

The Engineer has the option to use the IV sample for comparison testing as specified in 334-6.

334-5.7.2 Roadway: Obtain five 6 inch diameter roadway cores within 24 hours of placement, as directed by the Engineer, for IV testing. In situations where it is impractical to cut five cores per subplot, obtain a minimum of three cores per subplot at random locations, as identified by the Engineer. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1. If the average of the results for the subplot does not meet the requirements of Table 334-5 for density, then a comparison of the IV Gmm test results and the Contractor's Gmm test results, if available, will be made in accordance with the procedure provided in 334-5.7.1. Address any material represented by the failing test results in accordance with 334-5.9.5.

334-5.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-9.

334-5.9 Minimum Acceptable Quality Levels:

334-5.9.1 CPFs Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.2 CPFs Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.3 CPFs Less Than 0.80 and Greater Than or Equal to 0.75: If the CPF for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.9.5.

334-5.9.4 CPFs Less Than 0.75: If the CPF for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the Department, or as approved by the Engineer.

334-5.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the Department.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a CPF as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure, upon the approval of the Engineer the Contractor may perform

delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that may require removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation sampling and testing shall be monitored and verified by the Engineer. For materials that are defective due to air voids, an engineering analysis is required.

When evaluating defective material by engineering analysis or delineation testing, at a minimum, evaluate all material located between passing QC, PC or IV test results. Exceptions to this requirement shall be approved by the Engineer.

334-6 Comparison Testing.

At the start of the project (unless waived by the Engineer) and at other times as determined necessary by the Engineer, provide split samples for comparison testing with the Engineer. The purpose of these tests is to verify that the testing equipment is functioning properly and that the testing procedures are being performed correctly. In the event that the Engineer determines that there is a problem with the Contractor's testing equipment and/or testing procedures, immediately correct the problem to the Engineer's satisfaction. In the event that the problem is not immediately corrected, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for comparison testing may also be used for the QC sample. The split sample used for comparison testing must also meet the requirements for IV testing described in 334-5.7.

334-7 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections 320 and 330), the quantity to be paid for will be the weight of the mixture, in tons. The pay quantity will be based on the project average spread rate, excluding overbuild, limited to a maximum of 105% of the spread rate determined in accordance with 334-1.4 or as set by the Engineer. The project average spread rate is calculated by totaling the arithmetic mean of the average daily spread rate values for each layer.

The bid price for the asphalt mix will include the cost of the liquid asphalt and the tack coat application as directed in 300-8. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix. For the calculation of unit price adjustments of bituminous material, the average asphalt content will be based on the percentage specified in 9-2.1.2. The weight will be determined as provided in 320-3.2 (including the provisions for the automatic recordation system).

Prepare a Certification of Quantities, using the Department's current approved form, for the certified Superpave asphalt concrete pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the roadway per Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330).

For materials accepted in accordance with 334-5, based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for the following individual quality characteristics: pavement density, air voids, asphalt binder content, and the percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed by multiplying a CPF for the LOT by the bid price per ton. Perform all calculations using the latest version of the Department's Asphalt Plant Worksheet.

334-8.2 Pay Factors:

334-8.2.1 Partial LOTs: For Partial LOTs where no random sample is obtained due to insufficient tonnage, a CPF of 1.00 shall be applied.

334-8.2.2 Two or Less Sublot Test Results: In the event that two or less sublot test results are available for a LOT, Pay Factors will be determined based on the Small Quantity Pay Table. The Small Quantity Pay Table and Pay Factor calculations are determined in accordance with the instructions contained within the Department's Asphalt Plant Worksheet.

334-8.2.3 Three or More Sublot Test Results: When three or more sublot test results are available for a LOT, the variability-unknown, standard deviation method will be used to determine the estimated percentage of the LOT that is within the specification limits shown in Table 334-7. The Percent Within Limits (PWL) is determined in accordance with the instructions contained within the Department's Asphalt Plant Worksheet.

Table 334-7 Specification Limits	
Quality Characteristic	Specification Limits
Passing No. 8 sieve (%)	Target \pm 3.1
Passing No. 200 sieve (%)	Target \pm 1.0
Asphalt Content (%)	Target \pm 0.40
Air Voids (%)	4.00 \pm 1.20
Density (% of G_{mm}):	93.00 + 2.00, - 1.20 ⁽¹⁾
Note (1): If the Engineer (or Contract Documents) limits compaction to the static mode only, or for all one-inch thick lifts, compaction shall be in the static mode. No vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer. In either case, the specification limits will be as follows: 92.00 + 3.00, -1.20% of G_{mm} . No additional compensation, cost or time, shall be made.	

334-8.2.3.1 Pay Factors (PF): Pay Factors will be calculated by using the following equation:

$$\text{Pay Factor} = (55 + 0.5 \times \text{PWL}) / 100$$

The PWL is determined in accordance with the instructions contained within the Department's Asphalt Plant Worksheet.

334-8.3 Composite Pay Factor (CPF): A CPF for the LOT will be calculated based on the individual PFs with the following weighting applied: 35% Density (D), 25% Air Voids (V_a), 25% asphalt binder content (P_b), 10% Passing No. 200 (P_{-200}) and 5% Passing No. 8 (P_{-8}). Calculate the CPF by using the following formula:

$$\text{CPF} = [(0.350 \times \text{PF } D) + (0.250 \times \text{PF } V_a) + (0.250 \times \text{PF } P_b) + (0.100 \times \text{PF } P_{-200}) + (0.050 \times \text{PF } P_{-8})]$$

Where the PF for each quality characteristic is determined in either 334-8.2.2 or 334-8.2.3, depending on the number of subplot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the CPF for the LOT by the bid price per ton.

334-8.4 Payment: Payment will be made under:

Item No. 334- 1- Superpave Asphaltic Concrete - per ton.

SECTION 522

CONCRETE SIDEWALK AND DRIVEWAYS

522-1 Description.

Construct concrete sidewalks and driveways. Sidewalk will include sidewalk curb ramps.

522-2 Materials.

Meet the requirements specified in 520-2.

522-3 Forms.

Provide forms as specified in 520-3.

522-4 Foundation.

Compact fill areas, including cut areas under the sidewalk that have been excavated more than 6 inches below the bottom of sidewalk, to a minimum of 95% of AASHTO T99 density. The area to be compacted is defined as that area directly under the sidewalk and 1 foot beyond each side of the sidewalk when right-of-way allows.

522-5 Joints.

522-5.1 Expansion Joints: Form 1/2 inch expansion joints between the sidewalk and the curb or driveway or at fixed objects and sidewalk intersections with a preformed joint filler meeting the requirements specified in 932-1.1.

522-5.2 Contraction Joints:

522-5.2.1 Types: The Contractor may use open type or sawed contraction joints.

522-5.2.2 Open-Type Joints: Form open type contraction joints by staking a metal bulkhead in place and depositing the concrete on both sides. After the concrete has set sufficiently to preserve the width and shape of the joint, remove the bulkhead. After finishing the sidewalk over the joint, edge the slot with a tool having a 1/2 inch radius.

522-5.2.3 Sawed Joints: If electing to saw the contraction joints, cut a slot approximately 3/16 inch wide and not less than 1-1/2 inches deep with a concrete saw after the concrete has set, and within the following periods of time:

Joints at not more than 30 feet intervals

.....within 12 hours after finishing.

Remaining jointswithin 96 hours after finishing.

522-6 Placing Concrete.

Place the concrete as specified in 520-5.

522-7 Finishing.

522-7.1 Screeding: Strike-off the concrete by means of a wood or metal screed, used perpendicular to the forms, to obtain the required grade and remove surplus water and laitance.

522-7.2 Surface Requirements: Imprint concrete as detailed in the Plans, otherwise provide a broom finish. Ensure that the surface variations are not more than 1/4 inch under a 10 foot straightedge or more than 1/8 inch on a 5 foot transverse section. Finish the edge of the sidewalk with an edging tool having a radius of 1/2 inch.

522-8 Curing.

Cure the concrete as specified in 520-8.

522-9 Method of Measurement.

The quantity to be paid will be plan quantity, in square yards, completed and accepted. Ramps, reconstructed sidewalks, walk around sidewalks, sidewalk landings, sidewalk curb, and driveways will be included in the area to be paid.

522-10 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section. Excavation for new installations will be paid for under the items for the grading work on the project. For repairs and replacements, removal of the existing sidewalk or driveway will be included in the cost of new sidewalks and driveways.

Payment will be made under:

Item No. 522-	Concrete Sidewalks and Driveways- per square yard.
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SECTION 527

DETECTABLE WARNINGS ON WALKING SURFACES

527-1 Description.

Furnish and install Detectable Warning devices on newly constructed and/or existing concrete or asphalt walking surfaces (curb ramps, sidewalks, shared-use paths, etc.) constructed in accordance with the Design Standards, Index No. 304.

527-2 Materials.

527-2.1 Detectable Warning: Provide Detectable Warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705. Use Detectable Warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic. Use Detectable Warnings with size and pattern shown in the Plans comprised of truncated domes aligned in parallel rows in accordance with the Design Standards, Index No. 304. Do not use detectable warnings with a diagonal pattern.

527-2.1.1 Preformed Materials: Use Detectable Warnings consisting of weather-resistant tiles or pavers that are cast into concrete, or tiles or mats that are surface-applied to concrete or asphalt surfaces with adhesives and mechanical fasteners or torch-applied preformed thermoplastic.

527-2.1.2 Field-Formed Materials: Use Detectable Warnings applied as a secondary application to the substrate.

527-2.2 Material Properties: Provide Detectable Warnings that meet the following minimum material property requirements when tested in accordance with the indicated Standard appropriate to the material.

PROPERTY	STANDARD	TEST VALUE
Slip Resistance	FM 3-C1028	Dry Coefficient of Friction – 0.8 min. Wet Coefficient of Friction – 0.65 min. (include recessed areas between truncated domes)
Wear Resistance	FM 5-594	Average Volume Loss: no more than 0.06 cm ³
Water Absorption*	ASTM D570	Not to exceed 5%.
Adhesion/Bond Strength**	FM 5-589	150 psi min. tensile adhesion strength
Non-Hazardous Classification	Submit Material Safety Data Sheet (MSDS)	Non-Hazardous, per RCRA Subtitle C

* Applies only to plastic materials.

** Applies only to surface-applied materials.

527-2.3 Color/Contrast: Use safety yellow, brick red or black colored Detectable Warnings on concrete walking surfaces. Use safety yellow colored Detectable Warnings on asphalt walking surfaces. Acceptable Detectable Warnings shall meet the following criteria for a duration of three years.

COLOR	LIGHT REFLECTANCE VALUES (LRV) CAP Y*
Safety Yellow	25 – 45

Brick Red	5 – 15
Black	0 – 5
*When measured with a spectrophotometer	

527-2.4 Qualified Products List: Methods or products used to form Detectable Warnings in wet concrete will not be permitted. Use Detectable Warnings listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of products for inclusion on the QPL shall submit an application in accordance with Section 6 and include certified test reports from an independent lab showing the product meets the requirements of this Section and the Design Standards, Index No. 304 Acceptance Criteria and manufacturer's drawings, specifications and procedures for materials and installation, including touch-up and repair.

527-3 Installation Procedures.

527-3.1 Surface Preparation and Installation: Prepare the surface in accordance with the manufacturer's recommendations. Use only products and materials appropriate for the surface on which they will be applied. Install in accordance with the manufacturer's instructions, using materials and equipment recommended and approved by the manufacturer. For surface-applied tiles or mats, use adhesives applied over the entire surface and mechanical fasteners.

527-4 Method of Measurement.

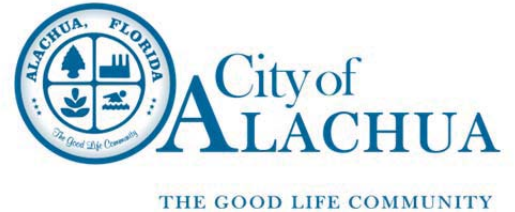
Detectable Warnings applied to newly constructed walking surfaces will be included in the cost of the walking surface. Detectable Warnings applied to existing walking surfaces will be paid per each location where Detectable Warnings are furnished, installed and accepted.

527-5 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including all labor, surface preparation, materials and incidentals necessary to complete the work for Detectable Warnings installed on existing walking surfaces.

Payment will be made under:

Item No. 527- 1- Detectable Warnings on Existing Walking Surfaces - each.



