City of
ALACHUA
public services

Design & Construction Manual

V 2.4

Water, Wastewater & Reclaimed Water



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QUALITY ASSURANCE – SECTION 1

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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, wastewater and reclaimed water systems. These requirements encourage consistency in the design approach used by various Designers.

The following are the quality assurance goals of the *COA Design and Construction Manual*:

1. Coordinate projects with each other.
2. Cost effective projects, both in design and construction.
3. Operable and maintainable projects.
4. Contract compliance.
5. Apply sound engineering in plans and specifications.
6. Use consistent processes and procedures.
7. Perform as scheduled.
8. Minimize public disruption during construction.
9. Document information in accordance with COA processes and procedures.
10. Completely disseminate information to the public and COA staff.
11. Use COA standard details whenever possible (see Supplement 3, COA Standard Details).

B. The term "provide" is used throughout this document. "Provide" means to "furnish" and "install".

C. The term "Designer" is used throughout this document. Depending on the project, the term "Designer" can either mean the COA, the Owner (for non-COA projects), the developer, the design engineer or the Engineer of Record.

D. For the task of signing and sealing Drawings, the term Engineer means a "Professional Engineer licensed in the State of Florida".

E. While the purpose of these requirements is to assure uniformity, it is not intended to stifle the Designer's creativity, design innovation, and ingenuity. The Designer shall review these requirements and adopt them into their design. The Designer is ultimately responsible for their design, and their responsibility is in no way diluted or absolved by the *COA Design and Construction Manual*.

F. It may be necessary for the Designer to deviate from the *COA Design and Construction Manual*. In such cases, the Designer shall immediately bring this matter to the attention of the COA Public Services Director.

G. During the construction phase, in certain instances, the Contractor will need to interface with the COA Public Service Department as so stated in the manual. If the COA has a services-during-construction agreement with an engineering consultant, the Contractor can also interface with the Services- During-Construction Engineer.

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 Manual. In addition, designs shall conform to applicable COA codes and adopted plans, including but not limited to the COA Comprehensive Plan, COA Code of Ordinances, and COA Land Development Regulations (LDR).

Verify applicable codes and standards and their editions at the time of final work, including but 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 Stormwater Pumping Stations, Manual of Practice FD-4 Water Environment Federation.
5. Great Lakes Upper Mississippi River Board 10 States Standards; latest edition.
6. Occupational Safety and Health Act (OSHA).
7. International Building Code (IBC), latest edition.
8. International Fuel Gas Code (IFGC), latest edition.
9. International Mechanical Code (IMC), latest edition.
10. International Fire Code (IFC), latest edition.
11. NFPA 1, Fire Code, latest edition.
12. NFPA 70, National Electric Code, latest edition.
13. NFPA 101, Life Safety Code, latest edition.
14. NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities, latest edition.
15. ICC/ANSI 117.1 American National Standard Accessible and Useable Buildings and Facilities, latest edition.
16. Americans with Disabilities Act (ADA), latest edition.

17. American Concrete Institute (ACI) 318, Building Code Requirements for Reinforced Concrete.
18. ACI 530, Building Code Requirements for Concrete Masonry Structures.
19. American Institute for Steel Construction (AISC), Steel Construction Manual.
20. ASCE 7 Minimum Design Loads for Buildings and Other Structures.
21. American Water Works Association (AWWA) Standards.
22. Applicable American Society for Testing and Materials (ASTM).
23. Uni-Bell Plastic Pipe Association, Handbook of PVC Pipe, Design and Construction.
24. International Society of Automation (ISA).
25. National Electrical Manufacturer's Association (NEMA).
26. American National Standards Institute (ANSI).
27. Institute of Electrical and Electronics Engineers (IEEE).
28. ANSI/IEEE Standard 141 for Motor Control Equipment.
29. IEEE 519-1992 Recommended Practices for Harmonic Control in Electrical Power Systems.
30. IEEE Standard 142 for Grounding.
31. IEEE C62 for Application of Transient Voltage Surge Suppression.
32. American Society of Mechanical Engineers (ASME).
33. Florida Building Code.
34. Florida Fire Prevention Code.
35. National Electric Code.

1.3. General Utility Information.

A. The Designer shall coordinate with utilities to minimize conflicts during construction. Utilities that may be involved include:

1. Potable and non-potable 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 lines, including fiber optic cables.

B. As part of the initial design, the Designer may wish to obtain underground utilities information from the COA. This information may be made available to the Designer upon written request to the COA Public Service Department.

C. COA-supplied information does not eliminate or diminish the responsibility of the Designer to survey the project area and existing facilities, or to perform underground locations in the project area. The Designer is responsible to ensure all existing information is properly recorded and shown on the Permit/Record Drawings. The Designer is responsible to verify and locate existing utilities or underground foundations that may encroach.

1.4. Pre-Design Meeting.

A. The COA encourages the Designer to meet with COA Public Services Department prior to design. The primary purpose of the Pre-Design Meeting is to firmly establish the project design criteria and to discuss the project's overall purpose so that all participants have the same understanding. A Pre-Design meeting is required for projects involving:

1. Fire flow analysis.
2. Potable water meters 1.5-inches and greater.
3. Potable water capacity that may exceed single family use.
4. Wastewater lift station(s).

B. The Pre-Design Meeting should occur after the pre-application meeting and before application submittal.

C. At the Pre-Design Meeting, the Designer may request temporary utility needs, such as water and electrical.

D. The COA Public Service Director may engage a consultant to review and identify needed performance and design requirements and 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 at the Pre-Design meeting are not binding on the COA. Plans and submittals 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 final 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 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 Services Department (1) a warranty review meeting held 9 months after final acceptance, and (2) a site inspection prior to expiration of the 1-year warranty period. COA will prepare a punch-list that the Contractor shall use to make all necessary repairs and/or corrections prior to conclusion of the 1-year warranty period.

   1. The Contractor shall be responsible for all labor and expenses in attending this meeting.
   2. The Contractor shall be responsible for all labor and expenses to address warranty issues and non-conforming work identified during the site inspection.

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 will not be released or returned until the work is inspected and accepted by the COA.

END OF SECTION 1

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DESIGN REQUIREMENTS – SECTION 2

2. DESIGN REQUIREMENTS

2.1. Supplements.

A. The supplements listed below are part of these design requirements:

1. Supplement 1, Grease Interceptor Sizing Criteria.
2. Supplement 2. Lift Station Instrumentation and Controls Specification.
3. Supplement 3, COA Standard Details.

2.2. Construction Drawing Requirements.

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

2.3. 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 detail to:

1. Be complementary with respect to all project documents.
2. Support consistent and comprehensive construction cost estimates of the project.
3. 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 so that proper spacing and arrangement are sufficiently defined.

D. The coordinate system for all CAD drawing files shall be Florida State Plane Coordinates, NAD 83 Zone North US Survey feet.

E. Plan and Profile Sheets.

1. Plan shall align vertically with the profile.
2. Water, wastewater, reclaimed, and stormwater lines shall be shown in both plan and profile view.
3. Existing and proposed finished grade shall be shown over proposed and/or existing gravity wastewater mains.
4. Plan view shall show 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.

F. Site plan shall show existing and proposed utility easements. Clearly label public utility easements, property lines and right-of-way. Also show deeded parcels, for facilities such as lift stations.

G. 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 shown shall be referenced to the NAVD 88 datum with elevations given in US Survey feet.

H. Drainage plan shall show the storm water facilities, 100-year floodplain, wetlands, and creek elevations. Show site contour elevations at minimum 2-foot intervals.

I. Landscaping plan shall show all water and wastewater utilities, including piping, water meters and gravity wastewater cleanouts. Confirm that proposed tree locations meet COA minimum horizontal distance requirements from water and wastewater infrastructure.

J. Use COA Standard Details, Supplement 3. If COA Standard Details do not cover a particular installation, submit an applicable detail, which is subject to COA approval.

K. Prepare a Pipe and Flowmeter Schedule. This schedule shall identify piping 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. For flowmeters, call out the manufacturer and model, line size, type of line connection, and pressure rating,

1. The Piping and Flowmeter Schedule may be listed in the specifications or shown as a separate drawing in the General Drawings.

L. Prepare a Valve Schedule. For all valves with electric operators, this schedule shall identify the valve type, size (inches), service, maximum operating flow rate, pressure class, maximum differential pressure (psid), specification section reference, and associated general notes. Assign and include in the valve schedule a tag number for each valve having an electric operator. Valve schedule may be

listed in the specifications or shown as a separate drawing in the General Drawings.

2.4. 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. Verify applicable codes and standards and their editions 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 shall 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. 3-inch pipe is not allowed in any application, unless approved by the COA Public Services Director.
3. 10-inch water mains are not allowed in any application, unless approved by the COA Public Services Director.
4. Potable Water Service Laterals.
    a. All potable water service laterals shall be 2-inch, NSF-61 rated, Schedule 40 PVC.
    b. All potable water service laterals shall have a solid 10 Ga. tracer wire. Solder or split nut is acceptable. Extend the wire into valve boxes and keep out of wheels.
5. Potable Water Mains.
    a. All potable water mains, including those made of ductile iron, shall have a solid 10 Ga. tracer wire. Solder or split nut is acceptable. Extend the wire into valve boxes and keep out of wheels.
    b. Potable water mains shall have a minimum of 36-inch cover. Depths exceeding 60-inch cover require approval from the COA Public Services Department.
    c. Potable water mains shall be a minimum of 6-inches in diameter, unless otherwise approved by the COA Public Services Department.
    d. Potable water mains shall be installed a minimum horizontal distance from any parallel underground utility as listed on the table in Paragraph 2.12 Utility Separation.

e. Where a potable water main crosses a wastewater force main,
   (1) Install the potable water main above the wastewater force main with a minimum vertical separation of 12 inches.
   (2) Arrange the crossing such that wastewater joints shall be equidistant and as far as possible from the water main joints.
   (3) If not possible to install the potable water main above the wastewater main, obtain the approval of the Public Services Director to install the potable water main below the wastewater main. Minimum vertical separation shall be 18 inches.

f. If the minimum 18-inch vertical separation below the wastewater main is not possible, the design documents shall employ one of the following construction methods, but an absolute minimum of 6 inches of vertical separation must be maintained:
   (1) Install the wastewater pipe with a minimum pressure rating of 150 psig.
   (2) Encase either the water main or wastewater line in a watertight carrier pipe that extends 10 feet on both sides of the crossing.
   (3) Provide one 20-LF segment of water main and one 20-LF segment of wastewater main centered at the point of crossing.

g. If it is found during construction that the 18-inch minimum vertical separation below the wastewater main is not possible, employ one of the methods described above. In addition, the following method may be used if approved by the COA Public Services Director, but an absolute minimum of 6 inches of vertical separation must be maintained:
   (1) Around the wastewater pipe, provide flowable fill that extends 10 feet on both sides of the crossing. Minimum fill thickness shall be 6 inches. Surround the entire pipe circumference with flowable fill.

h. Do not install potable water mains under roads or sidewalks. If unavoidable, minimize piping runs under road or sidewalks. Cross roads or sidewalks at a right angle to them. In certain cases, installing water mains axially underneath sidewalks may offer certain advantages. In such cases, the Public Service Director must approve such installations.

i. Design water mains at grades (minimum 0.1% slope) that will reduce the number of high points; do not design or install water mains that are level.

j. When water mains are installed under impervious surfaces or pavement, only standard hot-mix asphalt or cast-in-place concrete paving may be used within either a 6-foot wide corridor centered on the pipe or a corridor with a width equal to twice the depth to the pipe bottom, whichever is greater.

k. Provide air/vacuum release valve assemblies at all high points.

l. Provide air/vacuum release valves 2-inch in diameter on 4- through 16-inch water mains.

m. Air/vacuum release valves shall be the above-ground type, ARI D-040 combination air release valves, or equal.

n. Provide isolation valves at maximum 1,000-foot intervals. Isolation valves shall be mechanical-joint gate valve, resilient wedge type.

o. Except as noted below, at each tee and wye, provide three isolation valves –one on the upstream segment, and one each on the downstream segments. Isolation valves shall be the mechanical-joint gate valve, resilient wedge type.

p. Except as noted below, at each cross fitting, provide four isolation valves. Isolation valves shall be the mechanical-joint gate valve, resilient wedge type.

q. For a tee in a water main that branches to a fire hydrant, provide only one isolation valve, specifically on the branch to the fire hydrant.

r. Provide mechanical restraint for all buried in-line isolation valves. Provide flanged restraint for all exposed in-line isolation valves.

s. Connections to existing water mains shall only be made by properly trained and licensed Contractors that specialize in tapping active water pressurized lines. In addition, the specialty Contractor must have applied and been accepted by the COA Public Services Department as a pre-approved Contractor 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. Complete all tapping 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.

6. Evaluate piping to determine where restraint is required Where restraint is required, show and label the restraint method on all pipe larger than 2-inch. Provide approved restrained connections between pipe joints for a sufficient length of pipe adjacent to each fitting to provide restraint for all reaction forces. Restrained mechanical joint fittings are preferred and acceptable. Reaction blocks or other alternate restraint methods will only be approved at the discretion of the COA Public Services Department. In no case shall a reaction block be allowed to provide 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.

7. On dead-end mains 4-inch and larger that are stub-outs for future

connection, extend the stub-out past the last isolation valve. Minimum stub-out length is noted below. Provide mechanically restrained fittings and piping for the entire stub-out.

Minimum Length of Mechanically Restrained Stub-Out

Pipe Size	Min Length for DIP
4-inch	60-LF
6-inch	60-LF
8-inch	75-LF
12-inch	104-LF

8. Where a blow-off assembly is installed, provide mechanical restraint of the main upstream the blow-off assembly.
9. Install 2-inch water service lines located beneath paved roadways or parking areas in blue minimum 4-inch Schedule 40 PVC sleeves.
10. Potable Water Meters.
    a. Limit water services to two potable 5/8-inch X ¾-inch meters and two 5/8-inch X ¾-inch irrigation meters per 2-inch service.
    b. For potable water meters 1.5-inches or greater, the Designer 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.
    c. Each single-family lot shall have its own meter on the property it is serving within a Public Utility Easement (PUE).
    d. For meters 2-inches and less, provide a 5-ft square easement. For dual meters 2-inches and less, provide a 7-ft square easement. For meters between 3- and 6-inches, provide a 10-ft X 20-ft easement.
    e. Install dual residential potable water meters at property corners wherever possible.
    f. Locate potable water meters at minimum distances from electric transformers and gravity wastewater laterals as shown on COA Standard Details.
    g. Locate potable water meters away from roadway (4 feet minimum) and adjacent to the right-of-way line.
    h. 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.

i. 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.

