directly adjacent to the edge of pavement or back of curb along a roadway, and where existing sod is removed or disturbed by the WORK.

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Section 312

Excavations, Backfill, Compaction, and Grading Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section covers excavation, backfill, fill, and grading associated with utility trench and structural construction. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, compaction, grading and slope protection required to complete the WORK.

1.02 SOIL BORINGS AND SUBSURFACE INVESTIGATIONS

- A. The CONTRACTOR shall examine the site and undertake subsurface investigations including soil borings, pot holing, and the use of ground penetrating radar before commencing the WORK. PCU will not be responsible for presumed or existing soil conditions in the WORK area.

1.03 EXISTING UTILITIES

- A. The CONTRACTOR shall ensure that all existing utilities in the areas of WORK are located in accordance with Sunshine State One Call regulations, Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act". The CONTRACTOR is responsible for subsurface verification of all existing utilities prior to construction. The CONTRACTOR shall utilize due care at all times when performing excavations as utility locates are not exact in nature.
- B. If utilities are to remain in place, the CONTRACTOR shall provide adequate means of protection.
- C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, the CONTRACTOR shall be responsible for resolving the utility conflicts to PCU's satisfaction.
- D. All costs for repairing damages to properly located PCU infrastructure or other utilities shall be the CONTRACTOR's responsibility in accordance with Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act".
- E. PCU shall not be responsible for uncharted or incorrectly charted water, wastewater, and reclaimed water mains or other utilities as RECORD DRAWINGS are not to be considered totally representative of subsurface conditions or existing infrastructure.

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Section 312

Excavations, Backfill, Compaction, and Grading Specifications

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

Materials for use as bedding and backfill, whether in-situ or borrow, shall be as described under this Section. The CONTRACTOR shall, upon request by PCU, make an appropriate sample of this material available for testing by PCU or its designated representative.

B. Structural Fill:

Materials for structural fill shall be bedding rock or select common fill as specified herein or other suitable material as approved by PCU.

C. Common Fill:

1. Common fill shall consist of mineral soil, substantially free of clay, organic material, muck, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger 3-1/2 inches in any dimension in the top 12 inches or six inches in any dimension in the balance of fill area. Common fill shall not contain asphalt, broken concrete, masonry, rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Additional common fill shall be in accordance with FDOT specifications, unless finer material is approved for use in a specific location by PCU.
2. Material falling within the above specifications that is encountered during the excavation may be stored in segregated stockpiles for reuse. Material that is not suitable for backfill shall be disposed as unsuitable materials.

D. Select Common Fill:

Select common fill shall be in accordance with FDOT specifications.

E. Bedding Rock:

Bedding rock shall conform to FDOT No. 57 aggregate. Contractor may propose as an alternative No. 67 aggregate for COUNTY approval.

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Section 312

Excavations, Backfill, Compaction, and Grading Specifications

PART 3 - EXECUTION

3.01 DEWATERING, DRAINAGE, AND FLOTATION

A. General:

The CONTRACTOR shall excavate, construct and place all pipelines, concrete work, fill and bedding rock, in-the-dry. In addition, the CONTRACTOR shall not make the final 24 inches of excavation until the water level is a minimum of one foot below proposed bottom of excavation. For purposes of these specifications, "in-the-dry" is defined to be within two percent of the optimum moisture content of the soil. PCU reserves the right to ask the CONTRACTOR to demonstrate that the water level is a minimum of one foot below proposed bottom of excavation before allowing the construction to proceed.

1. Discharge water shall be clear, with no visible soil particles. Discharge from dewatering shall be disposed of in such a manner that it will not interfere with the normal drainage of the area in which the WORK is being performed, create a public nuisance or form ponding. The operation shall not cause damage to any portion of the WORK completed, in progress, to the surface of streets or to private property. The dewatering operation shall comply with the requirements of National Pollutant Discharge Elimination System (NPDES) and other state and COUNTY regulatory agencies. Additionally, the CONTRACTOR shall obtain proper right of entry where private property will be involved.
2. Dewatering shall be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
3. The CONTRACTOR shall furnish all materials and equipment and perform all WORK required to install and maintain the drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
4. During backfilling and construction, water levels may be required to be measured in observation wells if found necessary by PCU. Observation wells shall be located as directed by PCU.
5. Continuous pumping will be required as long as water levels are required to be below natural levels.

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3.02 EXCAVATION

A. General:

Excavation consists of removal, storage and disposal of material encountered when establishing required grade elevations.

1. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of PCU. Unauthorized excavation, as well as remedial work directed by PCU shall be at the CONTRACTOR's expense. Remedial work shall be performed as directed by PCU.
2. If the sub-grade is unsuitable, the CONTRACTOR shall remove and replace all unsuitable material below the pipe with selected common fill or bedding rock that shall be compacted to a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.
3. If the CONTRACTOR excavates below grade, then the CONTRACTOR shall refill the excavation using select common fill or bedding rock.
4. Slope sides of excavations shall comply with local codes, ordinances, and with OSHA requirements. The CONTRACTOR shall shore and brace or use a trench box where sloping is not possible due to space restrictions or stability of the material excavated. Sides and slopes shall be maintained in a safe condition until completion of backfilling.
5. The CONTRACTOR shall stockpile satisfactory excavated materials at a location approved by PCU until required for backfill or fill.
6. Soil materials containing top soils and associated materials shall be located away from the edge of any excavations.
7. No excavated materials shall be placed within 2 feet of the edge of any excavations.

B. Excavations for Structures:

All such excavations shall conform to the elevations and dimensions shown on drawing within a tolerance of plus or minus 0.10 feet.

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C. Trench Excavation:

Excavation for trenches required for the installation of utility pipes shall be made to the depths indicated on the approved PLANS to provide suitable room for laying the size and type of pipe specified.

1. Excavations shall not exceed normal trench width as specified in the STANDARD DRAWINGS. Any excavation that exceeds the normal trench width shall require special backfill requirements as determined by PCU.
2. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade in such a manner that will give a shaped bottom, true to grade, so that pipe can be evenly supported on undisturbed material, as specified in the STANDARD DRAWINGS. Bell holes shall be made as required.

3.03 SHORING

A. General:

Shoring, that meets OSHA standards, shall be utilized to prevent soil movement that could in any way diminish the width of the excavation. All adjacent structures, existing piping and/or foundation material shall be protected from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. Miscellaneous Requirements:

Unless otherwise approved or indicated on the approved PLANS, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specially adapted to that purpose, by watering or otherwise as may be directed.

3.04 BEDDING AND BACKFILL

A. General:

Material placed in fill areas under and around structures and pipelines shall be deposited within the lines and to the grades shown on the approved PLANS making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces that have been inspected and approved by PCU.