Department of Public Service

REQUIREMENTS FOR DESIGN & CONSTRUCTION

Potable Water, Reclaimed Water and Wastewater

2017

TABLE OF CONTENTS

Section 1:	1. QUALITY ASSURANCE.....	Page 1
	1.1 Purpose	Page 1
	1.2 Codes and Standards	Page 2
	1.3 General Utility Information	Page 3
	1.4 Pre-Design Meeting	Page 3
	1.5 Warranty.....	Page 4
Section 2:	2. DESIGN REQUIREMENTS.....	Page 5
	2.1 Construction Drawing Requirements	Page 5
	2.2 Drawing Content	Page 5
	2.3 Potable Water Design Requirements	Page 7
	2.4 Wastewater Design Requirements	Page 12
	2.5 Reclaimed Water Design Requirements.....	Page 16
	2.6 Lift Station Design Requirements	Page 19
	2.7 Jack and Bore Design Requirements.....	Page 26
	2.9 Piping Support	Page 29
	2.10 Piping	Page 30
	2.101 Utility Separation.	Page 30
Section 3:	3. EXECUTION	Page 36
	3.1 Existing Utilities	Page 36
	3.2 Inspection of Materials	Page 36
	3.3 Excavation and Trenching	Page 37
	3.4 Handling and Cutting Pipe	Page 38
	3.5 Pipeline Construction	Page 39
	3.6 Paving, Curb, Gutter and Walkways	Page 39
	3.7 Pipe Leakage Testing	Page 40
	3.8 Pipe Disinfection	Page 43
	3.9 Jack and Bore Execution	Page 44
	3.10 Potable and Reclaimed Water Execution	Page 45
	3.11 Wastewater Execution	Page 46
	3.12 Lift Station Execution	Page 46
	3.13 Traffic Control Plan	Page 47
	3.14 Final Acceptance	Page 48
	3.15 Record Drawings	Page 49

1. QUALITY ASSURANCE

1.1. Purpose

- A. This document describes the requirements for the design, construction, and preparation of contract documents associated with the City of Alachua (CoA) potable water, reclaimed water and waste water system. The term Engineer is defined as the owner, developer or the Engineer of Record. These requirements are provided to encourage consistency in the design approach used by various Engineers.

The following items represent the quality assurance goals of the *CoA Design and Construction Requirements*:

1. Projects coordinated with each other.
 2. Cost effective projects, both in design and construction.
 3. Operable and maintainable projects.
 4. Contract compliance.
 5. Application of sound engineering in plans and specifications.
 6. Use of consistent, processes and procedures.
 7. Performance as scheduled.
 8. Public disruption minimized during design and construction.
 9. Documented information in accordance with the CoA processes and procedures.
 10. Complete dissemination of information to the public and all staff members.
 11. Standard Details (see Attachment A: Standard Details).
- B. While the purpose of these requirements is to assure uniformity, it is not intended to stifle Engineer's creativity, design innovation, and ingenuity. Engineer shall review these requirements and adopt them into their design. Engineer is ultimately responsible for their design, and their responsibility is in no way diluted or absolved by the *CoA Design and Construction Requirements*.
- C. It may be necessary for the Engineer to deviate from these requirements. In such cases, the Engineer shall immediately bring this matter to the attention of the CoA Public Services Director.

1.2. Codes and Standards

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, federal regulations, and the *CoA Design and Construction Requirements*. In addition, applicable CoA codes and adopted plans, including but not limited to the CoA Comprehensive Plan, CoA Code of Ordinances, and CoA land Development Regulations.

Applicable codes and standards and their editions shall be verified at the time of final work and are including by not limited to:

1. United States Environmental Protection Agency (EPA)
2. Hydraulic Institute Standards
3. American Society of Civil Engineers (ASCE) and Water Pollution Control Federation, ASCE Manual and Report of Engineering Practice No.60 – Gravity Sanitary Sewer Design and Construction
4. Design of Wastewater and Storm water Pumping Stations, Manual of Practice FD-4 Water Environment Federation American Society of Civil Engineers (ASCE) and Water Pollution Control Federation, ASCE Manual and Report of Engineering Practice No.60 – Gravity Sanitary Sewer Design and Construction
5. Occupational Safety and Health Act (OSHA)
6. International Building Code (IBC); latest edition
7. International Fuel Gas Code (IFGC), latest edition
8. International Mechanical Code (IMC), latest edition
9. International Fire Code (IFC), latest edition
- 10.NFPA 1, Fire Code, latest edition
- 11.NFPA 70, National Electric Code, latest edition
- 12.NFPA 101, Life Safety Code, latest edition
- 13.NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities, latest edition
- 14.ICC/ANSI 117.1 American National Standard Accessible and Useable Buildings and Facilities, latest edition
- 15.Americans with Disabilities Act (ADA), latest edition
- 16.American Concrete Institute (ACI) 318, Building Code Requirements for Reinforced Concrete
- 17.ACI 530, Building Code Requirements for Concrete Masonry Structures
- 18.American Institute for Steel Construction (AISC), Steel Construction Manual
- 19.ASCE 7 Minimum Design Loads for Buildings and Other Structures
- 20.American Water Works Associations (AWWA) Standards
- 21.Applicable American Society for Testing and Materials (ASTM)
- 22.Uni-Bell Plastic Pipe Association, Handbook of PVC Pipe, Design and Construction
- 23.Instrument Society of America (ISA)
- 24.National Electrical Manufacturer's Association (NEMA)

- 25.American National Standards Institute (ANSI)
- 26.Institute of Electrical and Electronics Engineers (IEEE)
- 27.ANSI/IEEE Standard 141 for Motor Control Equipment
- 28.IEEE 519-1992 Recommended Practices for Harmonic Control in Electrical Power Systems
- 29.IEEE Standard 142 for Grounding
- 30.IEEE C62 for application of Transient Voltage Surge Suppression
- 31.American Society of Mechanical Engineers (ASME)
- 32.Florida Building Code,
- 33.Florida Fire Prevention Code,
- 34.National Electric Code,

1.3. General Utility Information

- A. The Engineer shall coordinate with utilities in order to minimize conflicts during construction. Utilities that may be involved include:
 1. Potable and nonpotable water pipelines
 2. Gravity and force main sewer pipelines
 3. Storm drains
 4. Traffic control signals/control wires
 5. Low pressure gas pipes
 6. High pressure oil and gas pipes
 7. Telephone and telecommunications lines
 8. Television cables
 9. Power lines and facilities
 - 10.Communication line, including fiber optic lines
- B. As part of the initial design of a project, the Engineer may wish to obtain underground utilities information from the CoA. This information may be available to the Engineer upon written request to the CoA Public Service Department.
- C. CoA supplied information does not eliminate or diminish the responsibility of the Engineer to survey the project area, existing facilities, or to perform underground locations in the project area. Engineer is responsible to ensure all existing information is properly recorded and displayed in the Permit/Record Drawings. Engineer is responsible to verify and locate existing utilities, or underground foundations which may encroach.

1.4. Pre-Design Meeting

- A. The CoA encourages the Engineer to meet with CoA Public Services Department for CoA related projects. The primary purpose of the Pre-Design Meeting is to firmly establish the project design criteria and to discuss the overall purpose for the project to ensure that all participants have the same understanding. A Pre-Design meeting is a required for projects that involve:
 - 1. fire flow analysis,
 - 2. potable water meters greater than 2-inches,
 - 3. potable water capacity that may exceed single family use, or includes a
 - 4. wastewater lift station
- B. The Pre-Design meeting should occur after the pre-application meeting and before application submittal.
- C. For CoA Public Services Department approval, Engineer shall indicate temporary water, electrical, and other utility needs.
- D. The CoA Public Service Director may engage a Consultant of CoA to review and identify needed performance and design requirements to coordinate ongoing infrastructure work and/or future requirements. The fee associated with the Consultant to review and perform analysis will be invoiced to the Applicant.
- E. Discussions occurring at the Pre-Design meeting are not binding on the CoA. Plans and submittal are subject to formal review.

1.5. Warranty

- A. Contractor installing CoA owned or proposed CoA owned utilities shall provide a 1 year warranty letter as part of close out. The warranty shall begin upon acceptance of the utilities by the CoA and not on the date of the letter. During the one year period, the Contractor shall warrant all work and materials from failure due to a defect in manufacturing or workmanship. The Contractor shall bear all the costs and expenses associated with replacement, equipment, labor, associated freight, and handling expenses incurred in the repair or replacement due to failed or damaged items under warranty.
- B. Contractor is responsible to arrange and coordinate with the CoA Public Service Department a 1 year warranty site inspection prior to the expiration of the warranty period. CoA will prepare a punch-list which the Contractor shall make all necessary repairs and/or corrections at the conclusion of the 1 year warranty period.
- C. Based on the nature and extent of the work to be performed within the CoA right-of-way, or work that affects public infrastructure, a surety bond may be required. The amount of the surety bond will be based on the construction cost of improvements to be performed within the right-of-way. The applicant or contractor must provide a cost estimate for the right-of-way improvements. The surety bond shall not be released or returned until the work is inspected and accepted by the CoA.

END OF SECTION 1

2. DESIGN REQUIREMENTS

2.1. **Construction Drawing Requirements**

The Engineer is responsible for preparing design drawings, specifications, and complete accurate supporting calculations of the final contract documents.

2.2. **Drawing Content**

- A. Design drawings shall clearly and concisely show the characteristics, relationships, and extent of all elements associated with the project design in sufficient depth and detail to: be complementary with respect to all project documents; support consistent and comprehensive construction cost estimates of the project; and to permit construction of the project in accordance with the design intent.
- B. Utility layout shall have consistent dimensioning. At a minimum, dimensioning shall locate all major equipment, valves, and piping centerlines as required, using a minimum of two dimension line references in the Plan view and one dimensional reference line defining elevation in the Elevation or Section view.
- C. For piping systems that contain major appurtenances such as couplings, thrust restraint systems, flange locations, etc., use additional dimensional line references that proper spacing and arrangement are sufficiently defined.
- D. Plan and Profile Sheets
 - 1. Plan shall align vertically with the profile.
 - 2. Water, wastewater, reclaimed, and stormwater line shall be illustrated in profile view.
 - 3. Existing and proposed finished grade shall be illustrated over proposed and/or existing gravity wastewater mains.
 - 4. Plan view shall illustrate water lines, valves, fittings, fire hydrants, services, meters, blow-off assemblies, wastewater lines, manholes, wyes, laterals, cleanouts, reclaimed water lines, storm water lines, electric lines, gas lines, paving, curbs and gutters, right-of-way lines, property lines, and all existing and proposed features.
 - 5. Sheet shall be drawn at (1-inch : 20-feet) or (1-inch : 30-feet) horizontal scale, and (1-inch : 2-feet) to (1-inch : 5-feet) vertical scale.
- E. Site plan shall illustrate existing and proposed utility easements shall be shown. Public utility easements and property lines shall be clearly labeled.
- F. Boundary/Topographic Survey shall contain horizontal coordinates referenced a minimum of three points on the drawing that have horizontal coordinate information. These points may be existing control, new control, or parcel corners. The coordinate system for all record drawings shall be Florida State Plane Coordinates, NAD 83 Zone North US Survey feet. Elevations provided shall be referenced to the NAVD 88 datum with elevations given in US Survey feet.

DESIGN REQUIREMENTS

- G. Drainage plan shall illustrate the storm water facilities, 100-year floodplain, wetlands, and creek elevations. Illustrate site contour elevations at minimum 2 foot intervals.
- H. CoA Standard Details shall be used.
- I. Pipe schedule shall identify by flow stream abbreviation, conveyance service, piping size range, exposure (exposed or buried), materials of construction corresponding specification section reference, piping joint type, protective linings and coatings, operating pressure, field testing requirements, field testing pressures, requirements for piping system colors and labels, and associated general notes for all piping used on the project. The piping schedule may be listed in the specifications, or shown as a separate drawing in the General Drawings.
- J. Valve schedule shall identify the tag number, valve type, size (inches), service, maximum operating flow rate, pressure class, maximum differential pressure (psig), specification section reference, and associated general notes for all valves with electrical operators. Valve schedule may be listed in the specifications, or shown as a separate drawing in the General Drawings.

DESIGN REQUIREMENTS

2.3. Potable Water Design Requirements

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Applicable codes and standards and their editions shall be verified at the time of final work; reference section 1.2 – *Codes and Standards*.
- B. All piping, joints, and fittings materials in contact with potable water shall comply with requirements of the Safe Drinking Water Act. Coatings and linings materials to be formulated from materials deemed acceptable to NSF 61.
- C. The following summarizes typical guidelines and requirements for piping, valve, sizing, and general design criteria to achieve the intended performance corresponding to conditions of service.
 - 1. Standard minimum easement widths, centered on the pipeline, are 20-feet for potable water lines.
 - 2. Potable Water Mains
 - a. Potable water mains shall have a solid 10 Ga. tracer wire. Solder or split nut is acceptable. The wire shall be extended into valve boxes and kept out of wheels.
 - b. Potable water mains shall have a minimum of 36-inch of cover. Depths exceeding 60-inch cover requires approval from the CoA Public Services Department.
 - c. Potable water mains shall not be installed within 3-feet of any parallel underground utility and shall be installed on a separate shelf.
 - 3. Mechanical joint restrained fittings, or other restraint method, must be shown and labeled on all fittings larger than 2-inch. Approved restrained connections between pipe joints shall be used for a sufficient length of pipe adjacent to each fitting to provide restraint for all reaction forces. Reaction blocks or other alternate restraint method will only be approved at the discretion of the CoA Public Services Department. In no case shall a reaction block be allowed for providing restraint in a location where a future utility installation or excavation could compromise the soil on which the reaction block is bearing. Use wing block/dead man restraint.