11. Isolation Valves.
    a. Provide isolation valves on transmission mains at 1000-foot maximum intervals and at distribution branches. Valves shall be of the resilient wedge gate type.
    b. Provide isolation valves on all branches, three valves per branch.
    c. For each service line that connects to a main, provide an isolation valve in the service line at the point of connection. Valves shall be of the resilient wedge gate type.
    d. Provide mechanical restraint for all buried inline isolation valves. Provide flanged restraint for all exposed inline isolation valves.
    e. At the discretion of the COA Public Services Department, isolation valves may be required at strategic locations to provide flexibility for operation and maintenance of the potable water system to allow segments of pipe to be isolated and minimize the number of service disruptions.
    f. Locate isolation valves so that associated valve boxes will not conflict with wheel path, parking spaces, curb & gutter, or ADA handicap ramps.
    g. Provide a valve box for every valve below grade. The valve box shall not transmit shock or stress to the valve. Center and plumb the valve box over the operating nut of the valve, with the box cover flush with the final grade with fabricated concrete ring and brass tag.
    h. A main line isolation valve must be installed beyond the last service on dead end lines and must be properly restrained.
    i. Provide a bacteriological sample point at the end of all dead-end water mains and at a maximum of 1,000-foot intervals. Install an isolation valve and perpendicular blow-off assembly at each sample point.
    j. Provide at least one perpendicular blow-off assembly on potable water main loops, at a maximum of 1,000-foot intervals, with main line isolation valves on both sides of the assembly to allow the water main to be flushed, disinfected, sampled, and isolated in both directions.
    k. Provide perpendicular blow-off assemblies at the end of all potable water mains sufficient to flush all sand and debris.
    l. Provide 3-inch blow-off assemblies on all 6- to 10-inch diameter potable water mains. Provide 6-inch blow-off assemblies on all 12-inch diameter

and greater potable water mains.

m. Provide 2-inch sample points with resilient seat wedge gates valves 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.

n. Two-inch valves located in paved areas, including sidewalks, or deeper than 18-inches shall be COA - approved cast iron, resilient wedge gate type with standard 2-inch operating nut, threaded with galvanized nipple between the valves and tapping saddle or tapped tee.

o. Each potable waterline, including those made of ductile iron, shall be furnished with a solid 10-Ga tracer wire that is stubbed up every 1,000 LF of pipe. Stub-up the tracer wire into an access point as per the standard details.

12. Fire Protection.

a. Provide fire hydrants 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. Provide a 20-ft wide easement for the fire line. Usually the fire hydrant is located within the fire line easement. If such an easement does not exist, provide a 10-ft square easement around the hydrant.

c. The Designer shall submit signed and sealed fire flow demand calculations in accordance with NFPA and Florida Fire Prevention Code requirements.

d. If required, include fire sprinkler demand in total demand.

e. For buildings with no sprinkler systems, determine fire flow requirements based on peak domestic demand plus the Florida Fire Prevention Code demand (at hydrants).

f. For buildings with sprinkler systems having 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.

g. Determine the number of fire hydrants required for a project based on the fire flow demand calculations. Locate at least one hydrant within 500 feet of the most remote point of the building, as the fire truck drives. Locate the remaining hydrants within 1,000 feet of the most remote point of the building, as the fire truck drives.

h. Serve all fire hydrants 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, serve each fire hydrant with

no less than a 6-inch diameter water main.

i. Pipe lengths for potable mains, whether looped or dead ended shall provide adequate fire flow for proposed and future fire flow demands.

j. Locate fire hydrants in easily visible and accessible locations. Locate fire hydrants at entrances and intersections whenever possible.

k. Locate fire hydrants at property corners just inside the right-of-way. Do not locate fire hydrants at the same corners as water meters or electric transformers.

l. Fire hydrants shall have a minimum clearance of 4 feet from the back of curb and 2 feet from the edge of sidewalk.

m. Orient fire hydrants with the largest (4.5-inch) nozzle directed towards the street or parking area.

n. Fire hydrants shall be red. Paint fire hydrant bonnets 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

o. There shall be no obstructions (fences, landscaping, signs, etc.) within 5 feet of each hydrant.

p. Connect fire hydrants to water mains using anchoring tees for restraint and valves. Fire hydrant assemblies shall include anchoring couplings for restraint and bends.

q. In addition to the anchoring tee, provide another means of restraint so the fire hydrant is dually restrained. An acceptable means of dual restraint are threaded rods.

r. Fire lines shall be designed and installed by a certified fire line Contractor.

s. Fire hydrants shall be the dry-barrel type. As per manufacturer's recommendations, install drain rock for weeping.

t. Locate fire hydrants to provide complete accessibility, and also in such a manner to minimize the possibility of damage from vehicles or injury to pedestrians. All hydrants shall stand plumb with the proper nozzle facing the curb and the bury line of the hydrant at the final grade (-2", + 6").

13. Backflow Prevention.

a. Backflow prevention shall comply 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 requirement 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. The auxiliary water source shall connect to the potable water service downstream the RPZ backflow prevention assembly.

c. An approved backflow prevention assembly (BFP) must be installed on the potable water service connected to each non-residential use and to each residential irrigation use downstream of the COA point of service, typically the water meter. The BFP shall be of the RPZ type – alternate BFP types will be approved by the COA on a case-by-case basis.

d. Any dedicated fire line must be equipped with an approved double check backflow preventer assembly (BFP), generally the RPZ type. For fire lines serving fire suppression systems containing antifreeze protection, foaming agent injection systems, or other chemical additives, RPZ backflow prevention assemblies are required.

e. Locate the backflow preventer on the water supply immediately as the line enters the site. Mount above grade in an appropriate COA Public Services Department-approved standard enclosure. The area shall be appropriately landscaped. Note that backflow preventers have drains that operate periodically – take this into account in the design.

f. The Designer shall verify that adequate potable water pressure exists at the site and shall identify if potable water booster pumps are 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. Submit a copy of the completed test to the COA Public Services Department.

h. The entity responsible for the cost of the water meter is also completely responsible for the backflow preventer assembly; namely, furnishing, installing, protecting it from freezing, protecting it from vandalism, performing annual testing, and maintaining the assembly. The furnished freeze protection system shall not impede access to test ports, valves, or nameplates, and shall not trap moisture against the backflow preventer (to avoid corrosion). If the freeze protection method is insulation, protect the insulation with a hard shell that is easily removable, waterproof, and protects the insulation from deterioration.

i. Furnish and install a privately-maintained back flow preventer on a house keeping pad downstream of the meter. Unless otherwise approved, the backflow preventer shall be located less than 24-inches from the meter.

The specific need and type of backflow preventer must be approved by the COA Public Services Department.

2.5. Wastewater Design Requirements.

A. Designs prepared for the COA shall conform to the latest adopted version of all applicable local, state, and federal regulations. Verify applicable codes and standards and their editions at the time of final work; reference Section 1.2 – *Codes and Standards*.

1. All wastewater piping (force mains, gravity mains, gravity laterals) shall have a minimum of 36 inches of cover. Minimum horizontal separation from other parallel underground utilities or structures shall be as noted in the table in Paragraph 2.12 Utility Separation.
2. Force Mains.
    a. Install force mains 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. Do not install force mains under roads or sidewalks. If unavoidable, minimize piping runs under roads or sidewalks. Cross roads or sidewalks at a right angle to them.
    c. Install force mains with 12-inch vertical minimum separation from potable water mains with the force main below the water main. If such separation is not possible, see paragraph Potable Water Design Requirements for alternative installation requirements.
    d. Design force mains at grades (minimum 0.1% slope) that will reduce the number of high points; do not design or install force mains that are level.
    e. 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 either a 6-foot wide corridor centered on the pipe or a corridor with a width equal to twice the depth to the pipe bottom, whichever is greater.
    f. Force mains shall be a minimum of 4-inch in diameter.
    g. Force mains shall be constructed from either corrosion-resistant lined ductile iron pipe or AWWA Class 900 PVC pipe with minimum DR 18 pipe thickness. Ductile iron pipe lining shall be PROTECTO 401 ceramic epoxy or equal.
    h. All force main fittings shall be ductile iron, unless otherwise approved by COA. All force main fittings (elbows, tees, etc.) shall be lined to prevent corrosion. Lining shall be either PROTECTO 401 ceramic epoxy or fusion bonded epoxy.
    i. All force main isolation valves shall be the corrosion resistant plug type.

Epoxy-coat both the internal and external body and cover.

j. Each force main, including those made of ductile iron, shall be furnished with a solid 10-Ga tracer wire that is stubbed up every 1,000 LF of pipe. Stub-up the tracer wire into an access point as per the standard details.

k. Provide air/vacuum release valve assemblies at all high points.

l. Provide air/vacuum release valves 2-inch in diameter on 4- through 12-inch diameter force mains. For 16-inch force mains, provide two air/vacuum release valves 2 inches in diameter. Either install the second air/vacuum release valve in parallel to the first valve or install the two valves within 25 feet of each other.

m. Air/vacuum release valves shall be above-ground type, ARI D-025 Combination air release valve for sewage, or equal.

n. Provide isolation valves at maximum 1,000-foot intervals.

o. At each force main tee and wye, provide three isolation valves, one on the upstream segment, and one each on the downstream segments. Isolation valves shall be the plug type.

p. Provide mechanical restraint for all buried in-line isolation valves and fittings. Provide flanged restraint for all exposed in-line isolation valves and fittings.

q. Locate each isolation valve so that its associated valve box will not conflict with vehicle wheel paths, parking spaces, curbs & gutters, and American Disability Act (ADA) handicap ramps. Locate the valve box outside of pavement where possible.

r. Do not install tees and 90-degree bends on force mains less than 16 inches in diameter unless approved by the COA Public Services Director. At connection points, either use wyes or bends 45 degrees or less.

s. Evaluate piping to determine where restraint is required. Where restraint is required, show and label the restraint method on all force main piping. Provide approved restrained connections between pipe joints for a sufficient length of pipe adjacent to each fitting to provide restraint for all reaction forces. Restrained mechanical joint fittings are preferred and acceptable. Reaction blocks or other alternate restraint methods will only be approved at the discretion of the COA Public Services Department. In no case shall a reaction block be allowed to provide 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.

t. If possible, make connections to existing force mains that are de-pressurized. If “hot tap” connections are unavoidable, such connections to

existing pressurized force mains shall only be made 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. Complete all tapping 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.

u. Connect force main near the bottom of the manhole so force main centerline matches 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.

v. Provide a corrosion-resistant plug valve in the force main adjacent to the gravity system connection.

w. Private force mains are not allowed to connect directly into COA wastewater force mains. Owner/Developer shall make provisions for private force mains to discharge into COAs gravity wastewater system. Each private force main shall discharge into either a COA manhole or cleanout dedicated to accepting the private force main discharge.

x. Installing a privately maintained individual grinder station with one pump that primarily serves a single residence/structure requires a COA Building Department permit. The COA Building Department Inspector will inspect both the grinder station and force main routed to the connection point and will verify that it is leak tested per Code.

3. Gravity Mains.

   a. Mains shall have a minimum 8-inch inside diameter and shall be installed with uniform alignment and grade between manholes.

   b. The standard minimum easement width, centered on the gravity main, is 30 feet.

   c. Install gravity mains in roadway centers. On curved roads, locate the gravity main and manholes such that the main remains within the limits of the paved area. Minimize the number of manholes by using only the number required to keep the main within the paved area. Locate the manholes in the center of either the roadway or the driving lane.

   d. Provide manholes at a minimum of 300-foot intervals, end of all lines, grade changes, and at deviations in alignment.

   e. Design gravity mains 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%	Designer to evaluate
12-inch	0.22%	Designer to evaluate

f. Installing 10-inch gravity mains requires pre-approval by the Public Services Director.

g. Design pipe slopes for greater than minimum slopes when possible. Design to obtain velocities of not less than 2-fps minimum and not more than 15-fps maximum at peak daily flow.

h. Provide gravity wastewater main stub-outs 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.

i. Extend gravity wastewater main stub-outs to the property line or phase line. Extend a minimum of 10 feet past the edge of pavement or a distance of 1.5 times the wastewater depth, whichever is greater.

j. 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.

k. Service laterals shall not be connected to stub-outs without a terminal manhole.

l. Outside drop construction is required for gravity lines 4-inch diameter and larger that 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.

m. Inside drop construction for 4-inch connections to existing manholes may be permitted at the discretion of the COA Public Services Director.

n. 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.

o. 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.

4. Service Laterals.

a. Unless otherwise noted, provide single gravity wastewater services to the corner of each lot, building, or parcel. The strong COA preference is to install cleanouts, so they are not in driveways. All cleanouts shall have a

concrete ring.

b. 3-inch service laterals are not permitted.

c. 4-inch service laterals shall have cleanouts installed at a minimum of every 75 feet and be designed to a 1.0% minimum slope.

d. 6-inch service laterals shall have cleanouts installed at a minimum of every 100 feet and be designed to a 0.60 % minimum slope.

e. Terminate service lateral with a cleanout located within the right-of-way or Public Utility Easement (PUE). In general, a permissible cleanout location within the PUE is in the middle of the PUE. Any other proposed cleanout location within the PUE must be approved by the Public Services Director.

f. Show the end of COA maintenance for service laterals on the Construction Drawings.

g. Additional private cleanouts on site shall include a clean out within 5 feet of the building wastewater service.

h. For each single-family residence, install the single service lateral at the lot corner and connect it perpendicular to the wastewater main. Design service laterals 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 for perpendicular- running utilities

i. Cleanouts from two adjacent lots shall not share a common lateral.

j. 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.

k. Provide cleanouts located in paved surfaces and sidewalks with traffic load bearing covers.

l. Locate each COA-maintained cleanout as close as possible to the property line, and not adjacent to the building it serves.

m. To monitor location of each COA-maintained cleanout, install an electronic marker near cleanout as per COA standard details.

n. Set cleanout invert elevations such that there is sufficient slope to the gravity main.

o. Design service laterals to connect to the gravity main with a wye fitting rotated 45 degrees up. The invert elevation of the horizontal service at the main shall be at or above the crown of the mainline pipe. See Standard Details for more guidance.

p. Design service laterals connecting to manholes with an invert a minimum

of 0.3 feet above the invert of the manhole.

q. Service laterals connecting to manholes shall penetrate completely through the manhole wall and extend 3 to 5 inches beyond the inside of the manhole; seal the penetration with a neoprene boot, which shall be cleanly grouted.

r. Set service lateral cleanout invert elevations at a minimum of 1.5 feet below the minimum finished floor elevation of the proposed buildings or lots/parcels under review.

s. 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, install a Clean Check extendable backwater valve (or equal) just downstream the sewer clean-out adjacent to the house. Replace the clean-out lid with a Sewer Popper (or equal) relief valve that shall be maintained by the property owner.