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1. Fill shall be brought up in uniform 6-inch compacted maximum level lifts starting with the deepest portion of the fill up to 12 inches above the top of pipe with the remaining fill to be placed in accordance with the requirements of the Agency having jurisdiction over the location at which the WORK is performed. As a minimum, the CONTRACTOR shall follow FDOT Standard Specifications for Roads and Bridge Construction Section 125 "Excavation for Structures and Pipe" (latest edition) when working within COUNTY rights-of-way and easements.
 2. Fill shall be placed and spread in layers by an approved method. Prior to the process of placing and spreading, all materials not meeting those specified under this Section, shall be removed from the fill areas.
 3. Fill materials shall be placed and compacted "in-the-dry". The CONTRACTOR shall dewater excavated areas as required to perform the WORK and in such manner as to preserve the undisturbed state of the natural inorganic soils. Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials. When existing ground surface has a density less than that specified under this Section for the particular area classification, the CONTRACTOR shall break up the ground surface, pulverize, moisture-condition to the optimum moisture content and compact to required depth and percentage of maximum density.
 4. The CONTRACTOR shall moisture condition soils for proper compaction. Material that is too wet shall be replaced.
 5. The entire surface of the WORK shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section.
- B. Bedding and Backfill for Structures:

Bedding rock shall be used for bedding under all structures, as indicated on the STANDARD DRAWINGS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed. Select common fill shall be used as backfill against the exterior walls of the structures. Fill shall be compacted sufficiently in accordance with this Section.

1. Backfilling shall be carried up evenly on all walls of an individual structure. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.

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2. In locations where pipes pass through structure walls, the CONTRACTOR shall take precautions to consolidate the fill up to the spring line of all portions of the pipe that extend beyond the structure. Select common fill in such areas shall be placed in accordance with the requirements of the entity having jurisdiction over the location at which the WORK is being performed.
3. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the approved PLANS. No soft spots or uncompacted areas will be allowed in the WORK.
4. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

C. Bedding and Backfill for Pipes:

Bedding for pipe shall be as shown on the approved PLANS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

1. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected. All backfilling shall be prosecuted expeditiously and as detailed on the STANDARD DRAWINGS.
2. Any space remaining between the pipe and sides of the trench shall be carefully backfilled, spread by hand, or approved mechanical device and thoroughly compacted evenly on both sides of the pipe with a tamper as fast as placed to a level of one foot above the top of the pipe in lifts with a minimum compacted thickness as specified by the entity having jurisdiction over the location at which the WORK is performed.
3. The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted in accordance with the requirements of the entity having jurisdiction over the location at which the WORK is performed.
4. Compaction shall be in accordance with this Section and the STANDARD DRAWINGS.

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D. Flowable Fill:

Where roadways and other improved sections are required to be open cut, the use of excavatable flowable fill may be required by PCU in lieu of soil backfill should time be of the essence. Accelerators and other additives shall be permitted as deemed necessary by the CONTRACTOR with the approval of PCU.

The flowable fill design mix shall be in accordance with FDOT specifications for excavatable flowable fill.

Should the entity having jurisdiction over the WORK require a different design mix than that specified in this MANUAL, the CONTRACTOR shall notify PCU of this requirement prior to its use.

3.05 COMPACTION

A. General:

The CONTRACTOR shall control soil compaction during construction to provide the percentage of maximum density specified. When utility work is conducted within FDOT, County, or municipal right-of-way, the more stringent minimum density standards shall apply.

B. Percentage of Maximum Density Requirements:

1. When a pipe or structure is placed under or within six feet of an improved or paved surface, fill or undisturbed soil from the bottom of the pipe trench to one foot above the pipe and then to the finished grade elevation shall be compacted to a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.
2. For areas not within six feet of an improved or paved surface, a minimum density of 95 percent of the maximum dry density based on AASHTO T-180 shall be obtained.

C. Compaction Tests:

One compaction test location shall be required for each 300 linear feet of pipe and for every 100 square feet of backfill around structures as a minimum. PCU may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests shall be in conformance with the following schedule.

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1. One test at the spring line of the pipe.
2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for pipes 24 inches and larger.
3. One test at an elevation of one foot above the top of the pipe.
4. One test for each two feet of backfill placed from one foot above the top of the pipe to finished grade elevation.
5. Tests shall be staggered around each manhole and lift station's wet well and valve vault within three feet of each structure's outside perimeter in accordance with the following schedule.
 - i. First test shall be one foot above the structure base; and
 - ii. Second test shall be two feet above first test
 - iii. Subsequent tests shall be every two feet up to finished subgrade.
6. One test under the center of each lift station wet well base. Compaction shall have a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.
7. The CONTRACTOR shall provide additional compaction and testing prior to commencing further construction if the ENGINEER's testing reports and inspection indicate that the fill that has been placed is below specified density.

3.06 GRADING

- A. All areas within the limits of construction, including transition areas, shall be uniformly graded to produce a smooth uniform surface. Areas adjacent to structures or paved surfaces shall be graded to provide positive drainage away from structures and pavement. Ponding shall be prevented. After grading, the area shall be compacted to the specified depth and percentage of maximum density, and outlined in this Section.
- B. No grading shall be done in areas where there are existing pipelines that may be uncovered or damaged until such lines have been relocated.

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3.07 MAINTENANCE

- A. The CONTRACTOR shall protect newly graded areas from traffic and erosion and keep them free of trash and debris. The CONTRACTOR shall repair and reestablish grades in settled, eroded, and rutted areas.

3.08 INSPECTION AND QUALITY ASSURANCE

- A. Inspection:

The CONTRACTOR shall examine the areas and conditions under which excavating, filling, and grading are to be performed and not proceed with the WORK until unsatisfactory conditions have been corrected.

- 1. The CONTRACTOR shall examine existing grade prior to commencement of WORK and report to PCU if elevations of existing grade vary from elevations shown on approved PLANS.

- B. Quality Assurance:

All WORK shall be performed in compliance with applicable requirements of governing authorities having jurisdiction.

- 1. The CONTRACTOR, at his expense, shall engage soil testing and inspection services for quality control testing during earthwork operations.
- 2. Quality control testing shall be performed during construction to ensure compliance with these specifications. The CONTRACTOR shall assist the testing service as necessary. The CONTRACTOR shall allow the testing service to inspect and approve fill materials and fill layers before further construction is performed. The CONTRACTOR shall give copies of all test results in a report form to PCU to demonstrate compliance with compaction requirements stipulated in this Section.

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Installation of Pipe Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. These specifications cover the pipe installation for potable water mains, wastewater force mains, reclaimed water mains and wastewater gravity mains.
- B. The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of project completion. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

1.02 PIPE STORAGE AND HANDLING

- A. Pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of PCU or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of PCU, is damaged beyond repair by the CONTRACTOR shall be removed from the site of the WORK and replaced with another unit.
- B. When applicable, joint gaskets shall be stored in a clean, dark, and dry location until immediately before use.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS AND APPURTENANCES

- A. Potable Water Mains:

Refer to the Section entitled "Potable Water System Standards and Specifications".

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B. Raw Water Mains:

Refer to the Section entitled "Raw Water System Standards and Specifications".

C. Gravity Wastewater Mains:

Refer to the Section entitled "Gravity Wastewater System Standards and Specifications".

D. Wastewater Force Mains:

Refer to the Section entitled "Wastewater Pipes, Valves, and Appurtenances Specifications".

E. Reclaimed Water Mains:

Refer to the Section entitled "Reclaimed Water System Standards and Specifications".

PART 3 - EXECUTION

3.01 SURVEY LINE AND GRADE

A. Pressure Mains:

Pipe shall be laid to the lines and grades shown on the PLANS. The CONTRACTOR shall utilize line and grade stakes at intervals sufficient to insure that construction is accomplished at the designed line and grade, including all valve locations, jack and bores beginning and ending points, directional bore beginning and ending points, air release valves, and at all line and/or grade change locations. The CONTRACTOR shall provide temporary bench marks at a maximum of 1,000-foot intervals. The minimum pipe cover shall be 36 inches below the finished grade surface or 36 inches below the elevation of the edge of pavement of the road surface whichever is greater.