DESIGN REQUIREMENTS

4. On dead-end mains 6-inch and larger, provided as a stub-out for future connection, the pipe must be extended past the last valve a minimum distance to provide reaction, or mechanically restrained. Following is a summary of the minimum distances:

Dead End Reaction Distance Pipe

<u>Pipe Size</u>	<u>DIP Reaction Distance</u>
6-inch	60-LF
8-inch	75-LF
12-inch	104-LF

5. Potable Water Meter
- Water services shall be limited to two potable 5/8-inch meters and two 5/8-inch irrigation meters per 2-inch service.
 - For potable water meters 1.5-inches or greater, the Engineer shall submit a detailed water demand estimate, reflecting Average Daily Flow, Peak Hour Demand calculations and AWWA meter sizing calculations, with supporting documentation for review and approval by the CoA Public Services Department.
 - Each single family lot shall have its own meter on the property it is serving with a proper PUE.
 - Double residential potable water meters shall be installed at property corners wherever possible.
 - Potable water meters shall not be located at property corners containing electric transformers.
 - Potable water meters shall be located away from roadway (4 feet minimum) and adjacent to the right-of-way line.
 - For multi-family and commercial projects, buildings shall be master metered or served by grouped potable water meter gangs with no more than 12 units (meters) per gang. Every effort shall be made in the design to plan for all future services for tenants.
 - For multi-family and commercial projects, every effort shall be made to locate potable water meters in grass accessible areas, a minimum of 5-feet from buildings (perpendicular to building, facing the street), outside of tree drip lines and paved areas, behind sidewalks, and generally adjacent to parking areas or roadways at a minimum of 4-feet from the edge of pavement or 2-feet back of curb.

DESIGN REQUIREMENTS

6. Control Valves

- a. Control valves shall be provided on transmission mains at 800-foot maximum intervals and at distribution branches. Valve type shall be resilient wedge.
- b. Control valves shall be provided on each branch of potable water main tees.
- c. At the discretion of the CoA Public Services Department, control valves may be required at strategic locations to provide flexibility for operation and maintenance of the potable water system in order to allow segments of pipe to be isolated and minimize the number of service disruptions.
- d. Control valves shall be located so that associated valve boxes will not conflict with wheel path, parking spaces, curb & gutter, or ADA handicap ramps.
- e. A valve box shall be provided for every valve below grade. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve, with the box cover flush with the final grade with fabricated concrete ring and brass tag.
- f. A main line control valve must be installed beyond the last service on dead end lines and must be properly restrained.
- g. A perpendicular blow-off assembly/bacteriological sample point shall be provided at the end of all dead end water mains and at a maximum of 1,000-foot intervals.
- h. At least one perpendicular blow-off assembly shall be provided on potable water main loops, at a maximum of 1,000-foot intervals, with main line control valves on both sides of the assembly to allow the water main to be flushed, disinfected, sampled, and isolated in both directions.
- i. 3-inch blowoff assemblies shall be provided on all 6 to 10-inch diameter potable water mains, and 6-inch blow-off assemblies shall be provided on all 12-inch diameter and greater potable water mains.
- j. 2-inch sample points with resilient seat wedge valves shall be provided at the end of all potable water mains, and at 1,000-foot maximum intervals, coincident with blow-off assemblies wherever feasible. Sample points shall consist of a smooth, unthreaded hose bib, to prevent the attachment of a hose.
- k. 2-inch valves located in paved areas, including sidewalks, or deeper than 18-inches shall be CoA approved cast iron, resilient seat gate valves with standard 2-inch operating nut, threaded with galvanized nipple between the valves and tapping saddle or tapped tee.

DESIGN REQUIREMENTS

7. Fire Protection

- a. Fire hydrants shall be installed with a maximum spacing of 800-feet along water mains and within 500-feet of the most remote portion of a building as a truck travels.
- b. Engineer shall provide signed and sealed fire flow demand calculations in accordance with NFPA and Florida Fire Prevention Code requirements.
- c. If required, fire sprinkler demand shall be included in total demand.
- d. For buildings with no sprinkler systems, fire flow requirements shall be determined based on peak domestic demand plus the Florida Fire Prevention Code demand (at hydrants).
- e. For buildings with sprinkler systems with a signed and sealed fire protection design, fire flow requirements shall be based on the greater of peak domestic demand plus the Florida Fire Prevention Code demand or peak domestic demand plus fire sprinkler line demand.
- f. The number of fire hydrants required for a project will be determined based on the fire flow demand calculations. One hydrant will be required for each 1,000 gpm of demand, with at least one hydrant located within 500-feet of the most remote point of the building, as the fire truck drives. The remaining hydrants shall be located within 1,000-feet of the most remote point of the building, as the fire truck drives.
- g. All Fire hydrants shall be served with a minimum 8-inch diameter water main (Note: in redevelopment or infill areas, the diameter may be reduced to 6 inch at the sole discretion of the CoA). In all cases, fire hydrants shall be served with no less than a 6-inch diameter water main.
- h. Pipe lengths for potable mains, whether looped or dead ends shall provide adequate fire flow for proposed and future fire flow demands.
- i. Fire hydrants shall be located in easily visible and accessible locations. Fire hydrants shall be located at entrances and intersections whenever possible.
- j. Fire hydrants shall be located at property corners just inside the right-of-way. Fire hydrants shall not be located at the same corners as water meters or electric transformers.
- k. Fire hydrants shall have a minimum clearance of 4-feet from the back of curb and 2-feet from the edge of sidewalk.
- l. Fire hydrants shall be oriented with the largest (4.5-inch) nozzle directed towards the street or parking area.
- m. Fire hydrants shall be red. Fire hydrant bonnets shall be painted in accordance with the following standards:
 - Blue > 1,500 gpm,
 - Green 1,000 to 1,499 gpm,
 - Orange 500 to 999 gpm
 - Red > 500 gpm.

DESIGN REQUIREMENTS

- n. There shall be no obstructions (fences, landscaping, signs, etc.) within 5 feet of each hydrant.
 - o. Fire hydrants shall be connected to water mains using anchoring tees and valves. Fire hydrant assemblies shall utilize anchoring couplings and bends.
 - p. Fire lines shall be designed and installed by a certified fire line Contractor.
 - q. Fire hydrants are to be dry barrel and have manufacturers recommended installation of drain rock for weeping.
 - r. Fire hydrants shall be located to provide complete accessibility, and also in such a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized. All hydrants will stand plumb with the proper nozzle facing the curb and the bury line of the hydrant at the final grade (-2", + 6").
8. Backflow Prevention
- a. Backflow prevention shall be provided in accordance with the *CoA Cross Connection Control Plan*. If there are any conflicts between the *CoA Design and Construction Requirements* and the *CoA Cross Connection Control Plan*, the more stringent shall apply.
 - b. If an auxiliary water source (water from a source other than the potable water system) is proposed or provided for irrigation or other purposes, an approved Reduced Pressure Zone (RPZ) backflow prevention assembly must be installed on the potable water service downstream of the CoA point of service, typically the water meter.
 - c. An approved backflow prevention assembly must be installed on all potable water services connected to all non-residential uses downstream of the CoA point of service, typically the water meter. The type of BFP will be as determined by the CoA based on the facilities use.
 - d. Any dedicated fire line must be equipped with an approved double check backflow preventer assembly. For fire lines serving fire suppression systems containing antifreeze protection, foaming agent injection systems, or other chemical additives an RPZ backflow prevention assembly is required.
 - e. The backflow preventer shall be located on the water supply immediately as the line arrives on site, and shall be mounted above grade in an appropriate, CoA Public Services Department approved, standard enclosure. The area shall be appropriately landscaped. Note that the backflow preventers have a drain that operates periodically – this shall be taken into account in the design.

DESIGN REQUIREMENTS

- f. Engineer shall verify that adequate potable water pressure exists at the site, and that the need for potable water booster pumps is not required.
- g. All backflow prevention assemblies must be installed and tested by a certified backflow tester at the time the CoA Public Services Department installs the potable water meter. A copy of the completed test shall be submitted to the CoA Public Services Department.
- h. The entity responsible for the cost of the water meter installation is responsible for furnishing, installing, protection from freezing, protection from vandalism, performing annual testing, and maintaining the backflow preventer assemblies. The freeze protection system shall not impede access to test ports, valves, or name plate, and shall not trap moisture against the backflow preventer (to avoid corrosion). If the freeze protection method is insulation, the insulation shall be protected with a hard shell that is easily removable, waterproof, and protects the insulation from deterioration.
- i. Privately maintained back flow preventer shall be installed downstream of a meter and shall have 18 to 21-inches of clearance with a house keeping pad. The specific need and type of back flow preventer shall be approved by the CoA Public Services Department.

2.4. Wastewater Design Requirements

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Applicable codes and standards and their editions shall be verified at the time of final work; reference section 1.2 – *Codes and Standards*.
 - 1. All wastewater piping shall have a minimum of 36-inch of cover and a minimum of 10-feet of clearance from other parallel underground utilities or structures.
 - 2. Mains shall be installed in the center of roadways. On curved roads, the wastewater main and manholes shall be located such that the pipe remains within the limits of the paved area. The number of manholes should be minimized by using only the amount required to keep the pipe within the paved area with the manhole covers located in the center of the roadway or the driving lane.
 - 3. Standard minimum easement widths, centered on the pipeline, are 30-feet for gravity wastewater, and 20-feet for force mains.
 - 4. Force Mains
 - a. Force mains shall be installed at the centerline of a standard 20-foot wide easement. Force mains crossing under roadways or commercial driveways shall be installed within a steel casing.
 - b. Force mains shall be designed with 10-feet horizontal and 1.5-feet vertical minimum separation from potable water mains and 3-feet minimum horizontal separation from other underground utilities.

DESIGN REQUIREMENTS

- c. Force mains shall be designed at grades (minimum 0.1% slope) that will reduce the number of high points; force mains shall not be designed or installed level.
- d. When force mains are installed under impervious surfaces or pavement, only standard hot mix asphalt or cast in place concrete paving may be used within a 6-foot wide corridor centered on the pipe, or a corridor with a width equal to twice the depth to the bottom of the pipe, whichever is greater.
- e. Force mains shall be a minimum of 4-inch in diameter.
- f. Air/vacuum release valve assemblies shall be provided at all high points.
- g. Air/vacuum release valves 2-inch in diameter shall be used on 4 through 8-inch diameter force mains. 12 through 16-inch force mains shall be provided with 3-inch air release valves.
- h. Air release valves shall be above ground type, ARI D-025 Combination air release valve for sewage, or similar.
- i. Plug valves shall be provided at maximum 2,000-foot intervals and on all force main branches at tees and wyes. Plug valves shall be provided in the main immediately upstream of each tee and wye so that the branch may be kept in service while isolating the main upstream.
- j. Tees and 90 degree bends shall not be used on force mains less than 12 inch in diameter unless approved by the CoA Public Services Director. Wyes shall be utilized at connection points and bends 45 degrees or less shall be used.
- k. Mechanical restraint method must be shown and labeled for all fittings and pipe line segments.
- l. Connections to existing force mains shall only be conducted by properly trained and licensed Contractors that specialize in the business of tapping active water/sewer pressurized lines. In addition the specialty Contractor must have applied and been accepted by the CoA Public Services Department as a pre-approved Contractor certified to tap CoA owned mains. A pipeline integrity test shall be performed by the Contractor in the presence of the CoA Public Services Department Inspector prior to scheduling a force main tap. All tapping shall be completed in the presence of the CoA Public Services Department Inspector. The resulting tap coupon shall be tagged, labeled, and delivered to the CoA Public Services Department.
- m. Private force mains shall connect only to a gravity sewer, and shall connect via a lateral at a clean-out at the right-of-way or PUE line.
- n. Force mains shall be connected at the bottom of the manhole matching the crown of the existing gravity pipe. The flow from the force main shall be directed into the downstream invert of the manhole to reduce the amount of turbulence and H₂S dissipation.
- o. A plug valve shall be provided in the force main adjacent to the gravity system connection.

DESIGN REQUIREMENTS

- p. Installation of privately maintained individual grinder stations with one pump that primarily serve a single residence/structure requires CoA Building Department permit. The CoA Building Department Inspector shall inspect installation of the station and force main routed to the connection point and verifies it is leak tested per Code.

5. Gravity Mains

- a. Mains shall have a minimum 8-inch inside diameter and shall be installed with uniform alignment and grade between manholes.
- b. Manholes shall be provided at a minimum of 300-feet intervals, end of all lines, grade changes, and at deviations in alignment.
- c. Gravity mains shall be designed in accordance with the following slopes (foot/100-feet):

Pipe Size	Minimum Slope	Maximum Slope
8-inch	0.40%	4.50%
10-inch	0.28%	Engineer to verify
12-inch	0.22%	Engineer to verify

- d. Pipe slopes shall be designed at greater than minimum slopes when possible, and shall be designed to obtain velocities of not less than 2-fps minimum and not more than 15-fps maximum at peak daily flow.
- e. Gravity wastewater main stub-outs shall be provided to all developable land parcels in the vicinity of the project and future phases of the project as directed by the CoA Public Services Director.
- f. Gravity wastewater main stub-outs shall be extended to the property line or phase line and shall extend a minimum of 10-feet past the edge of pavement or a distance of 1.5 times the wastewater depth, whichever is greater.
- g. Terminal manholes may be required on gravity wastewater stub-outs that exceed 40-feet in length for the purposes of inspection and maintenance; at the discretion of the CoA Public Services Director.
- h. Services shall not be connected to stub-outs without a terminal manhole.
- i. Outside drop construction is required for mains which enter a manhole at greater than 2-feet above the manhole invert. Drop connection must have the lower invert placed 0.1 to 0.3-feet above the invert of the manhole outlet.
- j. Inside drop construction for connections to existing manholes may be permitted at the discretion of the CoA Public Services Director.
- k. CoA or privately maintained collection systems serving more than two buildings, lots, or parcels shall be designed with minimum 8-inch gravity main and standard manholes.
- l. There shall be only one gravity main exiting each manhole and no more than 3 total connections, including services and mains, entering each manhole at or near the same elevation. At least 18-inches of precast concrete shall remain between the boots of any two adjacent pipes.