5. Manholes.

a. Locate manholes in either the centers of roadways or centers of lanes. Locate manholes where access for maintenance would not be blocked or restricted. Do not install manholes 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. Usually, a manhole is located within the easement of its associated gravity or force main. If such an easement does not exist, then provide an easement extending 5 feet from the manhole. For a 4-ft wide easement, the required minimum easement is 14-ft square.

c. Manhole "pans" may be required at the discretion of the COA Public Services Department.

d. Manholes located outside of pavement shall have the ring and cover raised to 6-inches above the final grade. Slope the ground around the manhole ring and cover from the top of the rim down to surrounding finished grade at 10:1 slope.

e. Manholes with a depth of 20 feet or more shall be 72-inch inside diameter.

f. Outside drop construction is required for gravity lines 4-inch diameter and larger that 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.

g. Inside drop construction for 4-inch connections to existing manholes may be permitted at the discretion of the COA Public Services Director.

h. The force main shall enter near the manhole bottom at the elevation of the crown of the gravity effluent pipe.

i. Provide a 12-foot wide access road, stabilized to a minimum LBR 30, to all COA-maintained manholes located within COA easements. Design the access road to provide adequate drainage and to prevent erosion from stormwater runoff.

j. Manhole Linings and Covers: During design, the Designer shall meet with the COA Pubic Services Department to identify those manholes requiring either corrosion-resistant liners or corrosion-resistant coatings. Unless otherwise decided, all new manholes that receive gravity flow either directly or indirectly from a force main shall be furnished with a corrosion-resistant liner. Similarly, all existing manholes that receive gravity flow either directly or indirectly from a force main shall be coated with a corrosion-resistant coating.

(1) Unless otherwise noted or shown, all new wastewater manholes that receive gravity flow either directly or indirectly from a force main 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).

(2) Unless otherwise noted or shown, each existing wastewater manhole that receives gravity flow either directly or indirectly from a force main shall be coated with Raven Lining Systems, Raven 405 epoxy coating, or approved equivalent by the COA Public Services Director. coating shall protect all surfaces within the manhole (side wall, upper side roof, floor, and pipe penetrations sleeved with flexible boot connector). Prepare surface and apply coating (thickness and number of coating as per the vendor's recommendation). Make bypass provisions and submit bypass plan so that existing manhole can be removed from service and lined.

(3) For each new and each existing manhole lined or coated as specified above, provide a composite non-metallic cover and frame except for manholes located in either county or state roads. In such roads, manhole covers shall be cast iron. Factory coat the bottom and side of the cover and the entire frame. Coat with POR-15 Rust Preventive Anti-Corrosive Paint, P.O.R. Products. Composite non-metallic cover and frames shall be installed on manholes located in city roads. For each existing manhole, prior to installing the composite non-metallic cover, first remove the existing manhole cover.

(4) Composite non-metallic covers and frames shall be made of compression-molded, fiber reinforced thermoset composite. Frames

and covers shall exceed the requirements of AASHTO M306: Proof Testing H-20/25 with ultimate load above 90,000 pounds. Covers must weigh at least 70 pounds. Metallic accessories shall be 316 stainless steel - austenite. Provide features as shown on the design details. Manhole ring and covers shall be the product of Composite Access Products, McAllen, TX, or COA approved equal.

(5) The interior of all new or existing rehabilitated manholes that are expected to contact only limited amounts of hydrogen sulfide such as in a subdivision shall be lined with two coats of water-based epoxy coating. Initial and final coats shall be red and gray, respectively. Covers of such manholes shall be cast-iron.

(6) For all manholes, provide an exterior coating consisting of two coats of water-based epoxy. Initial and final coats shall be red and gray, respectively.

(7) Polymer concrete manholes made by Armorock are acceptable in all applications as they are inherently corrosion-resistant. Such manholes do not require corrosion-resistant liners or coatings.

6. Grease Interceptors.

   a. All non-residential facilities that prepare, process or serve food are required to have either an approved grease interceptor or approved grease trap. A grease interceptor is located underground and outside of a food service facility. By contrast, a grease trap is located inside the food facility and under a sink.

   b. Design requirements in this manual deal with grease interceptors and not grease traps.

   c. Design and construct grease interceptors as specified herein, COA wastewater Standard Details, current edition, and other applicable local and state regulations.

   d. Furnish each grease interceptor with two 24-inch diameter traffic-bearing covers to facilitate proper inspection and maintenance.

   e. Size grease interceptor as per calculations found in Supplement 1, Grease Interceptor Sizing Criteria. Minimum capacity of any grease interceptor shall be 1000 gallons. Alternate calculation methods may be accepted subject to approval by the Public Services Director.

   f. Install the grease interceptor outside the food service facility in a location that provides easy access for inspection, cleaning, maintenance and pumping.

   g. Install the grease interceptor in the food service lateral wastewater line between all fixtures that may introduce grease and the wastewater

collection system. Such fixtures include, but are not limited to, sinks, dishwashers, garbage disposals and floor drains in food preparation and storage areas.

h. Do not introduce sanitary wastewater into the grease interceptor.

2.6. 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. Verify applicable codes and standards and their editions at the time of final work; reference Section 1.2 – *Codes and Standards*.

1. Reclaimed Service.
   a. Provide reclaimed water service to each lot, building, or parcel that requires a separate reclaimed water account.
   b. Limit reclaimed water services to one 5/8-inch X ¾-inch meter per 1-inch service, and two 5/8-inch X ¾-inch reclaimed water meters per 2-inch service, and 20 equivalent residential irrigation connections per 4-inch dead end reclaimed water main.
   c. Install double residential reclaimed water meters 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. Do not locate a reclaimed water meter at a property corner having a potable water meter. If either a wastewater lateral or an electric transformer is at a property corner, locate the reclaimed water meter a minimum distance away from them as shown on COA Standard Details.
   e. Locate the reclaimed water meter either on the property lot or the parcel that it is serving.
   f. For multi-family and commercial projects, make every effort 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 the edge of pavement.
   g. For reclaimed water meters 1.5-inch or greater, the Designer shall submit a detailed reclaimed water demand estimate for review and approval by the COA Public Services Department.
2. 3-inch pipe is not allowed in any application, unless approved by the COA Public Services Director.
3. All reclaimed water piping shall have a minimum of 36 inches of cover. Locate reclaimed water piping at the centerline of a standard 20-foot easement.

Depths exceeding 60-inch cover require approval by the COA Public Services Department.

4. Minimum horizontal separation of reclaimed water piping from other parallel underground utilities or structures shall be as noted in the table in Paragraph 2.12 Utility Separation.
5. Where a reclaimed water main crosses a wastewater force main,
   a. Install the reclaimed water main above the wastewater force main with a minimum vertical separation of 12 inches.
   b. Arrange the crossing such that wastewater joints shall be equidistant and as far as possible from the water main joints.
   c. If not possible to install the reclaimed water main above the wastewater main, obtain the approval of the Public Services Director to install the reclaimed water main below the wastewater main. Minimum vertical separation shall be 18 inches.
6. If the minimum 18-inch vertical separation below the wastewater main is not possible, the design documents shall employ one of the following construction methods, but an absolute minimum of 6 inches of vertical separation must be maintained:
   a. Install the wastewater pipe with a minimum pressure rating of 150 psig.
   b. Encase either the reclaimed water main or wastewater line in a watertight carrier pipe that extends 10 feet on both sides of the crossing.
   c. Provide one 20-LF segment of reclaimed water main and one 20-LF segment of wastewater main centered at the point of crossing.
7. If it is found during construction that the 18-inch minimum vertical separation below the wastewater main is not possible, employ one of the methods described above. In addition, the following method may be used if approved by the COA Public Services Director, but an absolute minimum of 6 inches of vertical separation must be maintained :

   Around the wastewater pipe, provide flowable fill that extends 10 feet on both sides of the crossing. Minimum fill thickness shall be 6 inches. Surround the entire pipe circumference with flowable fill.
8. Do not install reclaimed water mains under roads or sidewalks. If unavoidable, minimize piping under roads or sidewalks. Cross roads or sidewalks at a right angle to them. In certain cases, installing reclaimed water mains axially underneath sidewalks may offer certain advantages. In such cases, the Public Service Director must approve of such installations.
9. Limit 4-inch reclaimed water mains to 600 LF for dead end mains and 1,500 LF for looped mains.

10. Evaluate piping to determine where restraint is required. Where restraint is required, show and label the restraint method on all pipe larger than 2-inch. Provide approved restrained connections between pipe joints for a sufficient length of pipe adjacent to each fitting to provide restraint for all reaction forces. Restrained mechanical joint fittings are preferred and acceptable. Reaction blocks or other alternate restraint methods will only be approved at the discretion of the COA Public Services Department. In no case shall a reaction block be allowed to provide 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.
11. Connections to existing dead-end reclaimed water mains without an existing valve past the last service shall include installing a new valve in the main line at the connection point.
12. On dead-end mains 4-inch and larger that are stub-outs for future connection, extend the stub-out past the last isolation valve. Minimum stub-out length is noted below. Provide mechanically restrained fittings and piping for the entire stub-out.

Minimum Length of Mechanically Restrained Stub-Out

Pipe Size	Min Length for DIP
4-inch	60-LF
6-inch	60-LF
8-inch	75-LF
12-inch	104-LF

13. Install 2-inch reclaimed water services/crossings located beneath paved roadways or parking areas in a purple minimum 4-inch Schedule 40 PVC sleeve.
14. Each reclaimed waterline, including those made of ductile iron, shall be furnished with a solid 10-Ga tracer wire that is stubbed up every 1,000 LF of pipe. Stub-up the tracer wire into an access point as per the standard details.
15. Install reclaimed water mains at a minimum horizontal distance from any parallel underground utility as listed on the table in Paragraph 2.12 Utility Separation.
16. Valves and Blow Offs.
    a. Provide isolation valves on transmission mains with limited number of service connections at 1000-foot maximum intervals. Valves shall be of the resilient wedge gate type.
    b. At each branch, provide three isolation valves, one on the upstream segment, and one each on the downstream segments.
    c. Provide mechanical restraint for all buried in-line isolations valves. Provide

flange restraint for all exposed in-line isolation valves.

d. Provide air/vacuum release valve assemblies at all high points.

e. Provide air/vacuum release valves 2-inches in diameter on 4- through 16-inch reclaimed water mains.

f. Air/vacuum release valves shall be the above-ground type, ARI D-040 combination air release valves, or equal.

g. Provide isolation valves at strategic locations to provide flexibility for operation and maintenance of the reclaimed water system by allowing pipe sections to be isolated, reducing the number of customers out of service.

h. For isolation valves, provide a pre-fab concrete ring around each box.

i. Provide perpendicular blow-off assemblies at the end of all reclaimed water mains sufficient to flush all sand and debris.

j. Where a blow-off assembly is installed, provide mechanical restraint on 60 feet of main upstream the blow-off assembly.

k. For a blow-off assembly at the end of a pipe segment, provide a restrained isolation valve at the segment end to facilitate future expansion. Also restrain the last 60 feet of piping upstream the end of the pipe segment.

l. Provide 2-inch blow-off assemblies on all 4-inch diameter reclaimed water mains, 3-inch blow-off assemblies on all 6- and 8-inch diameter reclaimed water mains, and 6-inch blow-off assemblies on all 12-inch and larger diameter reclaimed water mains.

m. Locate each isolation valve so that its associated valve box will not conflict with vehicle wheel paths, parking spaces, curbs & gutters, and American Disability Act (ADA) handicap ramps. Locate the valve box outside of pavement where possible.

n. 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.

2.7. 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. Verify applicable codes and standards and their editions 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 Designer shall assess the following:

a. Visual impact on the neighborhood. Set the lift station sufficiently back from the property line. A minimum of 10 feet is required from the property line to the fence line to accommodate a landscaped buffer zone.

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: Include sufficient pavement areas and clearance to accommodate full movement and operations of 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. Clear the site of all landscaping.

e. Deed the site to the COA.

f. Grade the site to provide adequate and uniform sheet flow runoff. Use piping, inlets, curbs and concrete swales, as appropriate, to control stormwater and to prevent erosion.

g. Provide a uniformly graded level area around the valve pit, wet well, control panel, transformer, and meter. This area shall uniformly slope away from the pavement and structures at 2%.

h. Provide a uniformly graded, level area extending 5 feet beyond the paved drive as well as all structures and appurtenances. Slope this area at 4% away from all structures and appurtenances.

i. Provide minimum drainage slopes around the lift station, piping, valves, electrical building, and control panels.

j. Grade the site 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.

k. The paved drive shall be a minimum of 12-feet wide with a 20-foot wide area adjacent to the wet well and valve pit. Access roadway shall allow for trucks to turn around and be able to safely enter the main roadway from the turnaround points.

l. 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. Extend wet well tops 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. Provide site security by means of 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 gauge.
    b. Install the site security fence and entrance gate far enough from the street to allow maintenance vehicles to be off the main roadway when the operator stops to unlock the gate.
4. Design Flows.
    a. Design all lift stations to carry the estimated design wet weather flow from the area contributing to the lift station by the corresponding sanitary sewer system.
        (1) The Average Daily Flow (ADF) shall be based upon 250 gpd per Equivalent Residential Unit.
        (2) Size pumps to provide adequate pumping capacity for the peak hour flow (PHF) multiplied by a factor for infiltration. Assume the PHF is 4.0 times the average daily flow (ADF) for the proposed development. This PHF value is consistent with 10 States Standards.
        (3) Assume an infiltration factor of 5 percent for new gravity wastewater piping. The COA Public Services Department reserves the right to increase this infiltration factor to account for infiltration in older gravity wastewater piping.
    b. The COA Public Services Director shall approve all designs and determine the requirements for future upgrades of all lift stations. Design and construct lift stations so they can be up-graded to meet anticipated future flows of the development.
    c. The following design criteria shall be considered for hydraulic design.

(1) Use the Hydraulic Institute Engineering Data Book, or other recognized reference for hydraulic data, for fitting(s) and valve velocity head K-factors.

(2) Pump discharge piping velocity shall be generally 5 to 10 fps at design peak hour flow (PHF).

(3) The receiving sewer shall have sufficient capacity to accept the peak discharge rate from the proposed force main while not surcharging. Surcharging the receiving sewers is not allowed.

(4) Lift station, including sumps and baffle walls, shall be hydraulically designed per the recommendations of the Xylem/Flygt Corporation for submersible pumps, or the latest version of the Hydraulic Institute Standards.

(5) The Designer shall obtain a certification from the pump manufacturer that the pumps will perform in the designed pump station layout.

5. Pump Design.

a. The Designer shall prepare a set of pump and system curves to simulate operation of the selected pump(s) and force main under several conditions. Obtain the pump curve from the pump vendor. Coordinate with the COA, who will provide either the system piping and fittings; the system curve or the system operating pressure. The Designer shall analyze pump performance at the following conditions:

(1) Design: Design flow and design operating pressure. Obtain the latter from the COA.