B. Gravity Mains:

The CONTRACTOR shall set temporary bench marks at sufficient intervals to insure that construction is accomplished at the designed line and grade. The CONTRACTOR shall constantly check line and grade of the pipe by laser beam method. In the event line and grade do not meet specified limits described hereinafter, the WORK shall be immediately stopped, PCU notified and the cause remedied before proceeding with the WORK.

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3.02 PIPE PREPARATION AND HANDLING

- A. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation of connected pipe greater than one inch. The CONTRACTOR shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
- B. Proper implements, tools and facilities shall be used for the safe and proper protection of the WORK. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.

3.03 PIPE INSTALLATION

- A. Trench Preparation and Pipe Bedding:

Refer to the Section entitled "Excavation, Backfill, Compaction, and Grading Specifications" and the STANDARD DRAWINGS.

- B. Trench Dewatering and Drainage Control

Refer to the Section entitled "Excavation, Backfill, Compaction and Grading Specifications". CONTRACTOR shall prevent water from entering trench during excavation and pipe-laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

- C. Pipe Laying in Trench:

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. At times when pipe is laying is not in progress; the open ends of the pipe shall be closed by a means approved by PCU to ensure cleanliness inside the pipe. The color stripe shall be viewed from the top when installed.

- D. Locating Wire:

Locating wire for electronically locating the pipe after it is buried shall be securely attached along the entire length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. The locating wire shall be attached to the pipe with nylon wire ties or by other means approved by

Installation of Pipe Specifications

PCU, as shown in the STANDARD DRAWINGS. The wire itself shall be 14-gauge single strand solid core copper wire with non-metallic insulation, except that HDPE pipe installed by directional bore shall utilize two insulated 14 gauge locating wires or one single insulated 10 gauge wire specifically designed for directional bored installation. The insulation shall be color coded for the type of pipe being installed. Continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using waterproof wire connectors approved for underground applications as listed in the Florida Electrical Code. The wire shall extend to the surface and be connected to a test station box at valve locations, as shown in the STANDARD DRAWINGS.

E. Pipe Identification:

All pipes shall be identified in accordance with the STANDARD DRAWINGS.

F. PVC Pipe Installation:

PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe", AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer. At no time shall the bell end be allowed to go passed the "insertion line". A gap between the end of the spigot and the adjoining pipe is necessary to allow for expansion and contraction.

G. Ductile Iron Pipe Installation:

Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA Manual M-42.

H. HDPE pipe installation:

HPDE pipe installation shall follow the methods described in the most recent revision of the "Plastic Pipe Institute Handbook".

I. Installation of Pipes on Curves:

1. Long radius curves, either horizontal or vertical, may be installed with standard pipe by deflections at the joints. Maximum deflections at pipe joints, fittings and laying radius for the various pipe lengths shall not exceed the pipe manufacturer's recommendation.

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2. No deflection or bending is allowed in PVC pipe. Alignment change shall be made only with fittings.

3.04 INSTALLATION OF APPURTENANCES:

A. Appurtenances:

Valves, fire hydrant assemblies, blow-off assemblies, line markers, and combination air and vacuum release valve assemblies are to be installed at the locations shown on the plans and as shown in the STANDARD DRAWINGS. Valves and fire hydrant assemblies shall be restrained to the pipeline they are connected to. In addition, the pipeline shall be restrained as required by the use of approved materials from manufacturers listed in the appropriate "Approved Materials Checklist". The distance of pipeline restraint shall not be less than shown in the STANDARD DRAWINGS.

B. Service Lines:

Service lines shall be installed to service intended properties as shown on the PLANS and in the manor as shown in the STANDARD DRAWINGS.

C. Valve Boxes:

Valve boxes in non-paved areas shall be installed with a valve collar as shown in the STANDARD DRAWINGS.

D. Fittings:

When fittings are required to be restrained along a pressure pipeline, both the pipe and fitting shall be restrained by the use of approved materials from manufacturers listed in the appropriate "Approved Materials Checklist". The distance of pipeline restraint shall be not less than as shown in the STANDARD DRAWINGS.

E. Pressure and Non-Pressure Connections:

Any connection to the existing piping system shall be scheduled in accordance with this MANUAL.

3.05 SUBAQUEOUS CROSSINGS

- A. The preferred method of crossing bodies of waters is subaqueous means. PCU may approve other construction means or methods addressing special conditions.

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- B. A minimum cover of three feet shall be maintained over the pipe. HDPE, restrained joint PVC, or restrained joint ductile iron pipe shall be used. Pipe joints shall not be located under the bottom of a swale or ditch. Where the swale or ditch bottom width requires the placement of a pipe joint under it, the carrier pipe shall be placed with a steel casing in a manner that conforms to that used in jack and bore installations. Subaqueous pipe crossings of swales and ditches shall require a protective four-inch-thick reinforced concrete slab to be installed above the pipe but beneath the bottom of bottom of the swale or ditch as shown in the STANDARD DRAWINGS.
- C. Valves shall be provided at both ends of the water crossings so that the section can be isolated for testing or repair. The valves shall be easily accessible and installed, as shown in the STANDARD DRAWINGS, at locations not subject to flooding.
- D. Air release valves shall be installed as shown in the STANDARD DRAWINGS at the upstream high point prior to the subaqueous crossing. Valves shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be installed in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass. The end of the air release valve discharge pipe shall be a minimum of 12 inches above finish grade and installed as shown on the STANDARD DRAWINGS.
- E. It shall be the responsibility of the DEVELOPER to obtain all applicable regulatory permits, including dredge and fill permits to perform the WORK.

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Directional Drilling Standards and Specifications

PART 1 - GENERAL

- A. Horizontal directional drilling is a method of installation commonly referred to as directional drilling or guided horizontal boring.

PART 2 - UTILIZATION

- A. Directional drilling shall be allowed for pressurized mains.
- B. Directional drilling of force mains shall be restricted and require specific approval by PCU on a case by case basis.
- C. If a minimum slope of 1.00 percent is maintained, directional drilling may be utilized for gravity main installation on a case by case basis as approved by PCU.
- D. DI pipe shall only be utilized for water and reclaimed water mains.
- E. Longitudinal alignment installations along roadways may be considered by PCU on a case by case basis as approved by PCU.

PART 3 - DESIGN

- A. Horizontal alignment shall be as shown on the PLANS. The pipe shall have a minimum 36 inches of cover.
- B. The maximum depth shall be as shallow as physically possible while complying with all regulatory and manufacturers requirements. In no case, shall the minimum clearance from existing or, under special circumstances, proposed utilities to be crossed be less than 18 inches.
- C. Pipe diameter sizes for horizontal directional drill installations shall be in accordance with this MANUAL.
- D. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.
- E. For sub-aqueous crossings, a minimum cover of five feet shall be maintained over the pipe.