DESIGN REQUIREMENTS

- m. Proposed manholes with force mains discharging into them shall be lined with Agru Sure-Grip PE Yellow 3.0 mm thick liner or approved equivalent by the CoA Public Services Director. Liner shall protect all surfaces within the manhole (side wall, upper side roof, floor, and pipe penetrations sleeved with flexible boot connector).
 - n. Existing wastewater manholes that are to receive force main discharge shall be lined with an approved corrosion resistant liner. Liner shall be Agru Sure-Grip PE Yellow 3.0 mm thick liner or approved equivalent by the CoA Public Services Director. Liner shall protect all surfaces within the manhole (side wall, upper side roof, floor, and pipe penetrations sleeved with flexible boot connector).
6. Service Laterals
- a. Single gravity services shall be provided to the center of each lot, building, or parcel. All cleanouts shall have a concrete ring.
 - b. 4-inch services shall have cleanouts installed at a minimum of every 75 feet and be designed to a 1.0% minimum slope.
 - c. 6-inch services shall have cleanouts installed at a minimum of every 100 feet and be designed to a 0.60 % minimum slope.
 - d. Services shall terminate with a clean out at the right-of-way and indicate end of CoA maintenance.
 - e. Additional private cleanouts on site shall include a clean out within 5-feet of the building wastewater service.
 - f. For single family residential systems the single service shall be installed at the lot centerline and shall be drawn perpendicular to the wastewater main. Services shall be designed at a depth of 4.5 to 5.0-feet below finished grade at the CoA cleanout at the right-of-way or back of PUE to allow clearances to perpendicular running utilities.
 - g. For commercial and multi-family systems the CoA maintained services shall serve no more than one dwelling unit or commercial building. Services that serve more than one apartment or dwelling unit shall be privately maintained.
 - h. Cleanouts located in paved surfaces and sidewalks shall be provided with traffic load bearing covers.
 - i. Cleanout invert elevations shall be set such that there is sufficient slope to the gravity main.
 - j. Services shall be designed to connect to the gravity main with a wye fitting rotated 45 degrees up. The invert elevation of the service at the main shall be at or above the crown of the mainline pipe.
 - k. Services connecting to manholes shall be designed with an invert a minimum of 0.3-feet above the invert of the manhole.
 - l. Services connecting to manholes shall penetrate completely through the manhole wall and extend 3 to 5-inches beyond the inside of the manhole; a neoprene boot shall seal the penetration and shall be cleanly grouted.

DESIGN REQUIREMENTS

- m. Service lateral cleanout invert elevations shall be set a minimum of 1.5 feet below the minimum finished floor elevation of the proposed buildings or lots/parcels under review.
 - n. Finished floor elevation shall be a minimum of 0.5-feet higher than the rim elevation of the lowest upstream manhole. If this is not feasible, a Clean Check extendable backwater valve (or equal) shall be installed just downstream of the sewer clean-out adjacent to the house and the clean-out lid shall be replaced with a Sewer Popper (or equal) relief valve and maintained by the property owner.
7. Manholes.
- a. Locate manhole covers in the center of roadways or center of the lane. Manhole covers shall be located where access for maintenance would not be blocked or restricted. Manhole covers shall not be installed within 3-feet of the flow line of inverted crown roads or within the design high water limits of gutters, swales, or stormwater areas.
 - b. Manhole “pans” may be required at the discretion of the CoA Public Services Department.
 - c. Manholes located outside of pavement shall have the ring and cover raised to 6-inches above the final grade. The ground around the manhole ring and cover shall be sloped from the top of the rim down to surrounding finished grade at 10:1 slope.
 - d. Manholes with a depth of 20-feet or more shall be 72-inch inside diameter.
 - e. A 12-foot wide stabilized access road, stabilized to a minimum LBR 30, shall be provided to all CoA maintained manholes located within CoA easements. The access road shall be designed to provide for adequate drainage and to prevent erosion from stormwater runoff.

2.5. Reclaimed Water Design Requirements

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Applicable codes and standards and their editions shall be verified at the time of final work; reference section 1.2 – *Codes and Standards*.
1. Reclaimed Service
- a. Reclaimed water services shall be provided to each lot, building, or parcel that requires a separate reclaimed water account.
 - b. Reclaimed water services shall be limited to one 5/8-inch meter per 1-inch service, and two 5/8-inch reclaimed water meters per 2-inch service, and 20 equivalent residential irrigation connections per 4-inch dead end reclaimed water main.
 - c. Double residential reclaimed water meters shall be installed at property corners wherever possible. Where space is not available at a property corner, the reclaimed water service may terminate 5-feet offset from the sanitary wastewater cleanout at the center of the lot.
 - d. Reclaimed water meters shall not be located at property corners containing electric transformers or water meters. Reclaimed water meters should be shown and installed away from road, behind and adjacent to the right-of-way line.

DESIGN REQUIREMENTS

- e. The reclaimed water meter should be located on the property, lot, or parcel that it is serving.
 - f. For multi-family and commercial projects, every effort shall be made to locate reclaimed water meters in accessible areas, outside of paved areas, a minimum of 5-feet from buildings, behind sidewalks, and generally adjacent to parking areas or roadways a minimum of 2-feet from edge of pavement.
 - g. For reclaimed water meters 1.5-inch or greater, the Engineer shall submit a detailed reclaimed water demand estimate for review and approval by the CoA Public Services Department.
2. All reclaimed water piping shall have a minimum of 36-inches of cover and at the centerline of a standard 20-foot easement. Minimum of 10-feet of clearance from other parallel underground utilities or structures. Depths exceeding 60-inch cover requires approval by the CoA Public Services Department.
 3. 4-inch reclaimed water mains shall be limited to 600 LF for dead end mains and 1,500 LF for looped mains.
 4. Mechanical joint restrained fittings, or other restraint method, must be shown and labeled on all fittings larger than 2-inch in diameter. Approved restrained connections between pipe joints shall be used for a sufficient length of pipe adjacent to each fitting to provide restraint for all reaction forces. See Reaction Distance Table below for dead-end mains. Reaction blocks or other alternate restraint method will only be approved at the discretion of the CoA. In no case shall a reaction block be allowed for providing restraint in a location where a future utility installation or landscape excavation could compromise the soil on which the reaction block is bearing.
 5. Connections to existing dead-end reclaimed water mains without an existing valve past the last service shall include installation of a main line valve at the connection point.
 6. On dead-end mains, 4-inch diameter and larger, provided as a stub-out for future connection, the pipe must be extended past the last main line control valve a minimum distance of 60 LF to provide reaction, unless mechanical restraint is installed on the last 60-feet of main. If no valve is installed at this location, an equal length of pipe shall be restrained and the cap/plug at the end of the pipe shall be mechanically restrained. Below is a summary of the minimum restraining distances:

Reaction Distance

<u>Pipe Size</u>	<u>DIP</u>
4-inch	60 LF
6-inch	60 LF
8-inch	75 LF
12-inch	104 LF

7. 2-inch reclaimed water services/crossings located beneath paved roadways or parking areas shall be encased in a purple 4-inch Schedule 40 PVC sleeve.

DESIGN REQUIREMENTS

8. Reclaimed water mains with less than 18-inches of vertical separation from sanitary wastewater mains shall require one joint (20 LF) of reclaimed water main and one joint (20 LF) of wastewater main centered at the point of crossing.
9. All reclaimed waterlines shall have tracer wire stubbed up every 1,000 LF of pipe; in valve box with concrete ring.
10. Reclaimed water mains shall be installed with a minimum 3-feet horizontal clearance (center to center) from other parallel underground utilities, except potable water mains. For typical sizes, reclaimed water mains shall be installed with a minimum horizontal clearance of 4-feet center-to-center from water mains, and in all cases maintain a minimum of 36-inches outside-to-outside of pipe from all potable water mains.
11. Valves and Blow Offs
 - a. Resilient wedge control valves shall be provided on transmission mains with limited numbers of service connections at 2,500-feet maximum intervals and at distribution branches.
 - b. Air relief valves shall be provided at each high point on transmission mains not designed with reclaimed water services located at the high point.
 - c. Control valves shall be provided on all branches except the supply side of all reclaimed water main tees.
 - d. Control valves shall be provided at strategic locations to provide flexibility for operation and maintenance of the reclaimed water system to allow sections of pipe to be isolated minimizing the number of customers out of service.
 - e. Control valves shall be provided at a maximum of 500-feet intervals within urban areas, or as required by the CoA.
 - f. Control valves shall have a pre-fab concrete wring around each box.
 - g. A perpendicular blow-off assembly shall be provided at the end of all reclaimed water mains sufficient to flush all sand and debris from all mains.
 - h. A control valve shall be located a minimum of 60 LF upstream of each blow-off assembly, unless mechanical restraint is installed on the last 60 feet of main.
 - i. 2-inch blow-off assemblies shall be provided on all 4-inch diameter reclaimed water mains, 3-inch blow-off assemblies shall be provided on all 6 and 8-inch diameter reclaimed water mains, and 6-inch blow-off assemblies shall be provided on all 12-inch and larger diameter reclaimed water mains.
 - j. Control valves shall be located so that associated valve boxes will not conflict with vehicle wheel path, parking spaces, curb & gutter, and ADA handicap ramps, and should be located outside of pavement where possible.
 - k. 2-inch valves shall be an approved epoxy coated cast iron, resilient seat gate valve with standard 2-inch operating nut, threaded with an epoxy coated brass nipple on both sides.

2.6. Lift Station Design Requirements

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Applicable codes and standards and their editions shall be verified at the time of final work; reference section 1.2 – *Codes and Standards*.
1. Site selection is critical in producing a satisfactory permanent facility with attractive life-cycle costs. Site evaluation by the Engineer shall include assessment of the following:
 - a. Visual impact on the neighborhood. The lift station shall be sufficiently set back from the property line. A minimum of 10-foot from the property line to the fence line is needed to accommodate a landscape buffer zone. To the greatest extent, features shall be located below grade.
 - b. Top of lift station structures or grade level floors, top of valve vaults, and concrete pads for pump control panels, electrical rooms and generators shall all be at the same elevation. This common elevation shall be a minimum 1 foot above the highest of the following:
 - (1) Base flood (100 year flood)
 - (2) Record inundation
 - (3) Center line of adjacent street
 - (4) Nearest controlling sanitary sewer manhole
 - c. Access for pump removal equipment. The site shall include sufficient pavement areas and clearance to accommodate full movement and operations of the CoA vehicles. This includes being able to safely navigate around overhead interferences, such as electrical lines.
 - d. The site shall be a minimum of 50 x 50-feet square, and shall be deeded to the CoA. The site shall be cleared of all landscaping. Any landscaping adjacent to the lift station shall be placed outside of the lift station site area.
 - e. The site shall be graded to provide adequate and uniform sheet flow runoff. Piping, inlets, curbs and concrete swales, as appropriate, shall be utilized to control stormwater and prevent erosion.
 - f. A uniformly graded level area shall be provided around the valve pit, wet well, control panel, transformer, and meter, and shall uniformly slope away from the pavement and structures at 2%.
 - g. A uniformly graded, level area shall be provided extending 5-feet beyond the paved drive and all structures and appurtenances. This area shall be sloped at 4% away from all structures and appurtenances.
 - h. Minimum drainage slopes shall be provided around the pump station, piping, valves, electrical building, and control panels.
 - i. Site shall be graded so that surface water does not drain into the wet well, meter, or valve vaults. Slope shall not be greater than 1-foot vertical to 6 feet horizontal.
 - j. The paved drive shall be a minimum of 14-feet wide with a 20-feet wide area adjacent to the wet well and valve pit.

DESIGN REQUIREMENTS

- k. The paved drive shall have a uniform elevation with wet well and shall be designed and constructed to slope 2% away from the lift station.
- 2. Clearances
 - a. At least 30-feet from all sides of structure to the property lines, where space is readily available.
 - b. At least 20-feet from structure to property lines on at least two sides when available land is limited.
 - c. Wet well tops extending 8 to 12-inches above the finished grade without berming up to top slab elevation.
 - d. Minimum setback distances from all property lines shall be as governed by ordinances.
- 3. Access Requirements
 - a. Site security shall be provided by a full-perimeter intruder resistance fence, including one 12-foot wide, inward opening, double leaf swing gate secured with keyed padlock. The fence shall be 8-foot high black vinyl 6 GA fencing.
 - b. Site security fence and entrance gate shall be placed far enough from the street to allow maintenance vehicles to be off the main roadway when the operator stops to unlock the gate.
 - c. Access roadway shall be concrete pavement and the minimum width shall be 12-feet. Access roadway shall allow for trucks to turn around and be able to safely enter the main roadway from the turnaround points. Paving into the site shall be Portland cement concrete of sufficient design and thickness for anticipated loads.
- 4. Design Flows
 - a. All lift stations shall be designed to carry the estimated design wet weather flow from the area ultimately contributing to the lift station by the corresponding sanitary sewer system.
 - b. The CoA Public Services Director shall approve all design and determine the requirements for future upgrades of all Lift Stations. Lift Stations requiring up-grading shall be designed and constructed to meet the anticipated future flows of the development.
 - c. The following design criteria shall be considered for hydraulic design.
 - (1) Hydraulic Institute Engineering Data Book, or other recognized reference for hydraulic data, shall be used for fitting(s) and valve velocity head K-factors.
 - (2) The velocity of the pump discharge piping shall be generally 5 to 10 fps at design peak hour flow (PHF).
 - (3) For submersible lift stations, a minimum of 2-feet shall be added to the manufacturer's recommended minimum submergence requirements.