(2) One other point on the pump curve with system pressure as obtained from the COA. Identify the flow as determined by the pump curve.

b. 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.

c. Pumps shall be Xylem/Flygt 3000 Series, or approved by the COA Public Services Director.

d. For pumps with several possible impellers, the selected pump impeller diameter shall be in the middle range of the available diameters for the selected pump. Maximum or minimum impellers are only allowed if approved by the COA Public Services Director.

e. Attach sufficient electrical/control cable to the pump such that no splicing is required between the pump and a junction box. Furnish a seal 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.

f. 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).

g. Provide each pump with a tandem double mechanical seal running in an oil bath. The seal 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.

h. 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.

i. The pump motor shall be of Class F insulation, NEMA B design, watertight and air filled. Guarantee that the pump motor can run in a totally, partially, or non-submerged condition continuously for a period of 24 hours without damages.

j. 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. Connect the impeller to a short sturdy shaft in order to minimize shaft deflection.

k. Pump conductors shall be stranded cable, 50 feet in length minimum, and in compliance with industry standard for load and resistance against sewage. Conductors 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. Assembly must have strain relief as part of standard construction. Connect the conductors to a terminal board that separates the incoming service from the pump motor so that, if leakage occurs, the terminal board shall short out and not cause damage to the motor.

l. 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 that 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.

m. Provide each lift station with minimum 5-horsepower pumps. Design pumps such that each unit automatically connects to the discharge piping when lowered into place on the discharge connection.

n. The pump(s) shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be removed for this purpose and no need for personnel to enter pump well.

o. Fit each pump with a stainless-steel cable, plastic coated, of adequate strength and length to permit raising the pump for inspection and removal.

p. Furnish each pump with a sliding bracket that bolts to the pump and shall accept the discharge elbow furnished by the pump manufacturer. Guide the pump unit by no less than two guide bars. Seal the pump to the discharge-flange by means of 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 floor. 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. Surge Analysis of New and Existing Force Mains:

   a. For both new and existing force mains, evaluate the potential for hydraulic transients (i.e. surge, or water hammer). For force main systems with lengths greater than approximately 2,000 feet, surge analysis is required. A Professional Engineer registered in the State of Florida shall sign off on a report that includes piping parameters, assumptions, boundary conditions, operational scenarios, hydraulic equipment and valve characteristics. Recommend whether to implement a surge control strategy.

   b. If recommended by the report, implement the surge control strategy.

7. Drive Type, Lift Stations:

   a. Pump motors less than 20 Hp: For each pump motor, provide a Full Voltage Non-Reversing (FVNR) starter.

   b. Pump motors 20-Hp or larger: For each pump motor, provide a Reduced Voltage Soft Starter (RVSS) and a Bypass Contactor.

8. Electric Service, Lift Stations:

   a. Pump motors less than 20 Hp: Suitable for 208v, 3-phase service.

   b. Pump motors equal to 20 Hp: Suitable for either 208v, 3-phase or 460v, 3-

phase service, project dependent.

c. Pump motors greater than 20 Hp: Suitable for 460v, 3-phase service.

9. Access Frame and Cover.

a. Provide each pump 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. Securely mount the frame 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 doors for easy pump removal. For smaller pumps, one single door per lift station is permissible. For larger pumps, one set of double doors is required.

10. Stationary Generator.

a. Furnish a complete self-contained diesel generator package system to provide backup power for the entire lift station, assuming both pumps operate.

(1) Provide a 100-KW generator suitable for standby service. If this generator size is insufficient, the Designer shall notify COA during design.

b. Submittals:

(1) Catalogue cuts with all options called out.

(2) Parts list.

(3) Wiring and interconnecting diagrams.

(4) Load calculations: As per the following article.

c. Load Calculation Submittal: Demonstrate that the generator has sufficient capacity to power the lift station assuming the following:

(1) Both pumps are in operation.

(2) For pump motors less than 20-hp, assume across-the-line starting.

(3) For pump motors 20-hp and greater, assume the RVSS starts each motor.

(4) Calculate the excess capacity.

d. Quality Assurance:

(1) Provide work in accordance with NFPA 70, National Electric Code (NEC).

(2) UL 2200 listed.

e. Special Warranty/Guarantee: Standby Platinum coverage, 5 years.

f. Product: Caterpillar Model C4.4.

g. Service Conditions, Ambient Temperature: 122 degrees F, max.

h. Accepts 100% rated load in one step per NFPA 110.

i. Voltage Output: Match pump motor voltage requirements. Depending on pump motor, output voltage is either 480-volt, 3-phase or 208-volt 3-phase.

j. Frequency: 60 Hz.

k. Emissions/Fuel Strategy: U.S. EPA Certified for Stationary Emergency Application (Tier 3 Nonroad Equivalent Emission Standards).

l. Engine.

(1) Speed: 1800 rpm.

(2) Type: Vertical in-line 4, 4-cycle diesel.

(3) Starting/ Charging System: 12-volt starting motor; battery with rack and cables; battery charger – UL 10 amp.

(4) Air Inlet: Single element air filter.

(5) Fuel System: Primary and secondary fuel filters; fuel priming pump; flexible fuel lines.

(6) Fuel Consumption: 4.5 gallons per hr. at 50% load with fan.

(7) Governing System: Electronic.

(8) Jacket Water Heater.

(9) Jacket Water Cooling System: Radiator and cooling fan complete with protective guards.

(10) Lubrication System.

(11) Exhaust System: Exhaust flange outlet.

m. Generator.

(1) IP 23 protection.

(2) Anti-condensation heaters.

(3) Insulation System.

(4) Excitation System: Permanent magnet excited (PM).

(5) Load Adjustment Module.

(6) Voltage Regulator: Integrated; No load to full load regulation: plus or minus 0.25%; regulator response time: 10 ms.

(7) Voltage Regulation Performance: plus or minus 0.5% at steady state.

(8) Main Circuit Breaker: Manually operated, 250 amps.

n. Base Skid.

o. Integral Sub-base Fuel Tank.
   (1) Approximate Tank Volume: 500 gals.
   (2) Material: Carbon steel.
   (3) Exterior Finish: Black polyurethane enamel.
p. Package Dimensions and Weight: 93 X 44 X 51 inches; 2600 lbs.
q. Vibration Isolators: Rubber.
r. Control Systems.
   (1) Engine controller with display, data logger and self-diagnostics.
   (2) Generator set controller with display.
s. Outdoor Weather-Protective Enclosure.
   (1) Painted white.
   (2) Sound attenuated level 1.
   (3) Weather protected.
t. Electrical Service for Generator: The contractor/electrical subcontractor shall provide all required conduit and conductors for the generator. Base this on both the design drawings and the generator vendor's electrical drawings.
u. Automatic Transfer Switch (ATS).
   (1) Voltage and Poles: Compatible with pump motor voltage.
   (2) Ampacity: 200.
   (3) Specific Circuit Breaker rating: 25kA.
   (4) Enclosure Type: NEMA 3R.
   (5) Required Option: Feature bundle includes engine exerciser/event log/RS 485 Enabled/Common Alarm.
   (6) Solid (copper bus) neutral.
   (7) Microprocessor Control.
   (8) Signal Output 1: Engine Start Command, 5 amps, 30 VDC max.
   (9) Signal Output 2: Normal utility position, 10 amps, 480 VAC rating.
   (10) Signal Output 3: Emergency position (diesel backup), 10 amps, 480 VAC rating.
   (11) Product: ASCO 300 Series Transfer Switch.
v. Signal Interface Summary with Lift Station Control System.
   (1) As described in Article Transfer Switch above, except for the Engine Start command, which shall be directly wired to the diesel engine generator.

(2) Generator common alarm.

(3) Generator ON status.

(4) Generator Not in Auto.

(5) Installation: Contractor and generator vendor shall coordinate work so that all work tasks required for a safe and operable system are completed at no additional cost to COA.

w. Minimum Contractor Work Tasks:

(1) Design and construct generator foundation according to load requirements and soil conditions.

(2) Adjust vibration isolators prior to piping/wiring.

(3) Wiring: Furnish, install and terminate all interconnecting control wiring between generator set, ATS, battery fuel tank, etc. Furnish stranded conductor control wiring.

(4) Wiring: Furnish and terminate AC power to AC-powered accessories. Make power available, but do not energize prior to arrival of generator vendor.

(5) Wiring: Install control wiring in separate conduit from power wiring.

(6) Fuel System: Provide an adequate supply of high-quality fuel for start-up and load bank testing. Fuel shall be low-sulfur #2 diesel fuel.

x. Minimum Generator-Vendor Work Tasks:

(1) Products and engineering of such products in vendor' scope of supply.

(2) Installation and engineering support.

(3) Operation and Maintenance Manuals, both electronic pdf format and hard copies. Provide at least two hard copies.

(4) Start up: Inspect all interconnecting control wiring; load cable termination; AC power terminations and authorize contractor to energize AC powered equipment; fuel system, and exhaust system.

(5) Perform start-up as per vendor start-up procedures and specifications.

(6) Check all control functions and safeties.

(7) Verify system performance.

(8) Perform load test.

(9) Conduct training session.

11. Lift Station Instrumentation and Controls.

a. Instrumentation and controls shall comply with Lift Station Instrumentation and Controls Specification, Supplement 2.

b. As a minimum, instrumentation and controls includes the control panel, level instruments, pressure instruments, electromagnetic flow meter, radio system and antenna tower.

12. Lift Station Wet Well.

a. Circular wet well configuration. Slope floor bottoms toward pump inlets to minimize grit accumulation.

b. The wet well shall be a minimum of:

(1) 8-foot diameter for pumps less than 45 Hp.

(2) 10-foot diameter for pumps 45 Hp and greater.

(3) The above are minimums. The Designer shall evaluate wet well sizes with the COA during design and increase wet well diameter as needed with a maximum diameter of 12 feet.

(4) If approved by the COA Public Services Director and if future flows are not expected to increase, a 6-foot diameter wet well may be considered for pumps with motors 15 Hp and less.

c. Wet well volume for constant-speed pumps.

(1) The wet well volume for constant-speed pumps shall provide sufficient time within one pumping cycle to prevent motor insulation failure due to overheating. The Designer shall refer to NEMA standards.

(2) Pump cycle time shall generally be a minimum cycle time of 15 minutes (at design flow), per Ten States Standards, or as per the manufacturer's recommendation.

d. Minimum wet well depth.

(1) Determine minimum wet well depth as a function of gravity main invert elevation, High high alarm level set point, pump normal operating band (High level pump start and Low level pump stop), Low low level alarm set point, and minimum pump submergence.

(2) Provide minimum vertical distances for the above elevations as shown on Detail 224, Lift Station Wet Well Depth.

e. Limit the wet well to receiving one influent line, which connects to the receiving manhole on the lift station site.

f. 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. If the Designer prefers to provide a fiberglass basin, its use must first be approved by the

City of Alachua Public Service Director.

g. Precast wet wells 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). Field weld liner to cover pipe penetrations, etc.

h. Fillet wet well bottom: To reduce solids deposition, fillet lower sides and bottom of wet well:

   (1) Construct with either concrete or flowable fill.

   (2) Apply only after pump installation.

   (3) Fillet shall commence at the low level elevation with a slope of 2 (vertical) /1(horizontal).

   (4) On wet well bottom, apply fillet so it slopes toward pump.

   (5) The City will consider alternate fillet designs. Submit sketch of the proposed fillet design with reasons supporting its geometry.

i. Access Hatches shall be gasketed to prevent rain water from entering the pump station and shall be designed for a uniform load of 250 psi. Fabricate frame and cover of aluminum. Size pump access hatches (minimum 4 by 6 feet) to provide manufacturer's recommended clearance on all sides of the pump as it is being removed.

j. All guide rails, chains, anchor bolts and other fasteners and hardware within the wet well shall be Type 316 stainless steel.

k. Wet wells deeper than 30 feet may require a fiberglass intermediate landing located above the high water level. The Designer shall coordinate with COA Public Services Department for requirements.

13. Lift Station Vent: On the top of each wet well, provide a vent/odor control unit with the following features:

   a. Installing the vent on the hatch is not permitted.

   b. Install a 316 sst flanged pipe in the top of the wet well.

   c. Attach a passive odor control unit to flange. Unit features include:

      (1) Aluminum enclosure.

      (2) Condensation overflow, ½-inch drain valve, and UV-resistant black polyurethane tubing.

      (3) For 4-inch unit, two ½- gallon containers of odor neutralizer liquid.

      (4) For 6-inch unit, two 1-gallon containers of odor neutralizer liquid.

      (5) Plan view enclosure dimensions: 12.5 X 12.5 inches for 4-inch unit; 18.5 X 18.5 inches for 6-inch unit.

(6) Vendor and Product: Heyward Florida, HIVENT Odor Control Unit.

d. Vent and Odor Control Size:

(1) For lift station with firm pump capacity of less than 400 gpm, provide a 4-inch vent pipe and odor control unit.

(2) For lift station with firm pump capacity 400 gpm and greater, provide a 6-inch vent pipe and odor control unit.

14. Lift Station Valves.

a. Provide a check valve and full-port plug valve on the discharge of each pump.

b. Furnish a full-port plug valve on the common pump discharge. Install the plug valve downstream the flowmeter.

c. Check valves shall be suitable for sewage applications. All exposed ferrous surfaces except stainless steel shall be coated with a fusion bonded epoxy that shall comply with C550.

d. Plug valves shall be suitable for sewage applications and shall be corrosion resistant. Epoxy-coat both the internal and external body and cover.

e. Furnish a 2-inch air/vacuum release valve between the flowmeter and the plug valve.

(1) Air/vacuum release valves shall be above ground type, ARI D-025 Combination air release valve for sewage, or equal.

(2) Route the air discharge from the valve to the lift station. Provide a PVC Schedule 40 piping system. Penetrate the top slab of the lift station. Route the PVC pipe to near the air release valve, and transition to flexible Tygon tubing.

f. Install all lift station valves above ground. Installing valves in a vault below ground will only be allowed if permitted by the COA Public Services Director.

13. Flange Coupling Adapters/Dismantling Joints.

a. Furnish, install and restrain either a flanged coupling adapter or dismantling joint at the following locations:

(1) In each pump discharge line.

(2) In the common pump discharge line.

(3) Adjacent to the magmeter.

b. Flange coupling adapters/dismantling joints shall be fusion epoxy coated.

14. Receiving Manhole.

a. Provide a receiving manhole that 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. Provide a full-port corrosion-resistant plug valve in this main. Epoxy coat both the internal and external body and cover.

c. If the lift station design flow exceeds the gravity main capacity when 60% full and at 1 % slope, increase the size of the gravity main to 12-inches. Only if approved by the Public Services Director, a 10-inch gravity main will be considered.

15. Lift Station Design Drawings.

a. All wastewater lift station design drawings shall include mechanical and electrical drawings with sufficient information to comply with the *COA Design and Construction Requirements*. 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. All lift station design drawings shall include a Process and Instrumentation Diagram (P&ID) that complies with the *COA Design and Construction Requirements*. See Detail 290 Process and Instrumentation Diagram, Typical Lift Station.

c. Tag Numbers:

(1) Show tag numbers on the mechanical and electrical drawings, as well as the P&ID. As a minimum, tag numbers are required for pumps, control panels and instrumentation.

(2) For tag numbering system, see Supplement 2, Lift Station Instrumentation and Controls Specification.

d. Show the stationary generator on the mechanical and electrical plans.

e. List pump parameters on a mechanical plan sheet. As a minimum call out the rated flow and Total Dynamic Head (TDH) of the pump, the operating point, and dead head condition.

f. Design drawings shall include a lift station site plan at 1"=10' scale showing:

(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 in accordance with Section 6.4 of the Land Development Regulations (LDRs).

(4) Show the lift station parcel or site area with accurate dimensions. The minimum parcel size for a COA-maintained lift station is 50 x 50-feet.

(5) Label connections to an existing or proposed force main and gravity system with pipe size, type, slope, manhole top elevations and invert elevations.