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Directional Drilling Standards and Specifications

- F. The use of separate couplings to join sections of HDPE pipe shall be restricted to non-paved areas and depths of less than 6 feet below finish grade.
- G. Compound curvatures may be used, but shall not exceed the maximum deflections, as set forth by the pipe manufacturer or AWWA Standards, whichever is more stringent.
- H. Entry angle shall not exceed 15 degrees. Exit angle shall not exceed 12 degrees to facilitate pullback.
- I. A geotechnical subsurface report certified by an ENGINEER shall be provided to PCU, when required.
- J. When HDPE pipe connects to either push-on joint DI or PVC pipes, the DI or PVC pipes shall be restrained on either side of the point of connection with the HDPE section of pipe as specified in the applicable Restrained Pipe Table in the STANDARD DRAWINGS.

PART 4 - INSTALLATION

4.01 SCOPE OF WORK

The WORK specified in this Section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This WORK shall include all piping services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities, and environmental protection and restoration.

4.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Directional drilling CONTRACTOR (or SUBCONTRACTOR) shall have demonstrated experience constructing water, wastewater, or reclaimed water experience to include pipelines of the same or larger diameter and the same or greater lengths. All pipe and appurtenances of similar type and material shall be furnished by a single manufacturer.
 - 2. The CONTRACTOR's operations shall be in conformance with the Directional Crossing Contractors Association (DCCA) published

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guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

B. Jurisdiction:

For crossings under roadways or other installations within rights-of-way and easements under the jurisdiction of the COUNTY or other entity, the CONTRACTOR shall comply with regulations of the agency with said authority. State highway casing installations shall conform to the FDOT, "Utility Accommodation Guide".

C. The CONTRACTOR shall verify existing utility location prior to constructing drilling and receiving pits.

D. Subaqueous crossings shall also adhere to the requirements of the Section entitled "Installation of Pipe Specifications".

E. Locating wire shall be installed along the length of all directional drill mains. Two insulated 14 gauge locating wires or one single insulated 10-gauge wire specifically designed for locating directional bored mains shall be utilized. The insulation of the wire shall be color coded for the type of pipe being installed. Continuous continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using waterproof wire connectors approved for underground applications as listed in the Florida Electrical Code. The wire shall extend to the surface and be connected to a test station box at valve locations, as shown in the STANDARD DRAWINGS.

PART 5 - PRODUCTS

5.01 GENERAL

A. The directional drilling equipment shall consist of the following:

- a. A directional drilling rig of sufficient capacity to perform the bore and pull-back the pipe;
- b. A drilling fluid mixing, delivery and recovery system of sufficient capacity to complete the crossing;
- c. A drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused;
- d. A magnetic guidance system to accurately guide boring operations,

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- e. A vacuum truck of sufficient capacity to handle the drilling fluid volume, if required; and
 - f. Trained and competent personnel to operate the system.
- B. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in proper working order.

5.02 DRILLING SYSTEM

- A. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill 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 crossing. 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. The rig shall be grounded during drilling and pullback operations. There shall be a system to detect electrical current from the drilling string and an audible alarm that automatically sounds when an electrical current is detected.

5.03 PIPE

- A. Pipe shall be butt fused HDPE with ductile iron pipe outside diameters in accordance with AWWA C900. The dimension ratio shall be verified by the CONTRACTOR based on the pipe, joint and material pull strength required for the directional drilling.
- B. HDPE Pipe
- 1. HDPE pipe and related fittings shall be made with prime virgin resins exhibiting a minimum cell classification as defined in ASTM D3350 and meeting the PE 3408/PE 4710 code designation with maximum dimension ratios equal to the following.

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Table 314-3. Maximum Dimension Ratios for HDPE Pipe.

Type of Pipe System	Maximum Dimension Ratio
Wastewater	11
Reclaimed Water	11
Water	11

- C. HDPE pipe 4-inch and larger nominal diameter shall be joined by means of zero leak-rate butt (thermal heat) fusion welds and/or approved flanged joints. Joints shall provide axial pullout resistance. Pipe shall meet the requirements of ANSI/AWWA C906, and have an outside diameter dimension of ductile iron pipe. Flanged joints shall not be used below finished grade for horizontal directional drilling applications. The use of separate couplings to join sections of HDPE pipe shall be restricted to non-paved areas and depths of less than 6 feet below finish grade.

- D. HDPE pipe shall have been continuously marked by the manufacturer with permanent printing indicating at a minimum the following.
 - a. Nominal size (inches);
 - b. Dimension ratio (DR);
 - c. Pressure rating (psi);
 - d. Trade name;
 - e. Material classification (PE 3408/ PE 4710);
 - f. Plant, extruder and operator codes;
 - g. Resin supplier code;
 - h. Date produced; and
 - i. HDPE pipe used for portable water mains shall bear the NSF Seal of Approval.

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Directional Drilling Standards and Specifications

- E. HDPE pipe shall be black in color with permanent colored stripes extruded into the pipe along its entire length, a single painted stripe along its entire length, or shall be one solid color, per the applicable service.

Table 314-4. Pipe Color.

Pipe Use	Color Coding
Potable Water	Blue (RGB: 0, 204, 255)
Wastewater	Green (RGB: 0,255, 0)
Reclaimed Water	Purple (RGB: 204, 153, 255)

- F. Installation Curvature:

The pipeline curvature shall not have a radius less than as shown in Table 314-5.

Table 314-5. HDPE Pipe Deflection Information.

Pipe Diameter (inches)	Minimum Radius of Curvature (feet)	Offset per 20-ft Length (inches)
4	23	9.3
6	34	6.1
8	44	4.6
10	56	3.5
12	67	3.0
16	88	2.3

Note: Deflections for pipe diameters larger than 16" shall be in accordance with the pipe manufacturer's recommendations.

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Directional Drilling Standards and Specifications

5.04 DRILLING FLUIDS

- A. Drilling fluids shall consist of a mixture of potable water and gel-forming colloidal material, such as bentonite or a polymer surfactant mixture producing slurry of custard-like consistency.

PART 6 - EXECUTION

6.01 PERSONNEL REQUIREMENTS

- A. Responsible representatives of the CONTRACTOR and SUBCONTRACTOR(s) shall be present at all times during directional drilling operations. A responsible representative as specified herein is defined as a person experienced in the type of WORK being performed and who has the authority to represent the CONTRACTOR in a routine decision making capacity concerning the manner and method of carrying out the WORK.
- B. The CONTRACTOR and SUBCONTRACTOR(s) shall have sufficient number of competent workers on the project at all times to ensure the utility placement is made in a timely, satisfactory manner. Adequate personnel for carrying out all phases of the directional drilling operation (where applicable: tunneling system operators, operator for removing spoil material, and laborers as necessary for various related tasks) must be on the job site at the beginning of WORK. A competent and experienced supervisor representing the CONTRACTOR or SUBCONTRACTOR that is thoroughly familiar with the equipment and type of WORK to be performed, must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the project site during the directional drilling operation.
- C. The equipment operator of the directional drilling machine shall provide written proof to PCU of sufficient training on and shall be certified to operate the machinery that is being used on the project.
- D. Prior to beginning WORK and if required by PCU, the CONTRACTOR must submit a WORK plan to PCU detailing the procedure and schedule to be used to execute the project. The WORK plan should include the following.
 - a. A description of all equipment to be used;
 - b. Down-hole tools;
 - c. A list of personnel and their qualifications and experience;

Directional Drilling Standards and Specifications

- d. List of SUBCONTRACTORS;
 - e. A schedule WORK activity;
 - f. A safety plan, traffic control plan (if applicable);
 - g. An environmental protection plan and;
 - h. Contingency PLANS for possible problems.
- E. WORK plan must be comprehensive, realistic, and based on actual working conditions for this particular project. Plan must document the requirements to complete the project.
- F. Equipment:
- 1. If required by PCU, the CONTRACTOR will submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Equipment shall include but not be limited to the following.
 - a. Drilling rig;
 - b. Mud system;
 - c. Mud motors (if applicable);
 - d. Down-hole tools;
 - e. Guidance system and;
 - f. Rig safety systems.
 - 2. If required by PCU, calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that the CONTRACTOR intends to use or might use shall be submitted.