DESIGN REQUIREMENTS

- (4) The receiving sewer shall have the sufficient capacity to accept the peak discharge rate from the proposed force main while not surcharging. Surcharging of the receiving sewers is not allowed.
- (5) Lift station's, including sumps and baffle walls, shall be hydraulically designed per the latest version of the Hydraulic Institute Standards and the recommendations of the Flygt Corporation for submersible pumps.
- (6) Engineer shall obtain a certification from the pump manufacturer that the pumps will perform in the designed pump station layout.

5. Pump Design Conditions

- a. Engineer shall prepare a set of pump curves to simulate the operation of the selected pumps and force main under a wide range of scenarios. At a minimum, Engineer shall analyze pump performance at the following conditions:
 - 1. pumping at minimum,
 - 2. design, and
 - 3. maximum head condition.
- b. Wet well volume for constant speed pumps.
 - 1. The wet well volume for constant speed pumps shall allow the time within one pumping cycle to be limited in order to prevent motor insulation failure due to overheating. Engineer shall refer to NEMA standards.
 - 2. Pump cycle time shall generally be per the manufacturer's recommendation, or limited to a minimum cycle time of 15 minutes (at design flow), per Ten State Standards; whichever is more stringent.
 - 3. Wet well storage volume shall be such that detention time is less than 30 minutes at dry weather flow, per Ten State Standards, to minimize septic conditions and odor generation.
- c. All pipe line design shall consider the potential for hydraulic transients (i.e. surge, or waterhammer). For piping systems with lengths greater than approximately 2,000-feet, surge analysis is required. A registered Professional Engineer shall sign off on report ensuring piping, properties, assumptions, boundary conditions, operational scenarios, hydraulic equipment and valve characteristics, and surge control strategy is implemented on the project.
- d. All submersible pumps shall be able to "run dry", that is, with liquid in the wet well only deep enough to submerge the bottom half of the pump's volute.
- e. Pumps shall be Flygt submersible or approved by the CoA Public Services Director.
- f. Selected pump impeller diameter shall be in the middle range of the available diameters for the selected pump. Maximum or minimum impellers are not allowed.

DESIGN REQUIREMENTS

- g. Sufficient electrical/control cable shall be attached to the pump such that no splicing is required between the pump and a junction box. A seal shall be supplied between a junction box and any panel or disconnect, and between the wet well and junction box to isolate the junction box from the moisture and corrosive gasses in the wet well.
- h. Motor size shall be such that the nominal horsepower rating is not exceeded over the full operating range of the pump (i.e. motors shall be non-overloading at all the points on the pump curve, exclusive of the service factor).
- i. The pumps shall be provided with a tandem double mechanical seal running in an oil bath. The seals shall be of lapped tungsten carbide, held in contact by separate springs. Conventional double mechanical seals with a spring assembly between the rotating faces, requiring constant differential pressure to effect sealing, are not acceptable.
- j. The stator casing, oil casing, volute and impeller shall be of Class 30, gray iron construction, with all external parts coming into contact with sewage protected by a coating of high build epoxy resistant to sewage. All external bolts and nuts shall be stainless steel. The impeller shall be non-clog design, capable of passing solids, fibrous material, heavy sludge, and constructed with a long thruway with no acute turns.
- k. The pump motor shall be of Class F insulation, NEMA B design, watertight and air filled. The pump motor shall be guaranteed to run in a totally, partially, or non-submerged condition continuously for a period of 24 hours without damages.
- l. The pump shaft shall be of stainless steel and supported by a double row inboard bearing for axial thrust and a single row outboard bearing for radial thrust. The impeller shall be connected to a short sturdy shaft in order to minimize shaft deflection.
- m. The pump conductor shall be stranded cable, 50-feet in length minimum, and in compliance with industry standard for load and resistance against sewage. The conductor shall enter the pump through a heavy duty entry assembly which shall be provided with an internal grommet assembly to protect against leakage once secured and must have a strain relief assembly as part of standard construction. The conductor shall connect to a terminal board which separates the incoming service from the pump motor, so, if leakage occurs, the terminal board shall short out and not cause damage to the motor.
- n. The pump manufacturer shall warrant the pumps and accessories being supplied to the CoA against defects in workmanship and materials for a period of five years under normal use, operation, and service. In addition, the manufacturer shall replace certain parts which become defective through normal use and wear on a progressive schedule of cost for a period of five years; parts included are the mechanical seal, impeller, pump housing, wear ring, and ball bearings. The warranty shall be in published form and apply to all similar units.

DESIGN REQUIREMENTS

- o. The ADF shall be based upon 275 gpd per Equivalent Residential Unit.
 - p. The minimum pumping rate shall be based upon the greater of the peak hour flow (PHF) or the flow necessary to provide a minimum scouring velocity of 2.5 feet per second in the force main.
 - q. Pumps shall be sized to provide adequate pumping capacity for the peak hour flow (PHF), [2.5 times the average daily flow (ADF)], for the proposed development.
 - r. Lift Stations shall be designed with minimum 5 horsepower pumps. The design of the pumps shall be such that each unit will be automatically connected to the discharge piping when lowered into place on the discharge connection.
 - s. The pump(s) shall be easily removable for inspection or service, requiring no bolts, nuts, or other fastenings to be removed for this purpose and no need for personnel to enter pump well.
 - t. Each pump shall be fitted with a stainless steel cable, plastic coated, of adequate strength and length to permit raising the pump for inspection and removal.
 - u. Each pump shall be supplied with a sliding bracket which bolts to the pump and shall accept the discharge elbow provided by the pump manufacturer. The pump unit shall be guided by no less than two guide bars. Sealing of the pump to the discharge flange shall be accomplished by a simple downward linear motion of the pump with entire weight of the pump guided to and pressing against the discharge connection. No part of the pump shall rest directly on the sump flow and no rotary motion to the pump shall be required for sealing. Sealing of the discharge shall be a direct mating of the pump discharge and discharge connection.
- 6. Lift Stations requiring 20 Hp pumps or larger shall be served by 208v or 480v system with Soft Start or Variable Frequency Drive (VFD) equipment and CT/PT metering. All electrical components shall be sized to handle any future up-grading of the station. All stations shall have a step down transformer with 120 V power for auxiliary power.
 - 7. The pump control panel shall be a NEMA-3X 304 stainless steel enclosure, gasketed door, with alarm contact for unauthorized entry, heavy duty padlock hasp, internal "DEAD FRONT" safety door. Control panels shall require a safety latch to keep the doors locked in an open position during maintenance.
 - 8. Each pump motor shall have an individual disconnect switch, three phase overload protection with manual reset and a magnetic contactor, with time delay relays.

DESIGN REQUIREMENTS

9. Access Frame and Cover

- a. Each pump(s) shall be provided with an access frame complete with hinged and locking post equipped cover, upper guide holder, level sensor cable holder, and hooks for securing pump conductors. Frame shall be securely mounted above the pumps. Each door shall have safety locking handle in open position. All components shall be of aluminum and/or stainless steel, and rated to carry 300 pounds per square foot.
- b. Lift Stations shall have two single doors for easy removal of each pump.

10. Lift Station Control

- a. The primary device for pump station level measurement shall be a Flygt Multismart with level sensing probe shall be selected for measurement throughout the entire range of working volume of the wet well. A minimum of 10-sensors, mounting bracket, and multismart intelligent pump station manager and RTU shall be provided.
- b. Additional level floats shall be provided to indicate:
Low Low Level Alarm – 1 foot above pump's minimum submergence.
High Level Alarm – 1 foot below the lowest inlet pipe

11. Lift Station's Wet Well

- a. Circular wet well configuration with a minimum inside diameter of 6-feet or maximum of 12-feet may be used. Floor bottoms shall slope toward pump inlets to minimize grit accumulation.
- b. The wet well shall be a minimum of 6-feet in diameter for pumps up to 15 HP.
- c. The wet well shall be a minimum of 8-feet in diameter for pumps greater than 15 HP.
- d. The wet well shall be limited to one influent line, which connects to the receiving manhole on the lift station site.
- e. Lift stations may be constructed of pre-cast concrete sections or fiberglass basins. If pre-cast, each pre-cast section installed shall be joined to form a watertight joint with "Ram-Nek" sealer or equivalent.
- f. Precast wetwells shall incorporate Agru Sure-Grip PE Yellow 3.0 mm thick liner or approved equivalent by the CoA Public Services Director. Liner shall protect all surfaces within the manhole (side wall, upper side roof, floor, and pipe penetrations sleeved with flexible boot connector).
- g. Access Hatches shall be gasketed to prevent rain water from entering the pump station and be designed for a uniform load of 250 psi. Frame and cover shall be fabricated of Aluminum. Pump access hatches (minimum 4 by 6-feet) shall be sized to provide standards or manufacturer's recommended clearance on all sides of the pump as it is being removed.
- h. All guide rails, chains, anchor bolts and other fasteners and hardware within the wet well shall be Type 316 stainless steel.

DESIGN REQUIREMENTS

- i. Wet Wells deeper than 30-feet may require a fiberglass intermediate landing located above the high water level. Engineer shall coordinate with CoA Public Services Department for requirements.

12. Lift Station Design Drawings

- a. All wastewater lift station system design drawings shall contain mechanical and electrical drawings with sufficient information to comply with the *CoA Design and Construction Requirements* and at a minimum specify pump size, pumping rate, total dynamic head conditions, wet well size and associated elevations, pump discharge size, force main size, electrical loads, transformer size, electric conduit, conductor size, and associated appurtenances.
- b. Lift stations that receive flow from another lift station shall include an approved stationary generator.
- c. Provide the operating point, design point and dead head condition on the plan sheets.
- d. Plans shall include a lift station site plan at 1"=10' scale and it shall include:
 - (1) Paving, grading and drainage design and details, with existing and proposed one foot elevation contours.
 - (2) The control panel, SCADA tower, electric meter, transformer, primary conduit to the existing power supply, and secondary conduit to the control panel, and conduits to the wet-well.
 - (3) Site lighting at the station shall be provided in accordance with Section 6.4 of the LDRs.
 - (4) The lift station parcel or site area shall be depicted with accurate dimensions. The minimum parcel size for a CoA maintained lift station is 50 x 50-feet.
 - (5) Connections to an existing or proposed force main and gravity system shall be labeled with pipe size, type, slope, manhole top elevations and invert elevations.
 - (6) Existing and proposed stormwater facilities, adjacent or nearby the site, shall be shown, and the design high water elevations for the 100 year, 24 hour storm event shall be indicated.

13. Valve Pit and Receiving Manhole

- a. A receiving manhole shall be located 15 to 20-feet from the lift station's wet well.
- b. The gravity main connecting the receiving manhole and wet well shall be a minimum 8-inch diameter DR 18 PVC at minimum 1% slope, and include installation of a full port plug valve.
- c. A valve pit shall contain the swing arm check valves, control valves and emergency pump out connection.

DESIGN REQUIREMENTS

- d. The valve pit shall be a minimum of 4-feet deep. The length, width, and depth shall be determined based upon the discharge piping size and spacing. Within the valve pit there shall be minimum 12-inches of clearance between the discharge piping, valves and fittings; 24-inches of clearance between piping and internal walls. There shall be minimum 12 inches of clearance between the pipe flanges and the valve pit bottom.
 - e. Lift station's discharge shall incorporate a flowmeter with bypass (i.e. mag meter).
14. Electrical Control Panel and Service
- a. The lift station control panel shall be supplied by the pump manufacturer.
 - b. CoA Public Services Department will provide direction for lift station's SCADA and radio requirements.
 - c. The Engineer shall coordinate with the electric service provider for the location and type of electrical service to be provided.
 - d. The primary and secondary electrical conductors and conduit shall be sized to meet load requirements in accordance with the Florida Building Code and the National Electric Code.
 - e. The conductors and conduits may be oversized at the discretion of the CoA Public Services Department to accommodate future pump and panel upgrades.
 - f. Pad mounted transformers shall be provided in an accessible location at a minimum of 4-feet from a paved surface.
 - g. The pad-mounted transformer shall be located in the site corner on the same side as the control panel location.
 - h. Primary conduits shall be shown from the transformer to the existing point of service.
 - i. Secondary conduit shall be shown from the transformer to the meter with disconnect, and to the control panel.
 - j. A detail of the transformer pad shall be included on the site plan in accordance with the electrical provider's standards.

2.7. Jack and Bore Design Requirements

- A. Designs prepared for the CoA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Applicable codes and standards and their editions shall be verified at the time of final work; reference section 1.2 – *Codes and Standards*.
- 1. Force mains within jack and bore casings shall be PVC, C900/905, DR-18 Diamond-lok restrained joint piping.
 - 2. The encasement pipe shall be installed beneath highway and railroads, etc. at the location and depth.
 - 3. Where groundwater may be encountered during the construction, a rock-bed with pump to de-water the pit may be permitted; or, well points shall be specified by the Engineer.