(6) Show existing and proposed stormwater facilities, adjacent or nearby the site. Indicate the design high water elevations for the 100- year and 24-hour storm events.

(7) Plan and section process mechanical drawings of the lift station.

g. Lift station drawing set shall also include an electrical drawing. Show all conduit, conductors, and electrical devices, which shall include transformers, generator (if furnished), automatic transfer switch (if furnished), control panel(s), stand-alone surge suppressor(s), antenna(s) and site lighting. Also design and show a grounding grid. Show all required grounding connections to this grounding grid.

16. Valve Pit:

a. In general, do NOT provide a valve pit. Instead locate valves and other appurtenances above grade.

b. If providing a valve pit is unavoidable, first receive permission from COA prior to installation. The valve pit shall be a minimum of 4 feet deep. Determine the length, width, and depth based upon the discharge piping size and spacing. Within the valve pit, provide a minimum of 24 inches of clearance between piping and internal walls. Provide a minimum 12 inches of clearance between (1) the pipe flanges and the valve pit bottom and (2) pipe flanges and internal walls.

17. Electrical Service.

a. The Designer shall coordinate with the electric service provider for the location and required type of electrical service.

b. Size the primary and secondary electrical conductors and conduits to meet load requirements in accordance with the Florida Building Code and the National Electric Code.

c. The conductors and conduits may be oversized at the discretion of the COA Public Services Department to accommodate future pump and panel upgrades.

d. Locate electrical devices outside of classified hazardous areas (Class I, Divisions 1 and 2) and such that exposure to corrosive wet well gases is

reduced. Electrical devices include disconnect switches, the control panel and the magmeter.

(1) To comply with NFPA 820 latest edition, in plan view, locate electrical devices more than 5 ft. away from the vent pipe and 3 ft. away from access hatch openings.

(2) To reduce corrosion, locate electrical devices more than 10 feet away from the wet well. If not possible, discuss with the COA Public Services Director during design.

e. Provide a pad-mounted transformer in an accessible location at a minimum of 4 feet from a paved surface.

f. Locate the pad-mounted transformer in the site corner on the same side as the control panel location.

g. Provide primary conduits from the existing point of service to the transformer.

h. Provide secondary conduits from the transformer to the meter with disconnect, and to the control panel.

i. Include a detail of the transformer pad on the site plan in accordance with COA standards. If there is no COA standard detail for a particular type transformer, submit the electrical service provider's standard.

B. Private Lift Stations

1. Private lift stations are discouraged and will only be allowed where conventional gravity service is not feasible. The Owner/Developer shall either meet with COA staff or provide a detailed engineering study of alternative routes for sanitary sewer conveyance. COA will consider the both its wastewater master plan and wastewater model when evaluating alternatives. Lift stations will only be considered after the Owner/Developer has exhausted all other engineering alternatives.

2. If a lift station serves more than one property, upon completion and designed in accordance with COA standards, at the discretion of the COA Public Services Director, it may become the sole and exclusive property of COA. After being transferred to COA, the lift station will be operated and maintained as a part of the COA Sewerage System.

2.8. 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. Provide an encasement pipe beneath any railroad or highway crossing for potable water mains, wastewater force mains, wastewater gravity mains, and reclaimed water mains.
2. 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 Designer.
3. The Designer shall obtain the necessary permits for construction across State highways and railroads.
4. Carrier Pipe.
   a. Wastewater force mains within jack and bore casings shall be PVC, C900/905, either DR-18 Diamond-Lok or Certa-Lok restrained joint piping.
   b. Wastewater gravity mains: PVC SDR-26.
   c. Potable and reclaimed water: Ductile Iron. As an alternative, if approved by the Public Services Director, PVC, C900/905, either DR-18 Diamond-Lok or Certa-Lok restrained joint piping.
5. Encasement Pipe.
   a. All encasement pipes for railroad and highway crossings shall be steel suitable 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 conveying flammable and non-flammable substances.
   b. For COA roadways, encasement pipe length shall be as directed by the COA Public Services Director. Encasement pipe steel shall have minimum yield strength of 36,000 psi and shall have the following minimum thickness:

Steel Casing Diameter	Railroad Min. Thickness	Highway 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 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/WW 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

6. Boring and Jacking Method.
   a. Prior to installing casing by the boring and jacking method, inspect the roadway or rail-bed 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, continue the operation without interruption until the crossing is completed.
7. Casing Spacers.
   a. Provide stainless steel spacers for the carrier pipe. For ductile iron, provide two spacers per pipe, each located 2 feet from each pipe end. For PVC, provide three spacers per pipe, located at the center and 2 feet from each pipe end.
   b. Spacer shall include the shell, liner, fasteners, risers and runners.
   c. Shell: Bolt-on style with a two-piece solid shell made from T-304 stainless steel of a minimum 14-gauge thickness.
   d. Liner: Ribbed PVC sheet of a 0.090-inch thickness that overlaps the edges.
   e. Fasteners: 5/16-18 T-304 stainless steel.
   f. Risers: Made of T-304 stainless steel a minimum 14-gauge thickness. Attach to the shell by MIG welding. Fully passivate all welds. All fasteners shall be made from T-304 stainless steel.
   g. Runners: Made from Ultra High Molecular Weight (UHMW) polymer.

Runners attach to risers at appropriate positions to properly locate the carrier pipe within the casing and to ease installation.

h. Spacer width, number of risers/runners, and riser/runner height shall be as recommended by the manufacturer for the specific application.

i. 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).

2.9. Painting and Coatings.

A. Products shall be from nationally recognized manufacturers of paints and protective coatings who are regularly engaged in producing such material for essentially identical service conditions.

B. Products shall be from manufacturers with minimum 5-years experience in manufacture of specified products. Acceptable manufacturers are:

1. Carboline.
2. PPG.
3. Sherwin-Williams.
4. Tnemec.

C. The applicator shall have a minimum of 5-years experience.

D. Use only compatible materials from a single manufacturer for primers and finish coats. Thinners, cleaners, driers, and other additives, as recommended by coating manufacturer.

E. Finish colors will be approved by COA Public Services Department. Initial color selections by application are:

1. Potable Water: Blue.
2. Fire Service: Red.
3. Reclaimed Water: Purple.
4. Wastewater: Green.

F. Do not paint either concrete surfaces or stainless steel, unless specifically indicated and approved by COA Public Services Director.

G. Surface Preparation:

1. SP-10: Near-White Blast Cleaning: Remove visible oil, grease, dirt, dust, mill scale, rust, coatings, oxides, corrosion products and other foreign matter, except for random staining limited to no more than 5 percent of each unit area of surface that may consist of light shadows, slight streaks, or minor discolorations caused by rust stains, mill scale stains, or stains of previously applied coatings.

2. SP- 2, Galvanized Steel:
    a. Remove soil cement spatter, and other surface dirt with appropriate hand or power tools.
    b. Remove oil and grease by wiping or scrubbing surface with suitable solvent, rag, and brush. Use clean solvent and clean rag for final wiping to avoid contaminating surface.
    c. Obtain and follow coating manufacturer's recommendations for additional preparation that may be required.
3. SP- 3, PVC:
    a. Hand sand plastic surfaces with medium grit sandpaper to provide tooth for coating systems.
    b. Large areas may be power sanded or brush-off blasted, provided sufficient controls are used so surface is roughened without removing excess material.
4. SP- 4, Galvanized Steel:
    a. Remove soil cement spatter, and other surface dirt with appropriate hand or power tools.
    b. Remove oil and grease by wiping or scrubbing surface with suitable solvent, rag, and brush. Use clean solvent and clean rag for final wiping to avoid contaminating surface.
    c. Obtain and follow coating manufacturer's recommendations for additional preparation that may be required.

H. Protective Coatings Systems:
1. System No. 1 Exposed Metal, Highly Corrosive.
    a. Surface Prep: SP-10, Near-White Blast Cleaning.
    b. Epoxy Primer, Ferrous Metal: 1 coat @ 2.5 Minimum Dry Film Thickness (MDFT).
    c. High Build Epoxy: 1 coat @ 4 MDFT.
    d. Polyurethane Enamel: 1 coat @ 3 MDFT.
2. System No. 2 Exposed Metal, Mildly Corrosive.
    a. Surface Prep: SP-10, Near-White Blast Cleaning.
    b. Epoxy Primer, Ferrous Metal: 1 coat @ 2.5 Minimum Dry Film Thickness (MDFT).
    c. Polyurethane Enamel: 1 coat @ 3 MDFT.
3. System No. 3 Exposed PVC.
    a. Surface Prep: SP-3.

b. Acrylic Latex Semi gloss: 2 coats, 320 Square Feet Per Gallon Per coat (SFPGPC).

4. System No. 4, Exposed Galvanized Steel.
   a. Surface Prep: SP-4.
   b. Primer: Epoxy primer, high-build, as recommended by coating manufacturer for galvanized steel. Minimum coats and cover, as recommended by the coating manufacturer.
   c. Finish coats as required for exposure.
5. System No.5, Metal and Concrete.
   a. Surface Prep and Finish coats: As per Detail 307.
   b. Application: As called out on details.

I. Application Schedule:
   1. Exposed Ductile Iron, Lift Stations: System No. 1.
   2. Exposed Ductile Iron, all other applications: System No. 2.
   3. Exposed PVC, all applications: System No. 3.
   4. Exposed Galvanized Steel, all applications: System No. 4.

2.10. Piping Support.

A. Piping support system shall be designed and sealed by a Professional Engineer registered in the state of 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 pipe that connects to equipment by pipe supports and not by equipment.

D. Support large and heavy valves, fittings and appurtenances independently of connected piping.

E. Do not support pipe from other pipe or equipment.

F. Provide dielectric barrier between painted or galvanized carbon steel members; between copper or stainless steel pipe; and between stainless steel supports and non-stainless steel ferrous metal piping.

G. Piping support materials: Stainless Steel. If piping supports other than stainless steel are being furnished, they will only be permitted if approved by the Public Services Director.

H. Painting and Coatings:
   1. None required for stainless steel.

2. If piping supports other than stainless steel are approved by the Public Services Director, paint as per the application schedule under Section Paintings and Coatings.

2.11. Piping.

A. Pipe Identification: On all new exposed pipes, paint the flow stream identification and the flow direction using an arrow. Use 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 required for all exposed services.

B. Tracer Wire System: Provide a tracer wire system for potable water piping, reclaimed water piping and wastewater force mains. Tracer wire systems shall be as specified in this design manual and as shown on the details.

C. When a potable or reclaimed water main, or a wastewater force main is routed within 5-feet of an electric transformer, center a complete length of Ductile Iron Pipe (DIP) on the transformer with mechanical restraint at each end. Do not locate fittings or valves within 10 feet of the nearest transformer edge. Maintain a minimum clearance of 3 feet between the main and transformer.

D. Maintain (1) the minimum horizontal separation distances of piping from parallel utilities and (2) the minimum clearance distance from other objects as noted in the table in Paragraph 2.12 Utility Separation.

E. Water and gravity wastewater service laterals require up to 5 feet less clearance from each utility for each application noted in the table in Paragraph 2.12 Utility Separation. As a minimum, provide 2 feet of clearance from each lateral and each utility.

F. Install water service laterals 2-inches and less within 4-inch minimum Schedule 40 PVC sleeves under roadways.

G. Do not install 3-inch pipe in any application.

H. HDPE Pipe: In general, COA does not allow the use of HDPE pipe. However, the COA will consider its use for certain applications such as directional drilling. The Contractor must obtain approval from COA for each proposed application. HDPE pipe thickness must be at least Schedule 11.

I. Potable Water Piping and Fittings.

1. Size: ≤ 2-inches

a. Material: Polyvinyl Chloride (PVC), Schedule 40 Pressure-Rated; ASTM D1784, D1785, NSF 61 suitable for potable water.

b. Application: Buried.

c. Joint type: Solvent welded. Use solvent cement conforming to ASTM D-

2564 & NSF 61, suitable for potable water.

d. Interior Lining: None.

e. Exterior Coating: None.

f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

g. Fittings: Schedule 40.

2. Size: ≤ 2-inches.

a. Material: Galvanized carbon steel, ASTM A106, Grade B seamless or ASTM A53, Grade B seamless or ERW. Schedule 80.

b. Application: Exposed.

c. Joint type: Flanged or threaded; AWWA C606.

d. Interior Lining: None.

e. Exterior Coating: Finish color blue; paint as per Paragraph Painting and Coatings.

f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

g. Threaded Fittings: 150 or 300-pound malleable iron, ASTM A197 or ASTM A47, dimension in accordance with ASME B16.3.

h. Thread Lubricant: Teflon tape or joint compound that is insoluble in water.

3. Size: All.

a. Material: Cement-Lined Ductile Iron (CLDI):

b. Pressure Rating: Class 350 for 12-inch diameter pipe or less; Class 250 from 14-inch to 24-inch diameter.

c. Application: Major traffic areas, under pavement, easements, sidewalks, roadways, exposed piping, and within bore and jack casings.

d. Buried joint type: Bell and spigot; where required, proprietary restrained joint.

e. Exposed joint type: Flanged.

f. Interior Lining: Cement mortar; in accordance with AWWA C104/A21.4.

g. Buried Coating: Factory-applied asphaltic coating.

h. Exposed exterior coating: Finish color blue; factory-applied asphaltic coating plus paint as per Paragraph Painting and Coatings.

i. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

4. Size: 4 to 12-inch.

a. Material: PVC DR 18, conforming to AWWA C900 NSF-61 rated, suitable for potable water.

b. For buried applications not requiring DIP.

c. Joint Type: Hub and spigot; where required, proprietary restrained joint.

d. Pipe color (from factory): blue or blue striped.

e. Buried exterior coating: none.

f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

5. Fittings for Ductile Iron and C900 PVC Pipe:

a. Material: Ductile Iron.

b. Rating: 350 psi.

c. Connection Types: Mechanical Joint and Flanged. During construction, provide restraint where required.

d. Standards: ANSI/AWWA C110/A21.10 and C153/A21.53.

e. External Coating: Asphaltic seal coat per ANSI/AWWA C104/A21.4.

f. Internal Lining: Cement-lined and asphalt seal coat pr ANSI/AWWA C104/A21.4 and UL/NSF-61.

g. Fitting Types:

(1) 11 ¼-degree through 90-degree bends; tees; crosses; reducers; wyes; caps and plugs; base bends; base tees.

(2) Sleeves: Long subtype for C153 Fittings.