6.02 COORDINATION OF THE WORK

- A. The CONTRACTOR shall notify PCU at least three days in advance of starting WORK.
- B. The CONTRACTOR and PCU shall select a mutually convenient time for the crossing operation to begin in order to avoid schedule conflicts.

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GENERAL REQUIREMENTS

Section 314

Directional Drilling Standards and Specifications

- C. The actual crossing operation shall not begin until PCU is present at the project site and agrees that proper preparations for the crossing have been made. PCU's approval for beginning the crossing shall in no way relieve the CONTRACTOR from the ultimate responsibility for the completion of the WORK.

6.03 PROCEDURE

- A. The installation of appropriate safety and warning devices in accordance with the "FDOT Manual on Traffic Control and Safe Practices" shall be completed prior to beginning WORK.

6.04 INSTALLATION

- A. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud will be disposed of off-site in accordance with local, state and federal requirements and/or permit conditions.

- 1. No other chemicals or polymer surfactant shall be used in the drilling fluid without written consent of PCU and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.

- B. Pilot Hole:

Pilot hole shall be drilled on bore path with no deviations greater than two percent of depth over a length of 100 feet. In the event that pilot does deviate from bore path more than two percent of depth in 100 feet, the CONTRACTOR will notify ENGINEER. The ENGINEER may require the CONTRACTOR to pull-back and re-drill from the location along bore path before the deviation.

- C. Reaming:

Upon successful completion of pilot hole, the CONTRACTOR will ream borehole to a minimum of 25 percent greater than outside diameter of pipe using the appropriate tools. CONTRACTOR will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

- D. Pullback:

Directional Drilling Standards and Specifications

After successfully reaming borehole to the required diameter, CONTRACTOR will put the pipe through the borehole. In front of the pipe will be a swivel and barrel reamer to compact bore hole walls. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into borehole. During pullback operations, the CONTRACTOR shall not apply more than the maximum safe pipe pull pressure at any time. A break away head rated at the maximum safe pull pressure shall be utilized.

- E. The CONTRACTOR shall submit any proposed deviations from the design bore path with SHOP DRAWINGS.
- F. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe.
- G. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until PCU and ENGINEER have been consulted.
- H. The pipe shall be pulled back through the borehole using the wet insertion construction technique.
- I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- J. A continuous location log of all drilling activities shall be maintained by the equipment operator and produced for PCU review upon request. A legible copy of the log shall be provided to PCU upon completion of the directional drilling operation. Horizontal and vertical locations shall be noted every 25 feet.
- K. When HDPE pipe is to be connected to PVC or DI Pipe, mechanical joint adapters shall be utilized.
- L. When HDPE pipe connects to either push-on joint DI or PVC pipes, the DI or PVC pipes shall be restrained on either side of the HDPE section of pipe as specified under the heading entitled Point of Connection with HDPE Pipe in the applicable Restrained Pipe Table in the STANDARD DRAWINGS.

6.05 FIELD TESTING

- A. HDPE Pipe:

Directional Drilling Standards and Specifications

- B. The CONTRACTOR shall perform hydrostatic testing for leakage following installation in accordance with the applicable testing and inspection sections of this MANUAL. Ductile Iron Pipe
 - 1. The CONTRACTOR shall test all installed DI pipe in accordance with AWWA C600. Pressure Testing:

The test pressure for installed pipes shall be 150 psi for water and reclaimed water and 150 psi for wastewater.

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GENERAL REQUIREMENTS

Section 315

Jack and Bore Standards and Specifications

PART 1 - GENERAL

- A. Jack and boring is a method of pipe installation that includes the traditional jack and bore and micro tunneling processes.

PART 2 - UTILIZATION

- A. Jack and bore shall be allowed for pressurized mains. The installation of gravity mains by the jack and bore method may be allowed by PCU on a case by case basis.

PART 3 - DESIGN

- A. The casing shall have a minimum 36 inches of cover.
- B. The maximum depth shall be as shallow as physically possible while complying with all regulatory and manufacturers requirements. In no case, shall the minimum clearance from existing or, under special circumstances, proposed utilities to be crossed be less than 18 inches.
- C. A geotechnical subsurface report certified by an ENGINEER shall be provided to PCU if required.

PART 4 - MINIMUM CASING DIAMETER

- A. The minimum casing diameter and wall thickness shall be in accordance with Table 315.1 below.

Table 315-1. Casing Pipe Minimal Nominal Diameter and Wall Thickness.

Carrier Pipe Nominal Diameter (in.)	Casing Outside Diameter (in.)	Casing Wall Thickness (in.)
4	12	.250"
6	16	.250"
8	18	.250"
10	20	.250"
12	24	.250"

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Section 315

Jack and Bore Standards and Specifications

Carrier Pipe Nominal Diameter (in.)	Casing Outside Diameter (in.)	Casing Wall Thickness (in.)
16	30	.312"
20	36	.375"
24	42	.500"
30	48	.500"
36	54	.500"
42	60	.500"

PART 5 - CONSTRUCTION

5.01 SCOPE OF WORK

- A. The installation of casing and carrier pipes by the method of boring and jacking shall be covered by these specifications. The overall scope of WORK shall include, but not be limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, casing spacers, coatings, location signs as required, installing the carrier pipe, and miscellaneous appurtenances to complete the entire WORK as shown on the STANDARD DRAWINGS and restoration. Applicable provisions of this MANUAL shall apply concurrently. Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the PLANS.

5.02 QUALITY ASSURANCE

- A. Jurisdiction:

For crossings under roadways or other installations within rights-of-way and easements under the jurisdiction of the COUNTY or other entity, the CONTRACTOR shall comply with regulations of the agency with said authority. State highway casing installations shall conform to the FDOT "Utility Accommodation Guide".
- B. The CONTRACTOR shall verify existing utility locations prior to constructing drilling and receiving pits.

Jack and Bore Standards and Specifications

- C. Subaqueous jack and bore crossings shall also adhere to the requirements contained within the Section entitled "Installation of Pipe Specifications".

PART 6 - PRODUCTS

6.01 PIPE MATERIAL

- A. Steel Casing:

Steel casings shall be new over the entire length and conform to the requirements of ASTM Designation A139 (straight seam pipe only) Grade "B" with minimum yield strength of 35,000 psi. The casing pipes shall have the minimum nominal diameter and wall thickness as shown in Table 315-1.

The sections of steel casing shall be shop and field welded in accordance with the applicable portions of AWWA C206 and American Welding Society (AWS) D7.0 for field welded pipe joints. Welds shall be complete penetration, single-bevel groove type joints. Welds shall be airtight and continuous over the entire circumference of the pipe and shall not increase the outside pipe diameter by more than 3/4-inch.