DESIGN REQUIREMENTS

4. Engineer shall obtain the necessary permits for construction across State highways and railroads.
5. Encasement Pipe
 - a. All encasement pipes for railroad crossing shall be steel casing pipe for Cooper B 80 loading and shall conform to the provisions of Part S, Section 3 of the American Railroad Engineering Division Specifications for pipe lines for conveying flammable and nonflammable substances.
 - b. The length of the encasement pipe shall be as directed by the CoA Public Services Director. The steel shall have minimum yield strength of 36,000 psi and shall have the following minimum thickness:

Steel Casing Diameter	Railroad Min. Thickness	DOT Min. Thickness
8-inch	0.250-inch	0.188-inch
10-inch	0.250-inch	0.188-inch
12-inch	0.250-inch	0.188-inch
14-inch	0.281-inch	0.250-inch
16-inch	0.281-inch	0.250-inch
18-inch	0.312-inch	0.250-inch
20-inch	0.375-inch	0.250-inch
22-inch	0.375-inch	0.250-inch
24-inch	0.500-inch	0.250-inch
30-inch	0.500-inch	0.312-inch
36-inch	0.562-inch	0.375-inch

- c. The carrier pipe for potable and reclaimed water mains shall be ductile iron. The following is the recommended size of the steel casing for the various sizes of carrier pipe:

Minimum Diameter of Steel Casing (in.)		
Carrier Pipe (inch)	Water/FM Casing (inch)	Gravity Casing (inch)
4	12	14
6	14	16
8	16	18
10	NA	20
12	20	22
14	22	NA
15	NA	30
16	24	NA
18	30	30
20	30	NA
21	NA	36
24	36	42
30	42	48
36	48	54

DESIGN REQUIREMENTS

6. Boring and Jacking Method

- a. Prior to a casing installation by the boring and jacking method, the roadway or rail-bed shall be inspected for depressions or pavement damage.
- b. Under no circumstances may anchors or other supports be installed in the roadbed or rail-bed.
- c. Once started, the operation shall continue without interruption until the crossing is completed.

7. Casing Spacers

- a. Carrier pipe shall be supported on stainless steel supports. Two supports per joint of ductile iron pipe shall be used located 2-feet from each end of the pipe. Three supports per joint of PVC pipe shall be used, located at the center and 2-feet from each end of the pipe.
- b. Spacers shall be bolt on style with a two piece solid shell made from T-304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed PVC sheet of a 0.090-inch thickness that overlaps the edges
- c. Runners, made from UHMW polymer, shall be attached to risers at appropriate positions to properly locate the carrier pipe within the casing and to ease installation.
- d. Risers shall be made from T-304 stainless steel of a minimum 14 gauge thickness and shall be attached to the shell by MIG welding. All welds shall be fully passivated. All fasteners shall be made from T-304 stainless steel.
- e. Riser and runner height, and the number of runners per support shall be as follows:
Four runners, height 2 through 12-inch carrier pipe
Six runners, height 2.5 through 36-inch carrier pipe
Seven runners, height 2.5 through 48-inch carrier pipe
- f. Casing spacers shall be Model CCS as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL, PSI (Pipeline Seal and Insulator, Inc. of Houston TX).

2.8. Painting and Coatings

- A. Products shall be from nationally recognized manufacturers of paints and protective coatings who are regularly engaged in the production of such material for essentially identical service conditions.
- B. Products from manufacturers with minimum 5 years experience in manufacture of specified products. Minimum 5 years experience for applicator.
- C. Only compatible materials from a single manufacturer shall be used in the Work (i.e. primers and finish coats). Thinners, cleaners, driers, and other additives, as recommended by coating manufacturer.
- D. Finish Colors: shall be approved by CoA Public Services Department.
- E. Do not paint exterior concrete surfaces, unless specifically indicated and approved by CoA Public Services Director.

2.9. Piping Support

- A. Piping supports system shall be designed and sealed by a Registered Professional Engineer in Florida.
- B. Design pipe support systems for gravity and thrust loads imposed by weight of pipes or internal pressures, including insulation and weight of fluid in pipes.
- C. Support piping connections to equipment by pipe support and not by equipment.
- D. Support large and heavy valves, fittings and appurtenances independently of connected piping.
- E. Do not support pipe from pipe or equipment.
- F. Provide dielectric barrier between painted or galvanized carbon steel members and copper or stainless steel pipe or between stainless steel supports and nonstainless steel ferrous metal piping.

2.10. **Piping**

- A. Pipe identification. On all new exposed pipes, paint the flow stream identification and the direction of flow using an arrow. The painting shall be completed with stencils. Locate at intervals along piping not greater than 10 feet on center with at least one painted stencil applied to each exposed horizontal and vertical run of pipe.
1. Insulation required for all exposed services. Extent of insulation to a depth of 1-foot below surface grade.
 2. When a potable or reclaimed water main, or a wastewater force main is routed within 5-feet of an electric transformer, a complete length of DIP shall be centered on the transformer with mechanical restraint at each end. No fittings or valves shall occur within 10-feet of the nearest edge of the transformer. A minimum clearance of 3-feet shall be maintained between the main and the transformer.
 3. Gravity Wastewater mains shall maintain a minimum of 15-feet horizontal separation from, buildings, transformers, and all permanent structures.
 4. Service laterals require 5-feet less clearance for each of the utilities; note that water service laterals shall be installed within 4-inch sleeves under roadways. Separation to trees is reduced to 7.5-feet for pressurized mains and services and 10-feet (minimum) for gravity mains and services.
 5. Potable Water Piping and Fittings.
 - a Size: \leq 2-inches
 - (1) Material: Polyvinyl Chloride (PVC), schedule 40. Pipe shall be manufactured with titanium dioxide for ultraviolet protection.
 - (2) Application: Buried.
 - (3) Joint type: flanged, solvent welded. Solvent weld using Oatey No 30757 purple primer and Oatey No 30893 medium PVC cement.
 - (4) Interior Lining: none
 - (5) Exterior coating: finish color blue.
 - (6) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - (7) Fittings: schedule 80.
 - b Size: \leq 2-inches
 - (1) Material: Galvanized carbon steel, ASTM A106, Grade B seamless or ASTM A53, Grade B seamless or ERW. Schedule 80.
 - (2) Application: Exposed.
 - (3) Joint type: flanged or threaded; AWWA C606.
 - (4) Interior Lining: none.
 - (5) Exterior coating: none.
 - (6) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - (7) Threaded Fittings: 150 or 300-pound malleable iron, ASTM A197 or ASTM A47, dimension in accordance with ASME B16.3.

DESIGN REQUIREMENTS

- (8) Thread Lubricant: Teflon tape or joint compound that is insoluble in water.
- c Size: 4 to 12-inches.
 - (1) Material: Cement-Lined Ductile Iron (CLDI); Class 350.
 - (2) Application: major traffic areas, under pavement, easements, sidewalks, roadways, exposed piping, and within bore and jack casings.
 - (3) Buried joint type: proprietary restrained joint.
 - (4) Exposed joint type: flanged.
 - (5) Interior Lining: cement mortar; in accordance with AWWA C104/A21.4.
 - (6) Exposed exterior coating: finish color blue.
 - (7) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
- d Size: 4 to 12-inch
 - (1) Material: C900, conforming to AWWA C900.
 - (2) Joint Type: hub and spigot.
 - (3) Buried exterior coating: none. Blue in color or blue stripped.
 - (4) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
- 6. Wastewater Force main
 - a Size: All
 - (1) Material: Ceramic Epoxy-Lined Ductile Iron (CELDI)
 - (2) Buried joint type: proprietary restrained joint.
 - (3) Exposed joint type: flanged.
 - (4) Interior Lining: Protecto 401 epoxy lined.
 - (5) Buried exterior coating: pipe shall be polyethylene encased conforming to ANSI/ASTM D1248. Thickness shall be 8 mils. Install in accordance with AWWA C105.
 - (6) Exposed exterior coating: final color light brown.
 - (7) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - b Size: 4 to 10-inch
 - (1) Material: C900, conforming to AWWA C900.
 - (2) Application: 10-feet or less cover from finished grade. SDR 35.

DESIGN REQUIREMENTS

- (3) Application: located within easements between lots with less than 6 feet or more than 10-feet of cover from proposed grade.
SDR: 26.
- (4) Application: located below stormwater retention areas.
SDR: 18. Dimond-lok PVC.
- (5) Application: located within jack and bored steel casings.
SDR: 18. Dimond-lok PVC restrained joint piping.
- (6) Joint Type: hub and spigot.
- (7) Buried exterior coating: none. Green in color or green stripped.
- (8) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
- c Size: < 12-inch
 - (1) Material: C905; SDR 18.
 - (2) Application: buried.
 - (3) Joint Type: hub and spigot.
 - (4) Buried exterior coating: none. Green in color or green stripped.
 - (5) Test Pressure: 10 psig, hydraulic.
- 7. Wastewater Gravity
 - a Size: 4 to 10-inch
 - (1) Material: C900, conforming to AWWA C900.
 - (2) Application: 10-feet or less cover from finished grade.
SDR 35.
 - (3) Application: located below stormwater retention areas.
SDR: 18. Dimond-lok PVC.
 - (4) Application: located within jack and bored steel casings.
SDR: 18. Dimond-lok PVC restrained joint piping.
 - (5) Joint Type: hub and spigot.
 - (6) Buried exterior coating: none. Green in color or green stripped.
 - (7) Test Pressure: 100 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - b Size: > 12-inch
 - (1) Material: C905; SDR 18.
 - (2) Joint Type: hub and spigot.
 - (3) Buried exterior coating: none. Green in color or green stripped.
 - (4) Test Pressure: 100 psig or 2X the design pressure, whichever is greater, hydrostatic test.

DESIGN REQUIREMENTS

- c Size: ≤ 4 -inch
 - (1) Material: PVC.
 - (2) Joint Type: hub and spigot.
 - (3) Interior Lining: none
 - (4) Buried exterior coating: none.
 - (5) Exposed exterior coating: finish color: green.
 - (6) Test Pressure: 100 psig or 2X the design pressure, whichever is greater, hydrostatic test.
- 8. Reclaimed Water
 - e Size: ≤ 2 -inches
 - (1) Material: Polyvinyl Chloride (PVC), schedule 40. Pipe shall be manufactured with titanium dioxide for ultraviolet protection.
 - (2) Application: Buried.
 - (3) Joint type: flanged, solvent welded. Solvent weld using Oatey No 30757 purple primer and Oatey No 30893 medium PVC cement.
 - (4) Interior Lining: none
 - (5) Exterior coating: finish color purple.
 - (6) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - (7) Fittings: schedule 80.
 - f Size: ≤ 2 -inches
 - (1) Material: Galvanized carbon steel, ASTM A106, Grade B seamless or ASTM A53, Grade B seamless or ERW. Schedule 80.
 - (2) Application: Exposed.
 - (3) Joint type: flanged or threaded; AWWA C606.
 - (4) Interior Lining: none.
 - (5) Exterior coating: none.
 - (6) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
 - (7) Threaded Fittings: 150 or 300-pound malleable iron, ASTM A197 or ASTM A47, dimension in accordance with ASME B16.3.
 - (8) Thread Lubricant: Teflon tape or joint compound that is insoluble in water.

DESIGN REQUIREMENTS

- g Size: 4 to 12-inches.
 - (1) Material: Cement-Lined Ductile Iron (CLDI); Class 350.
 - (2) Application: major traffic areas, under pavement, easements, sidewalks, roadways, exposed piping, and within bore and jack casings.
 - (3) Buried joint type: proprietary restrained joint.
 - (4) Exposed joint type: flanged.
 - (5) Interior Lining: cement mortar; in accordance with AWWA C104/A21.4.
 - (6) Exposed exterior coating: finish color blue.
 - (7) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
- h Size: 4 to 12-inch
 - (1) Material: C900, conforming to AWWA C900.
 - (2) Application: buried.
 - (3) Joint Type: hub and spigot.
 - (4) Buried exterior coating: none. Purple in color or purple stripped.
 - (5) Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

2.1.1. Utility Separation

HORIZONTAL Separation Distances for PARALLEL Utilities and Perpendicular Clearance from Other Objects

	Electric Over Head	Electric Under Ground	Communications Over Head	Communications Under Ground	Gas Pipe	Water Main	WW Force Main	WW Gravity Main	Reclaimed Water Main	Trees	Lift Station (Property Line)	Structure	Transformer	Fire Hydrant	Water Meter	Street Light	Storm Sewers	Other Underground Utilities
Electric Overhead	N/A	-	N/A	-	-	3	3	10	3	15	20	NESC ⁷	N/A	-	-	NESC ⁷	3	3
Electric Underground	-	1	-	1	2	3	3	10	3	10	20	10	N/A	3	3	None	3	3
Communications Overhead	N/A	-	N/A	-	-	3	3	10	3	15	20	NESC ⁷	N/A	-	-	NESC ⁷	3	3
Communications Underground	-	1	-	1	2	3	3	10	3	7.5	20	10	N/A	3	3	None	3	3
Gas Pipe	-	2	-	2	-	3	10	10	3	7.5	20	5	None	3	3	3	3	3
Water Main	3	3	3	3	3	3	10	10	6	7.5	20	7.5	3	None	None	3	3	3
WW Force Main	3	3	3	3	3	10	3	10	3	7.5	20	7.5	3	10	3	3	3	10
WW Gravity Main	10	10	10	10	10	10	10	10	10	10	20	≥15	15	10	10	10	10	10
Reclaimed Water Main	3	3	3	3	3	6	3	10	3	15	20	7.5	3	3	3	3	3	3
Trees	15	10	15	7.5	7.5	7.5	7.5	10	15	N/A	20	N/A	10	10	7.5	15	7.5	7.5
Lift Station (Property Line)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Structure	NESC ⁷	10	NESC ⁷	10	5	7.5	7.5	15	7.5	N/A	20	N/A	10	10	5	N/A	10	10
Transformer	N/A	N/A	N/A	N/A	None	3	3	15	3	10	20	10	N/A	10	5	N/A	10	N/A
Fire Hydrant	-	-	-	3	3	None	3	15	3	10	20	10	10	N/A	5	10	4	3
Water Meter	-	3	-	3	3	None	5	10	3	7.5	20	5	5	5	1.5	5	5	5
Street Light	NESC ⁷	None	NESC ⁷	None	3	3	3	10	3	15	20	N/A	N/A	5	5	N/A	3	-
Storm Sewers	3	3	3	3	3	3	3	10	3	7.5	20	10	10	3	3	3	N/A	3
Other Underground Utilities	3	3	3	3	3	3	10	10	3	7.5	20	10	N/A	3	3	-	3	1

Notes:

1. All values are distances in feet - measured center-to-center of pipes for typical cases.
2. Large diameter pipes (>10") require additional clearance to achieve separation required by underlying rules based on outside-to-outside dimensions to be determined by the City of Alachua Public Services Department.
3. Separation from gravity sewer is dependent on the depth of the main, which varies with application.
4. N/A = Not Applicable
5. Measurements from buildings (structures) and above ground objects (hydrants, transformers, poles, etc.) are from the furthest external protrusion (roof, wall, porch, foundation, stairway, etc.).
6. Vertical separation is required for utilities crossing one another (not addressed here).
7. NESC - National Electric Safety Code - The separation from structures is based upon various criteria and must meet the NESC.
8. Separations shown between utilities not owned and operated by the City of Alachua are for reference only.