J. Wastewater Force Main and Fittings.

1. Size: All.

a. Material: Ceramic Epoxy-Lined Ductile Iron (CELDI).

b. Pressure Rating: Class 350 for 12-inch diameter pipe or less; Class 250 from 14-inch to 24-inch diameter.

c. Application: Buried or Exposed.

d. Buried joint type: Bell and spigot; where required, proprietary restrained joint.

e. Exposed joint type: Flanged.

f. Interior Lining: Protecto 401 epoxy lined.

g. Buried coating: Factory-applied asphaltic coating.

j. Exposed exterior coating: Final color green; factory-applied asphaltic coating plus paint as per Paragraph Painting and Coatings.

k. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

2. Size: 4 to 12-inch.
   a. Material: PVC DR 18, conforming to AWWA C900.
   b. Application: Buried.
   c. Joint Type: Hub and spigot; where required, proprietary restrained joint.
   d. Buried exterior coating: None.
   e. Pipe Color (from factory): Green color or green striped.
   f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
3. Fittings for Ductile Iron and C900 PVC Pipe:
   a. Material: Ductile Iron.
   b. Rating: 350 psi.
   c. Connection Types: Mechanical Joint and Flanged. During construction, provide restraint where required.
   d. Standards: ANSI/AWWA C110/A21.10 and C153/A21.53.
   e. External Coating:
      (1) Asphaltic seal coat per ANSI/AWWA C104/A21.4, or
      (2) Fusion bonded epoxy (FBE) per ANSI/AWWA C104/A21.15.
   f. Internal Lining:
      (1) Protecto 401 ceramic epoxy, or
      (2) Fusion bonded epoxy (FBE) per ANSI/AWWA C104/A21.15.
   g. Fitting Types:
      (1) 11 ¼-degree through 90-degree bends; tees; crosses; reducers; wyes; caps and plugs; base bends; base tees.
      (2) Sleeves: Long subtype for C153 Fittings.

K. Wastewater Gravity.
1. Size: 4 to 12-inch.
   a. Material: PVC, conforming to ASTM D3034.
   b. Application, General - 10-feet or less cover from finished grade: SDR 35.
   c. Application, General - More than 10 feet of cover from finished grade: SDR 26.
   d. Application - Located within easements between lots: SDR 26, all depths.
   e. Application - Located below stormwater retention areas: SDR 26.

f. Application - Located within jacked and bored steel casings: SDR 26.
g. Joint Type: Hub and spigot; elastomeric gasket.
h. Buried exterior coating: None.
i. Pipe Color (from factory): Green or green striped.
j. Meet ASTM D3219, 25-foot head pressure.
k. Test Pressure: 15 feet, hydrostatic.

2. Size: Less than 4-inches.
   a. Material: PVC, Schedule 40, pressure rated.
   b. Joint Type: Solvent welded; use solvent cement conforming to ASTM 2564 and NSF-61.
   c. Interior Lining: None.
   d. Buried exterior coating: None.
   e. Test Pressure: 15 feet, hydrostatic.

L. Reclaimed Water.
1. Size: ≤ 2-inches.
   a. Material: Polyvinyl Chloride (PVC), Schedule 40, Pressure-Rated; ASTM D1784, D1785, NSF 61 suitable for potable water.
   b. Application: Buried.
   c. Joint type: flanged, solvent welded. Use solvent cement conforming to ASTM D-2564 & NSF 61, suitable for potable water.
   d. Interior Lining: None.
   e. Exterior Coating: None.
   f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.
   g. Fittings: Schedule 40.
2. Size: ≤ 2-inches.
   a. Material: Galvanized carbon steel, ASTM A106, Grade B seamless or ASTM A53, Grade B seamless or ERW. Schedule 80.
   b. Application: Exposed.
   c. Joint type: flanged or threaded; AWWA C606.
   d. Interior Lining: None.
   e. Exterior Coating: Finish color purple; paint as per Paragraph Painting and Coatings.
   f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

g. Threaded Fittings: 150 or 300-pound malleable iron, ASTM A197 or ASTM A47, dimension in accordance with ASME B16.3.

h. Thread Lubricant: Teflon tape or joint compound that is insoluble in water.

3. Size: 4-inches or greater.

   a. Material: Cement-Lined Ductile Iron (CLDI); Class 350.

   b. Application: Major traffic areas, under pavement, easements, sidewalks, roadways, exposed piping, and within bore and jack casings.

   c. Buried joint type: Bell and spigot; where required, proprietary restrained joint.

   d. Exposed joint type: Flanged.

   e. Interior Lining: Cement mortar; in accordance with AWWA C104/A21.4.

   f. Buried coating: Factory-applied asphaltic coating.

   g. Exposed exterior coating: Finish color purple; paint as per Paragraph Painting and Coatings.

   h. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

4. Size: 4- to 12-inch.

   a. Material: C900 PVC, conforming to AWWA C900.

   b. For buried applications that do not require CLDI.

   c. Joint Type: Hub and spigot; where required, proprietary restrained joint.

   d. Buried exterior coating: None.

   e. Pipe color (from factory): Purple.

   f. Test Pressure: 150 psig or 2X the design pressure, whichever is greater, hydrostatic test.

2.12. Utility Separation.

Minimum Horizontal Separation Distances for Parallel Utilities and Minimum Horizontal Clearance from Other Objects

	Electric Over Head	Electric Under Ground	Communications Over Head	Communications Under Ground	Gas Pipe (Notes 8,9)	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	See Detail 563	10	NESC [7]	N/A	N/A	N/A	NESC [7]	N/A	N/A
Electric Underground	N/A	N/A	N/A	1	3	3	3	3	3	See Detail 560	5	5	N/A	5	3	None	3	3
Communications Overhead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	5	NESC [7]	N/A	N/A	N/A	NESC [7]	N/A	N/A
Communications Underground	N/A	1	N/A	N/A	2	3	3	3	3	10	10	10	5	5	3	None	3	3
Gas Pipe (Notes 8,9)	N/A	3	N/A	2	N/A	2	2	2	2	15	10	10	5	3	2	3	2	2
Water Main	N/A	3	N/A	3	2	N/A	10	10	10	10	10	10	5	None	None	5	4	3
WW Force Main	N/A	3	N/A	3	2	10	N/A	3	3	10	10	10	5	10	10	5	3	3
WW Gravity Main	N/A	3	N/A	3	2	10	3	N/A	3	10	10	10	5	10	10	5	3	3
Reclaimed Water Main	N/A	3	N/A	3	2	10	3	3	N/A	10	10	10	5	10	10	5	3	3
Trees	See Detail 563	See Detail 560	15	10	15	10	10	10	10	N/A	10	10	15	10	10	15	10	10
Lift Station (Property Line)	10	5	5	10	10	10	10	10	10	10	N/A	10	10	10	10	5	10	10
Structure	NESC [7]	5	NESC [7]	10	10	10	10	10	10	10	10	N/A	5	10	10	5	10	10
Transformer	N/A	N/A	N/A	5	5	5	5	5	5	15	10	5	N/A	10	10	5	10	5
Fire Hydrant	N/A	5	N/A	5	3	None	10	10	10	10	10	10	10	N/A	10	5	10	10
Water Meter	N/A	3	N/A	3	2	None	10	10	10	10	10	10	10	10	N/A	5	3	3
Street Light	NESC [7]	None	NESC [7]	None	3	5	5	5	5	15	5	5	5	5	5	N/A	5	5
Storm Sewers	N/A	3	N/A	3	2	4	3	3	3	10	10	10	10	10	3	5	N/A	3
Other Underground Utilities	N/A	3	N/A	3	2	3	3	3	3	10	10	10	5	10	3	5	3	N/A

Notes:
1. General: All values are distances in feet - measured center-to-center of pipes for typical cases. Adjust distances as per Note 2.
2. General: 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. General: 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. General: 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. General, Electrical: As a minimum, provide horizontal separation as per NESC.
9. Separations shown between utilities not owned and operated by the City of Alachua are for reference only.
10. Unless otherwise noted, minimum vertical separation between gas lines and all other utilities is 2 feet.
11. General: These distances only apply to parallel utilities. They do not apply to perpendicular utilities such as Electrical Underground feeding a Lift Station.

END OF SECTION 2

EXECUTION – SECTION 3

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3. EXECUTION

3.1 Meetings.

A. Pre-Construction Conference.

1. As a minimum, Contractor shall be prepared to discuss the following:
   a. Progress Schedules.
   b. Status of bonds and insurance.
   c. Sequencing critical path work items.
   d. Progress payment procedures.
   e. Project changes and clarification procedures.
   f. Use of site, access, office and storage areas, security and temporary facilities.
   g. Major product delivery.
   h. Inspections: Identify all inspections and who will perform the inspections.
   i. For wastewater gravity mains and laterals, confirm that they will be TV-inspected and recorded.
   j. Review standard details in the construction documents. Confirm that City of Alachua details are the most current version. Update if necessary.
   k. Safety plan.
   l. Confirm that construction plans and methods shall conform to the sub-dividers agreement.
   m. Record drawing procedures, coordination with Designer and deliverables.
   n. Confirm tree removal shall conform to Construction Drawings. If necessary, coordinate with COA Planning Department.
   o. Confirm that the location of each new tree is at least a minimum distance from water and wastewater infrastructure as per City of Alachua standards.
   p. Confirm that Contractor shall implement work as recommended by the geotechnical report.
   q. Confirm all sidewalks shall be constructed as shown on plans.
   r. Status of FDEP and FDOT (as necessary) permit applications.
2. Attendees: Representatives of City, Contractor, Design Engineer and Owner (Developer, City, etc.).
3. All above discussion items not fully resolved shall be included in topics covered under subsequent Construction Coordination and Progress Meetings.

B. Construction Coordination and Progress Meetings.

1. Owner (or Owner's designated representative) shall schedule such meetings. Initial frequency: Weekly. As construction proceeds, and if parties agree, change frequency to monthly.
2. Topics:
   a. Review Work progress, update progress schedule, review submittal progress, review inspection progress, review payment applications, and other items needing discussion and resolution.
   b. Unresolved topics from Pre-Construction Conference and previous Construction Coordination and Progress Meetings.
3. Attendees: Representative of City, Contractor, Design Engineer and Owner (Developer, City, Other.)

3.2. Progress Schedule.

A. Contractor shall prepare and update schedule at least monthly during Construction.

B. Contractor shall provide a preliminary progress schedule at the pre-construction conference.

C. Purpose:
   1. Assures adequate planning, scheduling, and reporting.
   2. Promotes work coordination between Contractor and various subcontractors and suppliers.
   3. Allows monitoring work progress.
   4. Assists in evaluating the proposed changes to contract time and schedule.
   5. Assists Owner in reviewing Contractor's payment application.

D. Form: Time-scaled horizontal bar chart that shows the scheduled work at any time during the project.
   1. Show complete sequence of work by activity.
   2. Identify the activity by structure, location and type of work. Include all Inspections on the bar chart, even though the Contractor does not perform the actual inspection.
   3. Chronological order of the start of each work item.
   4. Activity early and late start and stop dates.
   5. Planned and actual duration of activity.
   6. Successor and predecessor relationships for each activity.
   7. A clearly indicated critical path. Show only one critical path on the schedule.
   8. Total float time of each activity.

9. Projected percent complete, based on work dollar value of each activity. Use in preparing monthly payment application.
10. Schedule Revisions When Behind Schedule: Submit a report if the schedule shows the project is more than 30 days behind schedule. Include:
    a. Number of days behind schedule.
    b. Steps to be taken and anticipated time to bring project back on schedule.
    c. Revised schedule.
11. Change Orders: Revise schedule to reflect contract time adjustment approved by the change order.
12. Application for Payment: Owner will only recommend payment if revised schedule has been submitted.

33. Inspections.

A. Conduct inspections on various facilities:

1. As specified in the Contract Documents.
2. For subdivisions, as required by the Subdivider's Agreement. Typically, inspections of the following systems shall be required and shall be performed at multiple benchmarks. Contractor shall coordinate such inspections.
    a. Sewer: In addition to Subdivider's Agreement requirements, visually inspect (1) each wastewater gravity main and (2) each lateral from the gravity main to the property line using a video camera system, specifically, the Closed-Circuit Television (CCTV) type. Examine for alignment, grade, damage, defective pipe and other faults. Testing shall include introducing water at the cleanout to detect "bellies" in the lateral. Digitally record each CCTV inspection. Submit the recorded images on a CD so that the COA receives a copy. Submitted video shall conform to HTML Report/Plot of pipe, EPA/600R-10/082.
    b. Water.
    c. Electrical Conduit.
    d. Stormwater Management: In addition to Subdivider's Agreement requirements, visually inspect each stormwater pipe that is within the right of way using a video camera system, specifically, the Closed-Circuit Television (CCTV) type. Examine for alignment, grade, damage, defective pipe and other faults. Testing shall include introducing water at the cleanout to detect "bellies" in the lateral. Digitally record each CCTV inspection. Submit the recorded images on a CD so that the COA receives a copy. Submitted video shall conform to HTML Report/Plot of pipe, EPA/600R-10/082.
    e. Pavement.

B. Selection of Sewer and Stormwater Piping Inspector:

1. The Contractor will be allowed to self-inspect the sewer or stormwater piping provided they have a CCTV system that is capable of recording the video. If not, the Contractor shall retain a sub-contractor with such capabilities.

C. Inspection Reports:

1. COA-approved Inspector shall prepare and submit an Inspection Report. As a minimum, the report shall include the following parameters:
   a. Inspection Type.
   b. Contractors and Active Equipment/Key Personnel.
   c. Activities: Conflicts/Limitations.
   d. Weather Conditions.
   e. Observations.
   f. Deficiencies.
   g. Photos.
   h. CD of CCTV inspection.

D. Correction of Deficiencies.

1. The Contractor shall correct all deficiencies identified in the Inspection Report. Once corrected, the Contractor shall notify the COA-approved Inspector, who shall re-inspect the facility.
2. The COA-approved Inspector shall then prepare and submit another Inspection Report, including photos.

3.4. Existing Utilities.

A. The Designer shall investigate existing utilities in the project area. Contact the utilities and obtain the most current maps and description of their facilities. The Designer shall send a copy of all information obtained to the COA Public Services Director. Potholing as directed by the Designer may be necessary to confirm location and size of utilities.

1. Notify Underground Utilities and locate utilities (call 811) prior to beginning construction. Show any known obstructions on the Drawings. Exercise utmost caution 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. Keep existing utilities in operation by temporary lines, temporary pumps, or other means required for continuous operation of utilities. All temporary work shall be installed, maintained, operated, and removed by the Contractor upon job completion.

3. Ensure that structural elements are not overloaded as a result of or during performance of the Work. The Contractor shall be responsible for providing additional structural elements or increasing strength of existing structural elements that may be required as a result of the Work. Repairs, reinforcement, or structural replacement must have COA Public Services Department approval.
4. Provide temporary supports and/or adequate protection and maintenance on all underground and surface structures encountered in the progress of the Work. Structures that have been disturbed shall be restored upon completion of the work.
5. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of the COA. Contractor-damaged items shall be repaired or replaced as directed by COA Public Services Department.

3.5. Inspection of Materials.

A. Inspect materials delivered to the job site. Reject and remove from the job site without delay all materials found during inspection or during the progress of the work to have cracks, flaws, surface abrasions, cracked linings, or other defects.

3.6. Excavation and Trenching.

A. Excavate to line, grades, and dimensions as necessary to accomplish the 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 bas, topsoil, and similar items, wherever applicable. Trim to neat line where concrete is to be deposited against earth.

B. Minimum Trench Width:

1. Single pipes, conduits, direct-buried cables, and duct banks:
   a. Less than 4-inch outside diameter or width: 18-inches.
   b. 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 or greater clearance from both sides of aggregate width of pipes, conduits, cables, duct banks, plus space between.
3. Open the trench so that the pipe can be installed to the alignment and depth required. Excavate only so far in advance of pipe installation as to ensure proper installation.