The CONTRACTOR shall wire brush the welded joints and paint with an approved material.

- B. Carrier Pipe:

The carrier pipe shall be as specified in Chapters 4, 5, and 6 of this MANUAL, as applicable. Restrained joints shall be utilized on all PVC and DI pipe joints within the casing.

- C. Carrier Pipe Spacers:

- 1. Stainless Steel Casing Spacers:

Carrier pipes, inside of steel casing pipes, shall be supported by casing spacers at no more than 10 feet between spacers with no less than two casing spacers equally spaced along each section of carrier pipe. Each spacer shall be 8-inches wide for carrier pipes up to 12-inches in diameter and 12 inches wide for 16-inch to 30-inch in diameter carrier pipes. The spacer shall be manufactured of 14-gauge Type 304 stainless steel, as a minimum. All nuts and bolts shall be corrosion resistant and compatible with the respective steel band. Each spacer shall have a minimum of four runner supports manufactured of a high molecular weight polymer plastic.

Jack and Bore Standards and Specifications

The runner supports shall be of adequate height to position the carrier pipe in the center of casing with a minimum top clearance of 1/2-inch. Between each spacer and runner, there shall be a stainless steel riser. All casing spacers larger than 36-inch diameter (carrier pipe) shall be factory designed, taking in consideration the weight of the carrier pipe filled with water. All calculations and drawings shall be submitted to PCU for review.

2. HDPE Casing Spacers:

Casing spacers made of HDPE shall fasten tightly onto the carrier pipe so that the spacers do not move during installation. Casing spacers will be spaced no more than 6-1/2 feet apart with double spacers on each end of the casing. The casing spacers will provide a minimum safety factor of two to one to support the service load. Spacers shall have a minimum height that clears the pipe bell. Casing spacers shall be projection type totally non-metallic spacers constructed of preformed sections of high-density polyethylene.

D. Casing End Plugs:

After the carrier pipe has been tested, eight inch thick brick and mortar masonry casing end plugs shall be used to completely close both openings on either side of the casing in accordance with the STANDARD DRAWINGS. Plugs shall be suitable for restraining a saturated earth load at the casing's installed depth. A weep hole shall be installed near the bottom of each plug.

PART 7 - GENERAL

7.01 INSPECTION

- A. Casing pipe to be installed may be inspected for compliance with this MANUAL by an independent laboratory selected and paid for by PCU. The manufacturer's cooperation shall be required in these inspections.
- B. All casing pipe shall be subjected to a careful inspection prior to being installed. If the pipe fails to meet the specifications it shall be removed and replaced with a satisfactory replacement at no additional expense to PCU.

7.02 PIPE HANDLING

- A. Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. Pipe shall not be dropped. All pipes shall be examined before lying and no piece shall be installed which is found to

Jack and Bore Standards and Specifications

be defective. Any damage to the pipe or coatings shall be repaired or replaced to the satisfaction of PCU.

7.03 INSTALLATION

A. WORK Coordination:

It shall be the CONTRACTOR's responsibility to perform the boring and jacking work in strict conformance with the requirements of the agency in whose right of way or easement the WORK is being performed. Any special requirements of the agency such as insurance, flagmen, etc., shall be strictly adhered to during the performance of WORK. The special requirements shall be performed by the CONTRACTOR at no additional cost to PCU.

B. Dewatering:

Dewatering through the casing during construction shall not be permitted. PCU shall approve all dewatering methods before construction work begins.

C. Carrier Pipe Support:

The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. The load of the carrier pipes shall be distributed along the casing spacers. Casing spacers shall be as specified in the appropriate "Approved Materials Checklist".

D. Jacking Pits:

Excavation adjacent to the roads shall be performed in a manner to adequately support the roads. Bracing, shoring, sheeting or other supports shall be installed as needed. The CONTRACTOR shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions that might cause the casing to "freeze" in place. Upon completion of jacking operations, the reaction blocks, braces and all other associated construction materials shall be completely removed from the site. Appropriate barricades will be provided if pits are open overnight. Excavation shall be completely enclosed with barricades.

E. Maintaining Line and Grade:

Correct line and grade shall be maintained.

Jack and Bore Standards and Specifications

F. Removal of Excavated Material from Casing:

Earth within the casing shall not be removed too close to the cutting edge in order to prevent the formation of voids outside the casing. If voids are formed, they shall be satisfactorily filled with grout by pumping.

G. Cleaning of Casing Interior:

After completion of jacking, the CONTRACTOR shall clean the interior of the casing of all excess material.

CHAPTER 3

GENERAL REQUIREMENTS

Section 316

Aerial Crossings Standards and Specifications

PART 1 - GENERAL

- A. It shall be the responsibility of the DEVELOPER to obtain all applicable regulatory permits.

PART 2 - UTILIZATION

- A. Aerial crossings shall be allowed for potable water mains and reclaimed water mains only with the specific approval of PCU.

PART 3 - PLACEMENT

- A. Aerial crossings shall be located within dedicated public rights-of-way or Polk County Utilities Easements.

- 1. Public Rights-of-Way

- When installed in rights-of-way, aerial crossings shall maintain a consistent alignment with respect to the centerline of the road.

- 2. Polk County Utilities Easements

- If an aerial crossing is to be constructed within an easement, the centerline of the pipe shall be located along the centerline of the easement.

- a. When not adjacent to County or State rights of way, a minimum width of 20 feet for mains shall be provided.
 - b. Where multiple parallel aerial crossings are to be placed within a single easement, the FDEP required horizontal separation distance between the mains shall be added to the above minimum single main easement width and rounded up to the nearest even foot.
 - c. All locations and lengths of easements shall take in consideration the safety and accessibility of PCU vehicles and personnel.

PART 4 - DESIGN

- A. All above ground portions of aerial crossings shall be flanged pipe.
- B. Flexible joints shall be provided between the aerial and buried sections of the pipe. Flexible joints shall be designed by the ENGINEER to address expansion and contraction of the pipe. Calculations and design data are to be submitted by the ENGINEER for approval.

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GENERAL REQUIREMENTS

Section 316

Aerial Crossings Standards and Specifications

- C. Pipe joints shall be restrained or flanged ductile iron.
- D. Aerial crossings shall be designed with uniform positive or negative slopes to avoid undulations and minimize high points and low points in the profile.
- E. Aerial crossings shall be supported on concrete pilings.
- F. Adequate support shall be provided for all joints in pipes utilized for aerial crossings. A structural ENGINEER shall design the supports.
- G. For aerial stream crossings, the impact of floodwaters and debris shall be considered. The bottom of the pipe shall be placed no lower than one foot above the top of the bridge opening or the 100-year floodplain mapped floodway elevation, whichever is higher.
- H. Underground gate valves shall be provided at both ends of the aerial crossing so that the section can be isolated for testing or repair. The valves shall be restrained, easily accessible, and not subject to flooding. An automatic combination air release/vacuum relief valve shall be installed at the high point of the aerial crossing.
- I. Appropriate guards shall be installed at both ends of the aerial crossing to prevent public access to the pipe, as shown in the STANDARD DRAWINGS.