END OF SECTION 2

3. EXECUTION

3.1. Existing Utilities

- A. The Engineer shall investigate existing utilities in the area of the project. Investigation shall include contacting the utilities and obtaining the most current maps and description of their facilities. The Engineer shall send a copy of all information obtained to the CoA Public Services Director. Potholing as directed by the Engineer may be necessary to confirm location and size of utilities.
1. Underground Utilities shall be notified and utility locations performed (call 811) prior to beginning construction. Any known obstructions shall be shown on the Drawings. Utmost caution shall be taken in all operations to avoid damage to existing obstructions (for example, pipes, cables, conduit, utility poles, structures, etc.) whether or not shown on the Drawings.
 2. Existing utilities shall be kept in operation by temporary lines, temporary pumps, or other means provided for continuous operation of utilities. All this work shall be installed, maintained, operated, and removed by the Contractor upon completion of the job.
 3. Ensure that structural elements are not overloaded as a result of or during performance of the Work. Responsibility for additional structural elements or increasing the strength of existing structural elements may be required as a result of any Work performed shall be that of the Contractor. Repairs, reinforcement, or structural replacement must have Engineer approval.
 4. Temporary supports and/or adequate protection and maintenance shall be installed on all underground and surface structures encountered in the progress of work. Structures that have been disturbed shall be restored upon completion of the work.
 5. Take necessary precautions to avoid damage to exiting items scheduled to remain in place, to be reused, or to remain the property of the CoA; and Contractor-damaged items shall be repaired or replaced as directed by Engineer.

3.2. Inspection of Materials

- A. Material delivered to the job site shall be inspected. Materials found during inspection or during the progress of the work to have cracks, flaws, surface abrasions, cracked linings, or other defects shall be rejected and removed from the job site without delay. All materials delivered to the job site shall be in accordance with the CoA Approved Materials Manual.

3.3. **Excavation and Trenching**

- A. Excavate to line, grades, and dimensions as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, topsoil, and similar items, wherever applicable. Trim to neat line where concrete is to be deposited against earth.
- B. Minimum Width of Trenches:
1. Single Pipes, Conduits, Direct-Buried Cables, and Duct Banks:
Less than 4-inch Outside Diameter or Width: 18-inches.
Greater than 4-inch Outside Diameter or Width: 18-inches greater clearance from both sides of outside diameter or width of pipe, conduit, direct-buried cable, or duct bank.
 2. Multiple Pipes, Conduits, Cables, or Duct Banks in Single Trench: 18 inches greater clearance from both sides of aggregate width of pipes, conduits, cables, duct banks, plus space between.
 3. The trench shall be opened so that the pipe can be installed to the alignment and depth required. The trench shall be excavated only so far in advance of pipe installation as to ensure proper installation.
 4. Excavated material shall be piled in such a manner that it will not endanger the work, obstruct natural water courses, sidewalks, or driveways. Fire hydrants under pressure, valve pit covers, valve boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible at all times. Gutters shall be kept clear or other satisfactory provisions made for street drainage. All surface materials which are suitable for reuse in restoring the surface shall be kept separate from any unacceptable excavated material.
 - a. Keep trench free of water, debris, and foreign matter during work, inspections, and backfill. Promptly remove and dispose of water entering trench as necessary to grade trench bottom and to compact backfill and install pipe, conduit, direct-buried cable, or duct bank. Do not place concrete, lay pipe, conduit, direct-buried cable, or duct bank in water. Remove water in a manner that minimizes soil erosion from trench sides and bottom. Provide continuous water control until trench backfill is complete.
 - b. Trench Stabilization Material Installation
 - (1) Rebuild trench bottom with trench stabilization material.
 - (2) Place material over full width of trench in 6-inch lifts to required grade, providing allowance for bedding thickness.
 - (3) Compact each lift so as to provide a firm, unyielding support for the bedding material prior to placing succeeding lifts.

- c. Bedding
 - (1) Provide imported granular fill bedding material.
 - (2) Place over the full width of the prepared trench bottom in two equal lifts when the required depth exceeds 8-inches.
 - (3) Hand grade and compact each lift to provide a firm, unyielding surface. Compact the bedding granular fill material to at least 95 percent of the maximum dry density as determined by ASTM D1557.
- d. Marking Tape Installation.
 - (1) Continuously install marking tape along centerline of all buried piping, on top of last lift of pipe zone material.
 - (a) Detectable Marking Tape: install with nonmetallic piping and waterlines.
 - (b) Nondetectable Marking Tape: install with metallic piping.
 - (c) Settlement of trench backfill, or of fill, or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

3.4. Handling and Cutting Pipe

- A. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stage material as per manufacturer's written recommendations.
- B. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.
- C. Ropes, fabrics or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped into rocky or unprepared ground.
- D. Pipe material shall be loaded and unloaded as per manufacturer's written recommendation, or as directed here within; whichever is more stringent.
- E. Lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe or fittings for lifting, positioning, or laying. If damaged, the material shall be repaired in accordance with the liner manufacturer's recommendations
- F. Except as otherwise approved, all cutting shall be done with a power driven cut off saw. All cut ends shall be examined for possible cracks caused by cutting.

3.5. Pipeline Construction

- A. The CoA Public Services Department shall be notified two business days prior to beginning construction.
- B. Water mains shall be constructed as indicated on the drawings. Materials installed shall be in accordance with the materials indicated in the CoA Approved Materials Manual.
- C. Any material items not included in the Approved Materials Manual shall not be installed. Specialty items shall be approved by the CoA Public Services Director prior to installation.
- D. Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During layout operation, no debris, tools, clothing, or other material shall be placed into the pipe.
- E. After placing a length of pipe in the trench, the spigot end shall be centered in the bell, the pipe pushed home (to the manufacture's mark for PVC pipe) using proper homing equipment, brought to correct alignment, and covered with an approved backfill material.
- F. When pipe laying is not in progress, the open ends of pipe shall be closed by a water tight plug or other approved means. This provision shall apply during rain events, the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
- G. Before backfilling, Contractor shall coordinate with CoA Public Services Department Inspector for a visual inspection of all mechanical joint restraints/fittings and for proper backfill with two working days' notice.

3.6. Paving, Curb, Gutter and Walkways

- A. When open trench construction of pipe beneath paving is permitted, the pavement, curb and gutter, driveway, and walkway shall be removed to neat lines of a sufficient width to allow proper installation of the pipe work.
- B. Proper Maintenance of Traffic (MOT), such as signal lights, warning signs, and barricades shall be installed and maintained as required for adequate safety.
- C. No pavement base shall be replaced before the trench backfill has been inspected and approved. Density and compaction tests shall be as required by the authority having jurisdiction over the street, road, or highway involved.
- D. Pavement shall be replaced in accordance with the "Florida Department of Transportation, Standard Specifications for Road and Bridge Construction", or latest edition.

- E. Curb and gutter shall be replaced with a new concrete unit poured-in-place and having the same cross section as the original curb removed. The concrete shall be thoroughly cured. Backfill under concrete work shall be thoroughly compacted and the sub-grade approved before any concrete may be poured.
- F. Concrete walkways and driveways shall be replaced with concrete of the same cross section as the original walk or driveway. The concrete shall be thoroughly cured. Backfill under concrete work shall be thoroughly compacted and the sub-grade approved before any concrete may be poured.

3.7. Pipe Leakage Testing

- A. All piping shall be pressure tested.
- B. Notify Engineer in writing 5 business days in advance of testing. Perform testing in presence of Engineer and CoA Public Service Inspector.
- C. Pressure Piping:
 - 1. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.
 - 2. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
 - 3. New Piping Connected to Existing Piping.
 - a. Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges, or as acceptable to Engineer.
 - b. Test joint between new piping and existing piping by methods that do not place entire existing system under test load, as approved by Engineer.
 - 4. Hydrostatic Test for Pressure Piping:
 - a. Fluid: clean water of such quality to prevent corrosion of materials in piping system.
 - b. Exposed Piping:
 - (1) Perform testing on installed piping prior to application of insulation.
 - (2) Maximum filling velocity: 0.25 foot per second, applied over full area of pipe.
 - (3) Vent piping during filling. Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.
 - (4) Maintain hydrostatic test pressure continuously for 60 minutes, minimum, and for such additional time as necessary to conduct examinations for leakage.
 - (5) Examine joints and connection for leakage.
 - (6) Correct visible leakage and retest as specified.
 - (7) Empty pipe of water prior to final cleaning or disinfection.

EXECUTION

c. Buried Piping:

- (1) Test after backfilling has been completed.
- (2) Expel air from piping system during filling.
- (3) Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
- (4) Maintain hydrostatic pressure continuously for 2 hours minimum, reopening isolation valve only as necessary to restore test pressure.
- (5) Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.
- (6) The line under test shall be slowly filled with water at the specified test pressure. The lowest and highest elevation points on the section being tested shall be determined and any corrections necessary shall be calculated and a correction factor applied to account for the elevation of the test gauge. Pressure shall be adjusted as needed. Testing equipment must be capable of measuring the volume of water needed to re-pressurize the system during testing.
- (7) A blow-off or fire hydrant shall be installed at the end of the line under test. Before applying the specified test pressure, all air shall be expelled from the test section including service connections. If fire hydrants or blow-offs are not available at high places, taps at points of highest elevation shall be made before the test is made and plugs inserted after the test has been completed.
- (8) Pipe lines Mains shall hold the test pressure for a two-hour test period; sufficient manpower shall be employed to insure adequate testing and inspection. If the line fails to meet the test, it shall be repaired and retested until the test requirements are satisfied.
- (9) Leakage tests shall be performed on all newly installed lines. Any leakage discovered shall be less than the following per thousand feet of pipe:

<u>Pipe Diameter</u>	<u>Leakage</u>
4-inch	0.33
6-inch	0.55
8-inch	0.66
10-inch	0.83
12-inch	0.99
16-inch	1.32

- (10) If the above tests fail, all valves, joints, fittings, and fire hydrant assemblies shall be examined thoroughly by open-trench inspection. If any cracked or defective pipes, fittings, fire hydrants, or valves are discovered during the open-trench inspection, they shall be corrected accordingly and the above tests shall be repeated.

5. Hydrostatic Test for Gravity Piping
 - a. Testing Equipment Accuracy: plus or minus ½-gallon water leakage under specified conditions.
 - b. Maximum Allowable Leakage: 0.16 gallons per hour per inch diameter per 100 feet. Include service connection footage in test section, subjected to minimum head specified.
 - c. Gravity Sanitary: Test with 15-feet of water to include highest horizontal vent in filled piping. Where vertical drain and vent system exceed 15-feet in height, test system in 15-foot vertical sections as piping is installed.
 - d. Exfiltration Test:
 - (1) Hydrostatic Head:
 - (a) At least 6-feet above maximum estimated groundwater level in section being tested.
 - (b) No less than 6 feet above inside top of highest section of pipe in test section, including service connections.
 - e. Infiltration Test:
 - (1) Groundwater Level: at least 6-feet above inside top of highest section of pipe in test section, including service connections.
 - (2) Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.
6. Smoke Test
 - a. All gravity lines shall be smoke tested.
 - b. The Contractor shall provide the equipment and labor necessary for the CoA Public Services Department to witness a smoke test and inspect the system with a TV camera for any deflections, clogged clean-outs, or breaks. Any clogged clean-outs or breaks shall be repaired accordingly. Any sections of PVC pipe with more than 5% deflection shall not be accepted.
7. In addition to pressure testing, the following shall be completed on all wastewater piping installation.
 - (1) TV inspection
 - (2) Clean-outs adjusted
 - (3) Manhole to finished grade
 - (4) Inverts installed
 - (5) Road primed and ready for paving
8. Defective Piping Sections: replace and retest as specified.