4. Pile excavated material such that it will not endanger the work, obstruct natural water courses, sidewalks, or driveways. Leave unobstructed and keep accessible at all times all fire hydrants under pressure, valve pit covers, valve boxes, fire and police call boxes, and other utility controls. Keep gutters clear or make other satisfactory provisions made for street drainage. All surface materials that 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 to 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 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 non-metallic piping and waterlines.
            (b) Nondetectable Marking Tape: install with metallic piping.
            (c) Settlement of trench backfill/fill or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

3.7. Handling and Cutting Pipe.

A. Store pipes 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. Exercise care during pipe transportation such that it will not be cut, kinked or otherwise damaged.

C. Use ropes, fabrics or rubber-protected slings when handling pipes. Do not use chains, cables or hooks inserted into the pipe ends. Use two slings spread apart for lifting each pipe segment. Do not drop pipe or fittings onto rocky or unprepared ground.

D. Load and unload pipe material as per manufacturer's written recommendation, or as directed below; whichever is more stringent.

E. Handle lined pipe and fittings only from the outside of the pipe and fittings. Do not place forks, chains, straps, hooks, etc. inside the pipe or fittings for lifting, positioning, or laying. If damaged, replace the material in accordance with the liner manufacturer's recommendations.

F. Except as otherwise approved, cut all pipe with a power driven cut off saw. Examine all cut ends for possible cracks caused by cutting.

3.8. Pipeline Construction.

A. Notify the COA Public Services Department two business days prior to beginning construction.

B. Before placing pipe into trench, wipe the outside of the spigot and the inside of the bell clean and dry, free from oil and grease. Take every precaution to prevent foreign material from entering the pipe. During layout operation, do not place debris, tools, clothing, or other material into the pipe.

C. After placing the pipe into trench, center the spigot end in the bell, the pipe pushed home (to the manufacturer's mark for PVC pipe) using proper homing equipment, brought to correct alignment, and covered with an approved backfill material.

D. When pipe laying is not in progress, close the open ends of pipe 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.

E. Before backfilling, 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.

3.9. Paving, Curb, Gutter and Walkways.

A. When open trench construction of pipe beneath paving is permitted, remove the pavement, curb and gutter, driveway, and walkway to neat lines of sufficient width to allow proper installation of the pipe work.

B. Install proper Maintenance of Traffic (MOT) devices, such as signal lights, warning signs, and barricades. Maintain as required for adequate safety.

C. Do not replace pavement base until 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. Replace pavement in accordance with the "Florida Department of Transportation, Standard Specifications for Road and Bridge Construction", or latest edition.

E. Replace the curb and gutter with a new concrete unit poured-in-place and having the same cross section as the original curb removed. Thoroughly cure the concrete. Backfill under concrete work shall be thoroughly compacted and the sub-grade approved before any concrete may be poured.

F. Replace concrete walkways and driveways with concrete of the same cross section as the original walk or driveway. Thoroughly cure the concrete. Backfill under concrete work shall be thoroughly compacted and the sub-grade approved before any concrete may be poured.

3.10. Pipe Leakage Testing.

A. Pressure test all piping.

B. Notify COA Public Services Department in writing 5 business days in advance of testing. Perform testing in presence of 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 COA Public Services Department.
    b. Test joint between new piping and existing piping by methods that do not place entire existing system under test load, as approved by COA Public Services Department.
4. Hydrostatic Test for Pressure Piping:

a. Test Liquid: 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.

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) Slowly fill the line under test with water at the specified test pressure. Determine the lowest and highest elevation points on the section being tested. Calculate any corrections necessary. Apply a correction factor to account for the test gauge elevation. Adjust pressure as needed. Testing equipment must be capable of measuring the volume of water needed to re-pressurize the system during testing.

(7) Install a blow-off or fire hydrant at the end of the line being tested. Before applying the specified test pressure, expel air from the test section including service connections. If fire hydrants or blow-offs are not available at high places, provide taps at points of highest elevation prior to the test. Insert plugs after the test has been completed.

(8) Hold pipe line mains at the test pressure for a two-hour test period; employ sufficient manpower to insure adequate testing and

inspection. If the line fails to meet the test, repair and retest the line until the test requirements are satisfied.

(9) Perform leakage tests on all newly installed lines. Any leakage discovered shall be less than the following per thousand feet of pipe:

Pipe Diameter	Leakage (gallons per hr.)
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, thoroughly examine all valves, joints, fittings, and fire hydrant assemblies by means of an open-trench inspection. If any cracked or defective pipes, fittings, fire hydrants, or valves are discovered during the open-trench inspection, correct accordingly. Repeat the above tests.

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) At least 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. Smoke test all gravity lines.

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. Repair any clogged clean-outs or breaks. Any sections of PVC pipe with more than 5% deflection will not be accepted.

7. In addition to pressure testing, complete the following on all wastewater piping installation:
   a. TV inspection.
   b. Clean-outs adjusted.
   c. Manhole to finished grade.
   d. Inverts installed.
   e. 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 COA Public Services Department (or authorized representative) to confirm that the test has been satisfactorily completed.

3.11. Pipe Disinfection.

A. Disinfect all potable water piping.

B. Disinfecting Procedures: In accordance with AWWA C651 or latest State of Florida Heath 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. Disinfect pumps and associated system piping.

E. Disinfect all 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. Disinfect the water main and laterals with a concentration of 50 PPM Chlorine. Place tablets or granules 1 foot from the end on the inside of the pipe bell. Determine quantity of tablets or granules by consulting Table 1 in the AWWA Standard – Disinfecting Water Mains (ANSI/AWWA C651-05).

I. Place tablets or granules in each pipe section, fire hydrants and hydrant branches. Once pipe is filled with water, wait a minimum of three days (for tablets) or 24 hours (for granules) before flushing.

J. Disinfect pipe sizes 16-inches and above by injecting sodium hypochlorite solution. The method and procedure will be reviewed and approved by the COA Public Services Department Director.

K. Disposal of heavily chlorinated water: Do not allow flow into a waterway without neutralizing disinfectant residual. See the appendix of AWWA C653 for acceptable neutralization methods.

L. After the pipeline has been cleaned, disinfected, and refilled with potable water, the Contractor shall take two water samples per day, each at a different location, on 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, repeat disinfecting procedures and bacteriological testing until bacterial limits are met.

1. For pipe segments less than 1000 LF, only one water sample per day may need to be taken, subject to COA Approval. Sample location must be at the downstream end of the pipe segment.

3.12. Jack and Bore Execution.

A. Pit Excavation.

1. Do not over-excavate the boring pit bottom unless job site conditions so require. If over-excavation occurs, 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 Drawings. Compact each lift of the backfill material to at least 95% of maximum density as determined by AASHTO T99, Method.
2. During excavation, if ashes, cinders, refuse or other organic material considered unsuitable are uncovered at the bottom of the bore pit or at subgrade, remove such material and backfill with approved, suitable material. Tamp approved backfill material in 6-inch lifts to provide a uniform and continuous bearing characteristic of that area's soil condition.
3. Where the pit bottom 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, construct a suitable foundation.
4. Pile excavated material such that it will not (1) endanger the work, and (2) 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 components shall be kept clear or other satisfactory provisions made for proper drainage. All surface materials that 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.
6. Do not allow water in the entrance/exit pit at any time during bore and jack operation. Use dewatering equipment (well point systems, gravel and pump, etc.) to remove the water. Screen discharge from dewatering equipment to remove silt and route to natural drainage channels, storm drains or storm sewers in conformance with Federal, State, or Local regulations.

B. Completion and Clean-Up.

1. After installation, clean the steel casing pipe free of debris, soil and other foreign matter. Install the carrier pipe and plug the ends of the steel encasement pipe 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 completing clean-up of the construction area as required by the Federal Government, State, County, Railroad Company, or COA.

3.13. 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 (including ductile iron) or tubing for location purposes. Where the pipe connects to a valve or meter or where a test assembly is required, refer to the standard details for installing wiring stub-outs, pass-through wiring or test assembly wiring connections.

B. Install all meters 2-inches and less in an underground box with yoke bar assembly furnished and installed by the Contractor. The meter will be furnished by the COA.

C. All meters greater than 2 inches shall be above grade installations. The Contractor shall furnish all materials needed to install the larger meter assemblies. Install threaded galvanized pipe above grade with service unions and test/service bypass. Larger meters shall be flanged to ductile iron pipe with test/service bypass. Bypasses are preferred to be installed below grade. The COA will furnish the meter for installation under the supervision of the COA Public Services Department.

D. During construction, protect each water meter with a temporary barrier fence in conformance with COA standard details. COA will consider other means of protection.

E. Connections to existing water mains shall only be made by properly trained and licensed Contractors that specialize in tapping active water 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. Complete all tapping in the presence of the COA Public Services Department Inspector. Tag, label and deliver the resulting tap coupon to the COA Public Services Department.

F. For potable water applications, submit documentation 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.

3.14. Wastewater Execution.

A. Force Main.

1. 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. On the As-Builts, show the location and elevations of all ARVs. Pressure test the force main against a closed isolation valve of the air release assembly. After successful pressure testing, verify that all air release assembly isolation valves have been opened.

    a. The specified wastewater ARV has a maximum air release capacity – installing a larger ARV will not increase air release capacity. For 16-inch wastewater mains, install two ARVs per each actual high point. Either install (1) the two ARVs in parallel at the high point location or (2) install separate ARVs within 50 feet of each other.

2. Provide a valve box for every valve. Valve box shall not transmit shock or stress to the valve. Center and plumb the valve box over the wrench nut of the valve, with the box cover flush with the final grade or as may be specified in the Drawings.

3. Green insulated, solid conductor, 10-gauge copper wire shall be taped to or wrapped around all pipe (including ductile iron) or tubing for location purposes. Where the pipe connects to a valve or where a test assembly is required, refer to the standard details for installing stub-out wiring, pass-through wiring or test assembly wiring connections.

4. If at all possible, make connections to existing force mains that are de-pressurized. If "hot tap" connections are unavoidable, such connections to existing force mains shall only be made by properly trained and licensed Contractors that specialize in the business of tapping active 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. Complete all tapping 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.

B. Gravity Collection System.

1. Install gravity sewer mains with a pipe laser. Laterals may be installed with mason's lines and batter boards. Erect the batter board 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.

C. During construction, protect each cleanout with a temporary barrier fence in conformance with COA standard details. COA will consider other means of protection.

D. Prior to final acceptance and after completing the smoke test of the wastewater collection system, lower all clean outs to final grade and cap.

3.15. Lift Station Execution.

A. Inspection.

1. Inspection will be performed by COA Public Services Department and conducted in two phases.
    a. Phase 1: Mechanical phase, including piping, receiving manhole, wet well valve pit (if present) and force main piping.
    b. Phase 2: Electrical phase, including control panel, pumps, radio telemetry system and generator.
2. The Contractor shall retain the services of an Electrical Contractor licensed in the state of Florida during the electrical construction phase.

B. Start-up and Final Acceptance.

1. By written request, notify the COA Public Services Department Inspector five business days prior to start-up. 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 O&M Manuals; Complete sets of mechanical, electrical and control schematics; Sets of Fuses/Bulbs.

3.16. Traffic Control Plan.

A. The temporary traffic control plan shall be created by a registered Florida Professional Engineer, who is certified to do so by the FDOT. The temporary traffic plan shall provide for orderly Maintenance of Traffic (MOT) and must be in accordance with FDOT design standards and specifications.

B. Comply with Laws and Regulations regarding closing and restricting use of public streets or highways. Do not close any public or private road, except by written permission of the proper authority. Ensure 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 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 to accommodate 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. Place traffic control devices for lane closure including signs, cones, barricades, etc. as shown on submitted and COA Public Services Department-approved plans. Do not place signs without actual lane closures. Immediately remove signs 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. Locate tapers to maximize the visibility of their total length.

K. Advance warning signs, distances, and taper lengths may be extended, at direction of the Services During Construction (SDC) Engineer.

L. All existing road signs, pavement marking and/or pavement reflectors that conflict with the proposed traffic control plan shall be covered, removed, or relocated as directed by the COA Public Services Department. Restore to match pre-construction conditions.

M. Contractor shall make provisions to maintain pedestrian crossing locations and type, in accordance with all applicable codes and OSHA requirements.

N. Submittal: Contractor shall submit for COA Public Services Department-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.

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. 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 COA Public Services Department of any vehicular or pedestrian safety or efficiency problems incurred as a result of the Work.

3.17. Final Acceptance.

A. Upon work completion, remove from the site all waste materials or other debris caused by or accumulated as a result of the job. Refill any depressions resulting from settlement or backfilled trenches. Any seeding and mulching or sprigging and mulching, or sodding of the ground surface shall be done in accordance with the Drawings or as required by the Federal Government, State, County, or City.

B. Coordinate in advance with the COA Public Services Department Inspector to arrange a date and time for a "walk-through;" reference Section 2.4.10(G) (6) of the Land Development Regulations (LDRs).

C. Notify the COA Public Services Inspector when discrepancies have been repaired so they can be re-inspected.

1. When the system has passed inspection, 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 will not accept public infrastructure until all preceding requirements have been met.

3.18. Record Drawings.

A. Purpose of record documents is to document factual information regarding aspects of the work, both concealed and visible; and to enable future modification of the work to proceed without lengthy and expensive site measurement, investigation, and examination.

B. During project construction, the Contractor shall be responsible for keeping accurate track of any approved field construction revisions and show them on the approved Construction Drawings. The Services During Construction (SDC) Engineer shall periodically incorporate the approved field construction revisions onto the Record Drawing check set. The approved field construction revisions shall be accessible to COA staff at all times during the construction period.

C. At the completion of the work or prior to Contractor's notice of completion, the Services During Construction (SDC) Engineer shall provide (1) one set of full-size set of Record Drawings (2) 11 X 17-inch PDFs of the Record Drawings and (3) a digital file of the Record Drawings to the Public Services Department. Such drawings shall have incorporated all red-line markups. Label record drawings and stamp with the title, "RECORD DOCUMENTS," in neat large printed letters.

D. COA staff will review completeness, accuracy, and format of the submitted Record Drawings. If the Record Drawings are considered unacceptable, they will be returned to the SDC Engineer for correction and resubmission. The COA reserves the right not to accept the infrastructure and to delay the utility service until record and survey as-built drawings are deemed acceptable by the Public Services Director.

END OF SECTION 3

SUPPLEMENT 1 – GREASE INTERCEPTOR SIZING CRITERIA

GREASE INTERCEPTOR SIZING CRITERIA

COA may allow a trap to be installed in certain instances where an interceptor cannot be located due to site conditions.