PART 5 - PRODUCTS

5.01 PIPE MATERIALS

- A. Aerial crossing pipe material shall be ductile iron pipe with flanged joints and be in accordance with AWWA C115. Pipe sizes up from 3-inch to 20-inch shall be pressure class 350. Pipe sizes 24-inch to 64-inch shall be pressure class 250. Epoxy coated steel piping may be allowed on a case-by-case basis.
- B. Other piping materials and appurtenances shall be as specified in Chapters 4, 5, and 6 of this MANUAL.

PART 6 - CONSTRUCTION

6.01 SCOPE OF WORK

- A. The WORK specified in this Section consists of furnishing and installing pipe and appurtenances for aerial crossings. The WORK shall include all piping,

Aerial Crossings Standards and Specifications

materials, equipment, and labor for the complete and proper installation, testing, environmental protection, and restoration.

- B. Aerial crossings shall be constructed in accordance with all permit requirements, the PLANS, the STANDARD DRAWINGS, and this MANUAL.

System Connections Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Connections shall be made in accordance with this Section. Mains shall be tapped in such a manner as to avoid disturbance or disruption to the operation of the main in service and to protect the potable water supply from contamination. PCU shall operate all valves on existing mains.

PART 2 - PRODUCTS

2.01 TAPPING SLEEVES AND VALVES

- A. General:

Tapping sleeves shall be mechanical joint sleeves. Refer to the appropriate "Approved Materials Checklist", for all sleeves, valves, and appurtenances.

- B. Mechanical Joint Sleeves:

Sleeves shall be cast of gray-iron or ductile-iron and have an outlet flange with the dimensions of the Class 125 flanges shown in ANSI B16.1 and properly recessed for tapping valve. Glands shall be gray-iron or ductile iron. Gaskets shall be vulcanized natural or synthetic rubber. Bolts and nuts shall comply with ANSI/AWWA C111/ANSI A21.11. Sleeves shall be capable of withstanding a 200 psi working pressure.

- C. Fabricated Mechanical Joint Tapping Sleeves:

Sleeves shall be of split mechanical joint design with separate end and side gaskets. Sleeves shall be fabricated of high strength steel, meeting ASTM A283 Grade C or ASTM A-36. Outlet flange shall meet AWWA C-207, Class "D" ANSI I50 pound drilling requirements and be properly recessed for the tapping valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have manufacturer applied fusion bonded epoxy coating, minimum 12 mil thickness.

- D. Tapping Valves:

Tapping valves shall meet the requirements of Chapters 4, 5, and 6 except that units shall be flanged mechanical joint ends. Valves shall be compatible with tapping sleeves as specified above and specifically designed for pressure connection operations.

System Connections Specifications

PART 3 - EXECUTION

3.01 NOTIFICATION AND CONNECTION TO EXISTING MAINS

- B. The CONTRACTOR shall make a formal request to PCU in accordance with its current policy to schedule a connection to any existing main. The request shall be made a minimum of five NORMAL WORKING DAYS prior to the proposed tie-in to the existing main. In this request, the CONTRACTOR shall provide the following information.
 - 1. Points of connection, fittings to be used and method of flushing and disinfection if applicable.
 - 2. Estimated construction time for said connections.
 - 3. Identify pressure and non-pressure connections
- C. Connections shall only be made on the agreed upon date and time. If the CONTRACTOR does not perform the work in the agreed upon manner or schedule, the CONTRACTOR shall be required to reschedule the said connection by following the procedure outlined above.
- D. Unless specifically approved in writing by PCU, connections shall only be attempted to an existing PCU main from Monday through Thursday. No connections shall be attempted on or the day before a COUNTY holiday.

3.02 INSTALLATION

A. General:

The CONTRACTOR shall furnish and install the tapping sleeves and valves to existing mains. Taps shall not be permitted for single user connections on transmission mains 30 inches or larger.

B. Excavation, Backfill, Compaction and Grading:

The applicable provisions of the Section entitled "Excavation, Backfill, Compaction, and Grading" shall apply.

C. Pressure Connections:

Sufficient length of main shall be exposed to allow for installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping

System Connections Specifications

sleeve, valve and machinery. Any damage to the main due to improper or insufficient supports will be repaired at the CONTRACTOR's expense.

1. Prior to the tap, the CONTRACTOR shall assemble all materials, tools, equipment, labor, and supervision necessary to make the connection. PCU shall locate and exercise isolation valves prior to scheduled tap.
2. The CONTRACTOR shall excavate a dry and safe working area pit of sufficient size to enable the necessary WORK.
3. The inside of the tapping sleeve and valve, the outside of the main and the tapping machine shall be cleaned and swabbed or sprayed with one percent liquid chlorine solution prior to beginning installation for water system pressure connections and must comply with AWWA C-651-99 or most current version.
4. After the tapping sleeve has been mounted on the main, the tapping valve shall be bolted to the outlet flange, making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested under the observation of PCU personnel to 150 psi for 30-minute duration to ensure that no leakage will occur.
5. For pressure connections 4-inch through 20-inch installations, the minimum diameter cut shall be 1/2 inch less than the nominal diameter of the pipe to be attached. For larger taps, the allowable minimum diameter shall be two to three inches less than the nominal diameter of the pipe being attached. After the tapping procedure is complete, the CONTRACTOR shall submit the coupon to PCU.
6. The tapping valve shall be placed vertically for pressure connections to wastewater force mains.
7. Adequate restrained joint fittings shall be provided to prevent movement of the installation when test pressure is applied. Provisions in the "STANDARD DRAWINGS" shall apply.
8. The CONTRACTOR shall be responsible for properly backfilling the work area pit after the WORK is completed.

D. Non- Pressure Dry Connections:

When service must be interrupted to existing potable water customers during an addition of appurtenances the following shall apply.

System Connections Specifications

1. The CONTRACTOR shall provide five NORMAL WORKING DAYS notice to PCU.
2. No customer shall be without service for more than six hours, unless specifically approved in advance by PCU. This accommodation to customers may include scheduling before and/or after NORMAL WORKING HOURS.
3. The CONTRACTOR shall be ready to proceed by pre-assembling as much material as possible at the site to minimize the length of service interruption.
4. Needed pipe restraints must be installed prior to the initiation of the shut-down of water.
5. The excavation shall be opened and needed site preparations shall be completed before the initiation of the connection WORK.
6. PCU shall postpone a service cut-off if the CONTRACTOR is not ready to proceed at the scheduled time.
7. Only PCU personnel shall operate the valves needed to perform the shut-down on the existing system.

CHAPTER 3

GENERAL REQUIREMENTS

Section 318

Field Testing and Inspection Procedures

PART 1 GENERAL

- A. The CONTRACTOR shall schedule each required inspection from the PCU Inspector.
- B. PCU will notify the CONTRACTOR of utilities deficiencies or acceptance in accordance with the schedule of notification provided in Table 318-1 below.

Table 318-1. PCU Schedule of Notification of Inspections

Service	Type of Inspection	Timeframe (NORMAL WORKING DAYS)
Water	Wire Continuity for Pressurized Mains	5
Water	Walk Through for Subdivisions	5
Water	Cross Connection Control	5
Wastewater	CCTV Data Review	7
Wastewater	Wire Continuity for Pressurized Mains	5
Wastewater	Walk Through for Subdivisions	5
Wastewater	Informal Lift Station Start Up	2
Wastewater	Formal Lift Station Start Up	5
Reclaimed Water	Wire Continuity for Pressurized Mains	5
Reclaimed Water	Walk Through for Subdivisions	5
Reclaimed Water	Cross Connection Control	5

Field Testing and Inspection Procedures

- C. If there are any deficiencies or the system is not ready for inspection, as determined by PCU, the CONTRACTOR shall request a re-inspection which will restart the inspection period, as noted above.