9. Field Quality Control

- a. Test Report Documentation for each test:
 - (1) Test date.
 - (2) Description and identification of piping tested.
 - (3) Test fluid.
 - (4) Test pressure.
 - (5) Remarks, including:
 - (a) Leaks (type, location).
 - (b) Repair/replacement performed to remedy excessive leakage.
 - (6) Signed by Contractor and Engineer to represent that test has been satisfactorily completed.

3.8. Pipe Disinfection

- A. All potable water piping shall be disinfected.
- B. Disinfecting Procedures: in accordance with AWWA C651 or latest State of Florida Health Standards; whichever is more stringent.
- C. If the continuous feed method or the slug method of disinfection, as described in AWWA C651 is used, flush pipelines with potable water until clear of suspended solids and color. Provide hoses, temporary pipes, ditches and other conduits as needed to dispose of flushing water without damage to adjacent properties.
- D. Commence disinfection after completion of following:
 - 1. Completion and acceptance of internal painting of system(s); if applicable.
 - 2. Hydrostatic testing, pressure testing, functional and performance testing and acceptance of pipelines, pumping systems, structures, and equipment.
 - 3. Disinfection of Pumps and associated system piping.
- E. Disinfect all of the items installed or modified, intended to hold, transport, or otherwise contact potable water.
- F. Prior to application of disinfectants, clean filters, strainer, and pipelines of loose and suspended material.
- G. Allow freshwater and disinfectant solution to flow into pipe or vessel at a measured rate so chlorine-water solution is at specified strength. Do not place concentrated liquid commercial disinfectant in pipeline or other facilities to be disinfected before it is filled with water.
- H. One-inch Calcium Hypochlorite tablets (H.T.H.) containing 65% available chlorine or chlorine granules may be used when water mains are 12-inch and smaller and lengths up to 2,500-feet. The water main and laterals shall be disinfected with a concentration of 50 PPM Chlorine. Tablets or granules shall be placed 1-foot from the end on the inside of the bell of the pipe. Quantity of tablets or granules shall be determined by consulting Table 1 in the AWWA Standard – Disinfecting Water Mains (ANSI/AWWA C651-05).

EXECUTION

- I. Tablets or granules shall be placed in each section of pipe, fire hydrants and hydrant branches. Once pipes are filled with water, a minimum of three days (for tablets) or 24 hours (for granules) shall elapse before flushing.
- J. Disinfection for pipe sizes 16-inches and above shall be performed by injection of liquid chlorine. The method and procedure shall be reviewed and approved by the CoA Public Services Department Director.
- K. Disposal of Heavily Chlorinate Water; do not allow flow into a waterway without neutralizing disinfectant residual. See the appendix of AWWA C653 for acceptable neutralization methods.
- L. After pipelines have been cleaned, disinfected, and refilled with potable water, CoA will take two water Samples on each of the two consecutive days for every 1,000 LF of pipe and have them analyzed for conformance to bacterial limitations for public drinking water supplies. If Samples are bacterially positive, disinfecting procedures and bacteriological testing shall be repeated until bacterial limits are met.

3.9. Jack and Bore Execution

A. Pit Excavation

- 1. The bottom of the boring pit shall not be over-excavated unless job site conditions require. If over-excavation occurs, the Contractor shall backfill the pit with approved, suitable material in lifts not exceeding 6-inch thickness to the elevation necessary to install the steel encasement pipe as required by the Construction Drawing. Each lift of the backfill material shall be compacted to a minimum of 95% of maximum density as determined by AASHTO T99, Method.
- 2. During excavation, if ashes, cinders, refuse or other organic material considered unsuitable is uncovered at the bottom of the bore pit or at subgrade, it shall be removed and backfilled with approved, suitable material. Approved backfill material shall be tamped in 6-inch lifts to provide a uniform and continuous bearing characteristic of that area's soil condition.
- 3. Where the bottom of the pit at subgrade consists of unsuitable material to such a degree that it cannot be removed and replaced with an approved material to support the bore and jack equipment or the pipe properly, a suitable foundation shall be constructed.
- 4. Excavated material shall be piled in such a manner that it will not endanger the work, obstruct natural watercourses, sidewalks or driveways. Fire hydrants under pressure, valve pit covers, valve boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible at all times. Storm water collection facilities shall be kept clear or other satisfactory provisions made for proper drainage. All surface materials, which are suitable for reuse in restoring the surface, shall be kept separate from unsuitable excavated material.
- 5. Excavations must conform to governing Federal or State law, municipal ordinances, OSHA Standards or as may be necessary to protect life, property or the work. When shoring and / or sheeting systems are necessary, they must conform to the shoring/sheeting system manufacturer's written requirements.

EXECUTION

6. Water shall not be allowed in the entrance/exit pit at any time during the bore and jack operation. Dewatering equipment (wellpoint systems, gravel and pump, etc.) shall be used to remove the water. Discharge from dewatering equipment shall be screened to remove silt and routed to natural drainage channels, storm drains or storm sewers in conformance with Federal, State, or Local regulations.

B. Completion and Clean-Up

1. After the installation, the steel casing pipe shall be cleaned free of debris, soil and other foreign matter. The carrier pipe shall be installed and the ends of the steel encasement pipe shall be plugged with a neoprene end seal.
2. The Contractor shall be held responsible for repair of any settling occurring over encasement installed under this Contract and within the warranty period. Such repair work shall be at no additional cost to the CoA.
3. The Contractor shall be responsible for all work, including backfilling, seeding, sodding, mulching, and complete clean-up of the construction area as required by the Federal Government, State, County, Railroad Company, or CoA.

3.10. Potable and Reclaimed Water Execution

- A. Blue (potable) or purple (reclaim) insulated, solid conductor, 10 gauge copper wire shall be taped to or wrapped around all pipe or tubing for location purposes. The wire shall be stubbed out at the meter yoke or located in the water meter box. The wire shall be connected to the wire required on plastic water mains.
- B. All meters less than 2-inches shall be installed in an underground box with yoke bar assembly both supplied and installed by the Contractor. The meter shall be provided and installed by the CoA.
- C. All meters 2-inches and greater shall be above grade installations. All materials needed to install the larger meter assemblies shall be supplied by the Contractor. Installation shall utilize threaded galvanized pipe above grade with service unions and test/service bypass. Larger meters shall be flanged ductile iron pipe with test/service bypass. Bypasses are preferred to be installed below grade. The CoA shall supply the meter for installation under the supervision of the CoA Public Services Department.
- D. Connections to existing water mains shall only be conducted by properly trained and licensed Contractors that specialize in the business of tapping active water/sewer pressurized lines. In addition, the specialty Contractor must be accepted by the CoA as a pre-approved Contractor certified to tap CoA owned mains. A pipeline integrity test shall be performed by the Contractor in the presence of the CoA Public Services Department Inspector prior to scheduling a water main tap. All tapping shall be completed in the presence of the CoA Public Services Department Inspector. The resulting tap coupon shall be tagged, labeled, and delivered to the CoA Public Services Department.
- E. Supply certification that the product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF 61-G or to NSF/ANSI 372.

3.11. Wastewater Execution

A. Force Main

1. The Contractor shall adjust the planned location of Air Release Valves (ARVs) to the actual high points of the force main as directed by the CoA Public Services Department. As-builts will indicate the location and elevations of all ARVs. Pressure testing of force mains should be performed against the air release assembly isolation valve. After successful pressure testing, the Contractor shall verify that all air release assembly isolation valves have been opened.
2. A valve box shall be provided for every valve. Valve box shall not transmit shock or stress to the valve and be centered and plumb over the wrench nut of the valve, with the box cover flush with the final grade or as may be specified in the Drawings.

B. Gravity Collection System

1. Gravity sewer mains shall be installed with a pipe laser. Laterals may be installed with mason's lines and batter boards. The batter board shall be erected to a predetermined alignment and grade. Two mason's lines with a minimum of 75-feet in length shall be tightly stretched and supported with batter boards and at intervals not exceeding 25-feet.
2. Prior to final acceptance and after completion of the smoke test of the wastewater collection system, all clean outs shall be lowered to final grade and capped.

3.12. Lift Station Execution

A. Inspection

1. Inspection shall be performed by CoA Public Services Department Inspector and conducted in two phases.
2. Phase I: Mechanical phase, including piping, receiving manhole, wet well and valve pit.
3. Phase II: Electrical phase, including control panel, pumps and distribution system.
4. The Contractor shall require the services of an electrical Contractor licensed in the state of Florida during the electrical construction phase of the lift station.

B. Start-up and Final Acceptance

1. CoA Public Services Department Inspector shall be notified 2 business days prior to start-up of the Lift Station. During start-up the pump manufacturer's representative shall be present at the job site.
2. The manufacturer's representative shall be responsible for delivery of the following: Tool Set, Parts Manuals, Pump(s) O/M Manuals, Complete sets of Schematics, Sets of Fuses/Bulbs.

3.13. Traffic Control Plan

- A. The temporary traffic control plan shall be created by a registered Professional Engineer who is certified to do so by the FDOT MOT Certification training. The temporary traffic plan must be in accordance with FDOT design standards and specifications.
- B. Comply with Laws and Regulations regarding closing and restriction use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.
- C. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- D. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
- E. In making street crossings, do not block more than one-half the street at a time.
- F. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
- G. Prior to any road construction traffic control signs and devices shall be in place.
- H. Traffic control devices for lane closure including signs, cones, barricades, etc. shall be placed as shown on submitted and Engineer approved plans. Signs shall not be placed without actual lane closures and shall be immediately removed upon removal of the closures.
- I. Selection, placement, maintenance, and protection of traffic shall be in accordance with the Manual of Uniform Traffic Control Devices – Part VI “Standards and Guides for Traffic Control for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations,” and the State Department of Transportation Standards and Specifications.
- J. Tapers shall be located to maximize the visibility of their total length.
- K. Advance warning signs, distances, and taper lengths may be extended, at direction of the Engineer.
- L. All existing road signs, pavement marking and/or pavement reflectors which conflict with the proposed traffic control plan shall be covered, removed, or relocated as directed by the Engineer and then restored to match pre-construction conditions.
- M. Contractor shall make provisions for maintaining pedestrian crossing locations and type, in accordance with all applicable codes and OSHA requirements.
- N. Submittal: Contractor shall submit for Engineer approval the Traffic Control Plan that will detail procedures and protective measures proposed by the Contractor to provide for protection and control of traffic affected.

EXECUTION

- O. Traffic Control Plan shall include proposed locations and time durations of the following, as applicable:
 - 1. Pedestrian and public vehicular traffic routing.
 - 2. Lane and sidewalk closures, and restrictions and reductions anticipated to be caused by construction operations. Show and describe the proposed location, dates, hours and duration of closure, vehicular and pedestrian traffic routing and management, traffic control devices for implementing pedestrian and vehicular movement around the closures, and details of barricades.
 - 3. Access to buildings immediately adjacent to worksite.
 - 4. Driveways blocked by construction operations.
 - 5. Temporary traffic control devices, temporary pavement striping and marking of streets and sidewalks affected by construction.
- P. The Contractor shall notify in writing the Alachua Police Department (APD) no less than 7 days prior to such closures or whenever roads are impassable.
- Q. The Contractor shall immediately notify the Engineer of any vehicular or pedestrian safety or efficiency problems incurred as a result of the Work.

3.14. Final Acceptance

- A. Upon completion of the work, all waste materials or other debris caused by or accumulated as a result of the job shall be removed from the site. Any depressions resulting from settlement or backfilled trenches shall be refilled. Any seeding and mulching or sprigging and mulching, or sodding of the ground surface shall be conducted in accordance with the Drawings or as required by the Federal Government, State, County, or City.
- B. Contractor shall coordinate in advance with the CoA Public Services Department Inspector to arrange a date and time for “walkthrough,” reference Section 2.4.10(G)(6) of the LDRs.
- C. Contractor shall notify CoA Public Services Inspector when discrepancies are repaired for re-inspection.
 - 1. When the system has passed inspection, Contractor shall furnish the following to the CoA Public Services Department:
 - a Redlined record drawings;
 - b Survey As-built of all valves, blow offs, fire hydrants and mains;
 - c Maintenance Surety (if applicable);
 - d Warranty Letter (1 year Minimum).
- D. CoA shall not accept public infrastructure until all preceding requirements have been met.

3.15. Record Drawings

- A. Purpose of record documents is to document factual information regarding aspect of the work, both concealed and visible, to enable future modification of the work to proceed without lengthy and expensive site measurement, investigation, and examination.
- B. At the completion of the work or prior to Contractor's notice of completion, Engineer shall provide one set of full-size set of Record Drawings and PDFs of the Record Drawings to the Public Services Department. Record drawings shall be labeled and stamp with the title, "RECORD DOCUMENTS," in neat large printed letters.
- C. During construction of the project, the Contractor shall be responsible for keeping accurate track of any approved field construction revisions to the design depicted on the approved Construction Drawings. Record Drawings shall be accessible to CoA personnel at all times during the construction period.
- D. CoA personnel will review completeness, accuracy, and format of submitted Record Drawings. If the Record Drawings are considered unacceptable, they will be returned to the Engineer for correction and resubmission. The CoA reserves the right to not accept the infrastructure and delay the utility service until record and survey as-built drawings are deemed acceptable by the Public Services Director.

END OF SECTION 3

ATTACHMENT

Attachment A: General Details 01

Attachment B: Water Details 01

Attachment C: Water Details 02

Attachment D: Wastewater Details 01