Grease Interceptor Sizing Formula

(COA may use other sizing criteria determined on a case-by-case basis)

GI = SC x RT x SF x FF

Where:

GI = Grease Interceptor Volume, gallons

SC = Seating Capacity, Number of seats

RT = Retention Time, hours = 2.5

SF = Storage Factor, dimensionless = 1.5

FF = Flow Factor Criteria in gallons/seat/hour determined as follows:

Deep frying and dishwasher	FF = 3.0
No deep frying, dishwasher	FF = 2.5
Deep frying, disposable serving-ware, no dishwasher	FF = 2.5
No deep frying, reusable serving-ware, no dishwasher	FF = 2.0
No deep frying, disposable serving-ware	FF = 1.5
No cooking of any type, disposable serving-ware	FF = 0.5

If the facility has drive-through service, increase volume by 35% of the calculated volume using the above formula.

MINIMUM SIZE = 1000 gallons

SUPPLEMENT 2 – LIFT STATION INSTRUMENTATION & CONTROLS

1.01 LIFT STATION INSTRUMENTATION AND CONTROLS SPECIFICATION

DRAFT – EDIT FOR SPECIFIC PROJECT NEEDS

(NTD = Note to Designer)

(NTD: This sample specification assumes a duplex pump station. Modify as required if lift station has a different number of pumps.)

A. General:

1. All instrumentation, control, and electrical components provided under this section, including panel fabrication and color coding of lights and switches, shall comply with COA design requirements.
2. Provide control panel(s), electrical components, and wiring for a complete a functional system. Provide all items not specifically specified needed to implement functions required for proper system operation.
3. The Contractor's scope shall include all programming and commissioning of both the pump controller and radio.
4. Unless otherwise modified for the specific project, the Contractor shall furnish the radio, which will be located in the control panel. COA will furnish and install the radio cable, antenna and pole, and then back-charge the Contractor.

B. Tag Number System

1. Assign tag numbers to process equipment, including, but not limited to, pumps, control panels, and instrumentation.
2. Use tag numbers to identify process equipment on process mechanical and electrical drawings as well as on the submittal.
3. Tag Numbering Convention:

   a. Form: XXEEZ, where:

      (1) XX = Lift Station Number.

      (2) EE= ISA designation or process equipment abbreviation.

      (3) Z= Number to differentiate identical pieces of equipment.

   b. Examples:

      (1) 17P1 = Lift Station 17, Pump 1

      (2) 17P2 = Lift Station 17, Pump 2

      (3) 17FE = Lift Station17 Flowmeter

      (4) 17FIT = Lift Station 17, Flow Indicating Transmitter

(5) 17CP = Lift Station 17 Control Panel

(6) 17LSHH =Lift Station 17, Level Switch High High

C. Control Panel: The pump manufacturer shall provide the following panel:

Panel No.	**Name**	**NEMA Rating**	**Enclosure Material**
XXCP	Lift Station XX	4X de-rated to NEMA 3R due to side louvers	Type 304 SST

1. Panel Power Requirements:
   a. For lift stations with pump motors less than 20-HP, panel shall be suitable for 208-volt, 3-phase service.
   b. For lift stations with pump motors equal to 20-HP, panel shall be suitable for power service specific to project, either 208-volt 3-phase or 460-volt, 3-phase. Coordinate with COA.
   c. For lift stations with pump motors larger than 20-HP, panel shall be suitable for 460-volt, 3-phase service.
2. Panel to include enclosure UL Listing mark *(NTD: Choose one. COA preference is UL698A.):*
   a. Mark stating "Listed Enclosed Industrial Control Panel Relating to Hazardous (Classified) Locations as per either UL698A." (preferred), or:
   b. Mark stating "Listed Enclosed Industrial Control Panel as per UL508A."
3. Panel Features:
   a. External gasketed panel doors.
      (1) "Dead Front" Construction: Do Not install operator lights and handswitches on external panel doors.
      (2) Number of external panel doors: One or two, depending upon panel size.
      (3) Provisions for padlocking – hasp or equivalent.
      (4) Door clamps and door stop kit.
      (5) Safety latch to keep doors locked in an open position during maintenance.
      (6) 3-point latching mechanism instead of screw-down clamps to maintain NEMA 3R/4X rating.

(7) Padlockable handle.

(8) Panel Nameplate: White laminated nameplate with black letters, ½-inch high. Inscribe panel name and tag.

b. Panel Exterior: Factory powder coat white the entire panel exterior to decrease panel internal temperature by reducing solar effects.

c. On top of external panel,

(1) Provide a 304 SST solar shield vertically separated from panel top by 2-inch nominal air space.

(2) Provide a drip-shield.

d. On one side of panel, provide a 200-amp (NTD: If possible, verify during design.) generator receptacle with angle adapter.

(1) Prior to panel fabrication, confirm receptacle ampacity and modify to match total panel load.

e. On panel bottom, provide 12-inch stainless steel floor stand kits.

f. Inner "swing-out panel doors:

(1) Fabricated from aluminum.

(2) Install operator lights and handswitches on inner "swing-out" panel doors.

g. Backpanel: Fabricated from 10-gauge mild steel, and finished with a white polyester coat.

h. Internal copper grounding bus.

i. On each panel side, provide a screened louvre. Locate one louver approximately one foot from panel bottom. Locate the other louver approximately one foot from panel top to promote panel ventilation.

(1) Louvre shall be Nvent Hoffman HP05 Exhaust Grille Type 12/IP55, light gray; Nominal Dimensions 6-inch X 6-inch.

4. Operator Controls and Indicators: As a minimum, provide the following operator controls and indications on the inner "DEAD FRONT" safety door(s). All controls and indicators shall be rated NEMA 4X. Inscribe controls and indicators with black text on white nameplates and on the component itself (service legend).

a. Hand/Off/Auto hand switch, one per pump.

b. Normal/Bypass handswitch, one per pump, as applicable.

c. On status light, red lens, one per pump.

d. Off status light, green lens, one per pump.

e. Elapsed time meter, one per pump.

f. Multitrode pump controller, one total.

5. Motors and Starters:
   a. For each pump motor less than 20-HP, provide a Full Voltage Non-Reversing (FVNR) starter.
   b. For each pump motor 20-HP and greater, provide a Reduced Voltage Soft Starter (RVSS) AND a Bypass Contactor.
      (1) RVSS shall be Allen Bradley SMC-3.
   c. Furnish each pump motor with an individual disconnect switch, three-phase overload protection, and magnetic contactors with time delays as required.
6. Additional Components
   a. Various single-phase and three-phase circuit breakers.
   b. Various relays.
   c. LED interior panel light with handswitch.
   d. Duplex GFCI receptacle.
   e. Panel intrusion switch and contacts.
   f. GE/MDS SD1 Ethernet/Serial Radio and antenna surge suppressor.
      (1) Licensed radio compatible with COAs system.

      (NTD: Most City radios are licensed. Several are spread-spectrum. Obtain City's preference.)

      (2) Implement either serial or Ethernet connection to match existing radio poll. Coordinate with COA.
      (3) 12Vdc power supply and battery for radio and Multitrode pump controller.
      (4) Aluminum battery box.
7. Intrinsically safe circuits: For each circuit that enters a Class I, Div 1 classified area (such as a lift station wet well), make that circuit intrinsically safe. As a minimum,
   a. Within panel, furnish an intrinsically safe relay on each float circuit.
   b. Within the panel, furnish an intrinsically safe barrier that is suitable for each circuit of the MultiTrode probe.

D. External Interfaces:
1. Status and Alarms.
   a. As a minimum, input the following status and alarm contacts into the Multitrode controller:
      (1) Running status, one per pump.

(2) Handswitch in auto status, one per pump.

(3) Handswitch in bypass, one per pump, if applicable.

(4) FVNR overload alarm, one per pump.

(5) RVSS overload alarm, one per pump, if applicable.

(6) Motor high temperature, one per pump.

(7) Circuit breaker trip, one per pump.

(8) High high level alarm.

(9) Low low level alarm.

(10) Panel intrusion.

NTD: For a lift station with a generator engine (genset), provide the following additional inputs:

(11) Automatic Transfer Switch (ATS) normal utility position.

(12) ATS emergency (genset backup) position.

(13) Generator common alarm.

(14) Generator On status.

(15) Generator not in auto.

b. Accept the following current inputs:

(1) Pump Motor 1, Leg 1.

(2) Pump Motor 1, Leg 2.

(3) Pump Motor 1, Leg 3.

(4) Pump Motor 2, Leg 1.

(5) Pump Motor 2, Leg 2.

(6) Pump Motor 2, Leg 3.

c. Provide additional I/O modules as necessary.

2. *(NTD: Current COA practice is a serial connection with each radio being polled. Eventually, the communication scheme may be changed to Ethernet – the specified radio has this capability. Coordinate communications scheme with COA).* Serially connect the MuliTrode controller to the radio being polled. In the radio, create a table data of the above status and alarm signals, suitable for remote monitoring at the central facility.

3. 120Vac power circuits: Provide three circuits, each suitable to power a remote device. Furnish a breaker for each circuit.

a. 20-amp circuit, fixed generator battery power circuit.

b. 15-amp circuit, area lighting.

c. 15-amp circuit, electromagmetic flowmeter.

E. Functional Requirements:

a. In the event of power failure, upon power recovery, automatically reset pumps and resume normal operation without operator intervention.

b. Manual Mode Operation:

(1) When the selector switch is in the Hand position, the pump runs continuously.

(2) When the selector switch is in the OFF position, the pump does not run.

c. Automatic Mode Operation:

(1) The MultiTrode controller provides automatic control similar to that noted below. If an auto control scheme has been used successfully for previous COA lift stations, this scheme may be acceptable if approved by COA.

(a) Start the lead pump on rising Middle level.

(b) Start the lag pump on rising High level.

(c) Stop both pumps on falling Low level.

(NTD: The following is required when the pump motor is furnished with both RVSS and FVNR starters.)

d. Normal/Bypass Operation:

(1) When the selector switch is in Normal, the pump run command energizes the RVSS (soft) starter.

(2) When the selector switch is in Bypass, the pump run command energizes the FVNR (across-the-line) starter.

e. Backup Operation: Provide back-up operation using floats to monitor and relay circuits to control pumps.

(1) Start Pump 1 on rising High High level.

(2) Start Pump 2 on sustained rising High High level (time delay).

(3) Stop both pumps on falling Low Low level.

F. Additional Requirements:

1. Monitoring Submersible Motor for Abnormal Conditions

a. COA preference is to monitor high temperature in each submersible motor by means of a temperature switch. Provide a temperature switch for each motor. To maintain warranty, the pump vendor may require a more sophisticated device to monitor the motor for both high temperature and moisture. If so,

(1) Provide this device for each motor. Notify COA and Engineer during the submittal process.

(2) Shutdown the motor on any abnormal event. Before the motor can resume operation, manually initiate reset function on the controller.

2. Size all electrical components to handle any future lift station upgrade.
3. Furnish a step-down transformer with a 120-volt ac control circuit.
4. Provide a current transformer (six total) on each power leg to the pump motors. Input each signal to the pump controller. Monitoring current within the pump controller is not acceptable.
5. Provide a phase monitor external to the controller to monitor input power for proper phasing. If phasing is faulty, open contact to disable pump operation. Monitoring phase condition within the pump controller is not acceptable.

G. Field Instrumentation:

1. Provide two floats to monitor rising High High and falling Low Low levels. Tag as XXLSHH and XXLSLL. Floats shall be Flygt Monitoring Devices, ENM-10.
   a. High High level setpoint: 1 foot below lowest inlet pipe.
   b. Low low level setpoint: 1 foot above pump's minimum submergence.
2. Level-Sensing Probe:
   a. Compatible with controller in panel.
   b. Furnish MTISB barrier for intrinsically safe operation.
   c. Furnish MTAK2 mounting kit.
   d. Initial probe selection: 2.5 meter probe length, 10 sensors, and 30 m cable.
      (1) During design, modify probe selection as necessary.
   e. Manufacturer/Model: MultiTrode Conductive Level Sensing Probe.
3. Provide a magmeter with the following features:
   a. Size: See below.
   b. Two grounding electrodes.
   c. Liner: Suitable for raw wastewater; polyurethane is acceptable.
   d. Integral transmitter with display.
      (1) Provide a sunshade and support stand for the transmitter.
   e. Suitable for at least accidental submergence.
   f. Hazardous Classification:
      (1) Above ground: Provide unclassified magmeter.
      (2) Below ground: Provide a magmeter classified for Class I, Div 1, Group D environments.
   g. Install the magmeter above grade, unless otherwise instructed by the COA.
   h. Manufacturer and Model: Krohne or Rosemount.

4. Magmeter Sizing
    a. Maximum flow: 1.5 X pump design flow.
    b. Select meter size so velocity at maximum flow is between 5 and 10 fps.
    c. If the designer chooses to use a different sizing criterion, it must be approved by COA.
5. Provide a pressure gauge assembly for each pump.
    a. Parts: Gauge, diaphragm seal and quick disconnect.
    b. Diaphragm Seal: 304L sst diaphragm; carbon steel bottom housing; glycerin fill fluid; ½-inch NPT male process connection; ¼-inch NPT female process connection; Ashcroft 100 Series.
    c. Gauge: Select range so that pump design pressure point is within 30-60% of gauge range; 4 ½-inch face; PLUS! Dampening; ¼-inch NPT male process connection; Ashcroft Model 1279 Pressure Gauge.
    d. Accessories: ½-inch carbon steel female quick disconnect; carbon steel nipples.

H. Surge Suppressors:
1. Power: Furnish surge suppressor external to the panel. Suppressor with weatherproof enclosure shall be suitable for operation with 3-phase power of applicable voltage. Manufacturer/Model: Square D.
2. Type 1, 120Vac. Install within panel on 120Vac control circuit and as shown on the Contract Documents. Principle of operation: Two-stage metal oxide varistor/bipolar silicon avalanche.
    a. Emerson EDCO HSP-121 or equal.
3. Type 2, 24Vdc. Install within panel on analog signal from each remote transmitter, such as a magmeter, and as shown on the Contract Documents. Principle of operation: Two-stage metal oxide varistor/bipolar silicon avalanche.
    a. Emerson EDCO PC-642 or DRS or SRA-64; or equal.
4. Type 3, 24Vdc. Install in field adjacent to each remote transmitter, such as a magmeter, that sends analog signal to panel, and as shown on the Contract Documents. Includes stainless steel pipe nipple. Principle of operation: Two-stage metal oxide varistor/bipolar silicon avalanche.
    a. Emerson EDCO SS64, or equal.
5. Type 8, Radio Cable: Install within panel on radio cable.
    a. Polyphaser IS-50-NX-C2.

6. Ground all surge suppressors as per manufacturer's recommendations and COA Standard Details.

I. Antenna, Pole and Cable:

1. COA will furnish and install the antenna, pole and radio cable. *(NTD: This is usual COA practice, but COA may elect that Contractor do this work. Obtain COA preference during design.)*
2. The Contractor shall reimburse the COA for such work.
3. Contractor shall furnish and install (including grounding) two Standard Coax Cable Kits, Tessco or equal. See Standard Details.
4. Coordinate with COA for scheduling and installation.
5. The Contractor shall be responsible for commissioning and testing the radio communications link.

SUPPLEMENT 3 – COA STANDARD DETAILS

COA Standard Details are available in a stand-alone document titled
“City of Alachua Standard Details, Current Version”