- D. If more than two inspections are required, the CONTRACTOR shall be subject to being charged additional fees for re-inspection as specified by a separate Resolution adopted by the COUNTY.

CHAPTER 3

GENERAL REQUIREMENTS

Section 350

STANDARD DRAWINGS

- GR-01 Bedding and Trenching - Type A
- GR-02 Bedding and Trenching - Type B
- GR-03 Subaqueous Crossing (Typical)
- GR-04 Restrained Pipe Table
- GR-05 Thrust Collar
- GR-06 Bore and Jack
- GR-07 Gate Valve and Box (Shallow)
- GR-08 Butterfly Valve and Box (Shallow) (For Storage Tank Isolation Use Only)
- GR-09 Plug Valve (Shallow) (For Wastewater Treatment Facility Use Only)
- GR-10 Typical Valve Box Cover
- GR-11 Valve Box Assembly (Deep)
- GR-12 Valve Collar
- GR-13 Pipe Line Marker (Typical)
- GR-14-1 Pipe Tracer Wire
- GR-14-2 Pipe Identification - Potable Water Mains
- GR-14-3 Pipe Identification - Wastewater Force and Gravity Mains
- GR-14-4 Pipe Identification - Reclaimed Water Mains
- GR-14-5 Pipe Identification - Raw Water Mains
- GR-15-1 Automatic Air Release Valve (Above Ground)
- GR-15-2 Automatic Air Release Valve (In Ground)
- GR-16 Minimum Separation Requirements
- GR-17-1 Aerial Crossing and Access Barrier (Typical): Potable Water and Reclaimed Water Mains
- GR-17-2 Sign for Aerial Crossing and Access Barrier: Potable Water and Reclaimed Water Mains
- GR-18 Residential Service Locations (Typical)
- GR-19-1 Single Family Residential Utility Plan (Typical): Potable Water
- GR-19-2 Single Family Residential Utility Plan (Typical): Wastewater
- GR-19-3 Single Family Residential Utility Plan (Typical): Reclaimed Water
- GR-20-1 Potable Water and Reclaimed Water Services (Typical)
- GR-20-2 Standard Rectangular Meter Box Assembly: Potable Water and Reclaimed Water
- GR-21 MJ Tapping Sleeve and Gate Valve Assembly (Typical)
- GR-22 General Notes
- GR-23 THIS PAGE IS INTENTIONALLY BLANK
- GR-24 Pig / Swab Launcher Port (Typical)
- GR-25 Pig / Swab Receiving Port (Typical)
- GR-26 Concrete Arch and Full Encasement
- GR-27 Concrete Cradle and Half Encasement
- GR-28 Deflection of Pressure Mains
- GR-29 Bollard (Typical)



POLK COUNTY UTILITIES, FLORIDA UTILITIES INSPECTOR REPORT



Project Name:
Utilities Inspector:
PCU Project Number:
Contractor:
Engineer:

Report Number:
Inspection Date:
Data Entry Date:
Time Arrived: AM PM
Time Departed: AM PM

1. General Observations

Photos Taken Photos Not Taken

2. Observed Safety Issues (Copy to Risk Management)

- Trench Safety Deficiency Work Zone Safety Deficiency General Safety Deficiency
- MOT Deficiency Overhead Safety Deficiency
- Other

Issue(s)

IMMEDIATE ATTENTION AND/OR CORRECTION REQUIRED BY: Date: _____ Time: AM PM

3. Construction Work Underway

- No Activity Gravity Sewer Force Main
- Lift Station Potable Water Reclaimed Water Raw Water

4. Observed Construction/Installation Issues

- Not in Accordance with Plans Improper Installation Work Being Completed Satisfactory
- Other

Issue(s)

IMMEDIATE ATTENTION AND/OR CORRECTION REQUIRED BY: Date: _____ Time: AM
 PM

5. Weather

- Sunny Clear Cloudy Rainy

6. Temperature

- <32F 32F – 50F 51F - 70F 71F - 85F > 85F



POLK COUNTY UTILITIES, FLORIDA UTILITIES INSPECTOR REPORT



7. Wind

Still Windy

Signature: _____	Utilities Inspector:	Date:	Time: AM <input type="checkbox"/> PM <input type="checkbox"/>
Signature: _____	Utilities Inspector:	Date:	Time: AM <input type="checkbox"/> PM <input type="checkbox"/>

8. General Observation

<input type="checkbox"/> Project File	<input type="checkbox"/> Inspector	<input type="checkbox"/> Contractor	<input type="checkbox"/> Risk Management	<input type="checkbox"/> Data Entered into EPD Database
<input type="checkbox"/> Project Manager	<input type="checkbox"/> Project Engineer	<input type="checkbox"/> TS Director	<input type="checkbox"/> CP Director	
<input type="checkbox"/> Other				
				<input type="checkbox"/> Signed Copy Sent to Project File

CHAPTER 3

GENERAL REQUIREMENTS

Section 350-B

Utilities Inspector's Overtime Tracking Form

PCU Inspector: Project Name: PCU Project File Number: Reason for Overtime Request:		
If Private Development Related Project: Construction Company: Superintendent/Foreman: _____ Phone Number: _____		
If County Community Improvement or R&R Project: PCU: <input type="checkbox"/> Transportation: <input type="checkbox"/> Natural Resources: <input type="checkbox"/> Facilities: <input type="checkbox"/> Other: Project Manager: _____ Phone Number: _____		
Overtime Start Time: <input type="checkbox"/> AM / <input type="checkbox"/> PM	Overtime Start Date:	
Overtime Start Time: <input type="checkbox"/> AM / <input type="checkbox"/> PM	Overtime Start Date:	
Total Overtime Hours: _____	X (Inspector's Hourly Rate: \$ _____	X County Overhead Percentage: (0.33) X
Overtime Rate Multiplier: <input type="checkbox"/> Regular 1.5 or <input type="checkbox"/> Holiday 2.5 =	Total Billable Overtime Amount: \$ _____	
Inspector's Signature: _____	Date:	
Supervisor's Signature: _____	Date:	
<input type="checkbox"/> The Private Development Contractor acknowledges by his/her representative's signature below that PCU shall be reimbursed for all overtime costs necessitated by his company during the construction of the subject Project and that the company shall forward a check in the amount stated above within ten business days of its receipt of PCU's invoice.		
<input type="checkbox"/> The CIP or R&R Contractor acknowledges by his/her representative's signature below that PCU shall be reimbursed for all overtime costs necessitated by his company during the construction of the subject CIP Project and that the company shall either:		
<input type="checkbox"/> forward a check in the amount stated above within ten (10) business days of its receipt of PCU's invoice or		
<input type="checkbox"/> deduct the amount stated above from the company's next pay request submittal.		
Contractor's Representative's Signature: _____ Date: _____		
Distribution: <input type="checkbox"/> Contractor	<input type="checkbox"/> PCU Inspection Supervisor	<input type="checkbox"/> Project Manager
<input type="checkbox"/> Project File	<input type="checkbox"/> PCU Finance	