REEDY CREEK IMPROVEMENT DISTRICT

DESIGN CRITERIA
for
WATER, RECLAIMED WATER, & SEWER FACILITIES

A. General

1. Reclaimed water, sanitary sewer, and sanitary force mains shall be designed to avoid crossing over a potable water main, wherever possible.

2. Where a sanitary hazard (sanitary or storm sewer, sanitary force main, or reclaimed water pipe) crosses under a potable water pipe with less than eighteen (18) inches vertical clearance, the sanitary hazard shall be 20 feet or either ductile iron or concrete encased PVC, centered on the point of crossing.

3. When a potable water main parallels a sewer main, a separation of at least 10 feet (outside to outside) shall be maintained where practical. If less than 10 feet separation is provided, the sanitary hazard shall be ductile iron or PVC encased in concrete.

4. Maximum obtainable separation of reclaimed water mains and potable water or sewage mains shall be maintained. A minimum horizontal separation of five (5) feet (center to center) or three (3) feet (outside to outside) shall be maintained between reclaimed water lines and either potable water or sewage lines.

5. Minimum depth of cover shall be 36 inches over top of pipe, unless approved otherwise by RCES/RCID.

6. Jack & Bores
    a. Casing pipe material, thickness and diameter shall meet or exceed that specified by the Florida Department of Transportation.
    b. Design drawings shall indicate locations for boring pits.
    c. Dewatering of jacking and receiving pits shall be accomplished and disposition of the water shall be addressed.
    d. Carrier pipe shall be properly supported with spacers and the casing pipe ends shall be sealed

7. Drawing size: All design drawings shall be 22”x34” and shall include a graphic scale on each sheet.

B. **Potable Water**

1. Head loss shall not exceed 5 feet per 1000 feet, unless approved otherwise by RCES/RCID.

2. Velocity shall not exceed 8 feet per second.

3. Design of new pipeline shall be based on a Hazen-Williams coefficient of 120 for ductile iron and 130 for PVC.

4. Valves on water pipelines shall be resilient seated gate valves.

5. Butterfly valves are not acceptable and shall not be used unless specifically required by the Owner and Engineer of Record and specified as such on the contract documents.

6. Valves shall be placed on all branches at all pipeline intersections as necessary to isolate portions of the distribution system.

7. System design for domestic purposes (not fire protection) shall be based on maximum available pressure at the point of connection under peak flow conditions. In Subdistrict I that pressure shall not be assumed to be greater than 80 psi. In Subdistrict II, that pressure shall not be assumed to be greater than 60 psi. These values are street pressure before the meter and backflow prevention device. Facility/building designers must take into account the pressure loss of the meter and backflow preventer. For fire protection, the designer must consult Reedy Creek Emergency Services and Factory Mutual for criteria.

8. Minimum pipe size shall be 8 inch for mains and 6 inch for hydrant laterals.

9. Dead ends shall be avoided; when unavoidable, a blow-off must be installed.

10. Design Engineer shall designate on the drawings all points for bacteriological sampling as required by FDEP.

11. Sampling points and blow-offs installed for testing purposes shall be removed prior to completing construction.

12. Minimum tap size is 4 inches, with a 4-inch gate valve. Size-on-size taps are not permitted.

B. **Potable Water (con't)**

13. Where ductile iron pipe is used, Design Engineer shall determine whether cathodic protection is required based on soil properties, stray currents, etc. The Ductile Iron Pipe Research Association (DIPRA) shall be utilized to determine whether such protection is warranted.

14. Line valves shall be provided at spacings of no greater than every 1,000 feet, except for portions that are installed via horizontal directional drilling or where service connections are absent or unlikely.

15. Use of concrete thrust blocks is not allowed.

16. Joint restraint requirements shall be determined by the Design Engineer and exact locations of restrained joints shall be indicated on the drawings. Joint restraint requirements shall be based on DIPRA criteria. Where polyethylene encasement of ductile iron is used, Engineer shall take into account reduced pipe-to-soil friction in joint restraint design.

17. Automatic air release valves shall be installed at all significant pipe profile break points where air can accumulate. The Design Engineer shall evaluate whether vacuum relief valves are necessary to relieve negative pressures.

18. Fire hydrant locations shall be determined by RCID Fire Department.

C. **Reclaimed Water**

1. Head loss shall not exceed 5 feet per 1,000 feet, unless approved otherwise by RCES/RCID.

2. Velocity shall not exceed 8 feet per second.

3. Design for new pipelines shall be based on a Hazen-Williams coefficient of 120 for ductile iron and 130 for PVC.

4. Valves on pipelines shall be resilient wedge gate valves.

5. Butterfly valves are not acceptable and shall not be used unless specifically required by the Owner and Engineer of Record and specified as such on the contract documents.

6. Valves shall be placed on all branches at all pipeline intersections as necessary to isolate portions of the distribution system.

7. Maximum service pressure at the street before the meter shall be 80 psi static.

8. Where ductile iron pipe is used, Design Engineer shall determine whether cathodic protection such as joint bonding, anodes, polyethylene bags, etc. is required based on soil properties, stray currents, and other related criteria. The DIPRA shall be utilized to determine whether such protection is warranted.

9. Automatic air release valves shall be installed at all significant pipe profile break points where air can accumulate. The Design Engineer shall evaluate whether vacuum relief valves are necessary to relieve negative pressures.

10. Use of thrust blocks is not allowed.

11. Joint restraint requirements shall be determined by the Design Engineer and exact locations of restrained joints shall be indicated on the drawings. Joint restraint requirements shall be based on DIPRA criteria. Where polyethylene encasement of ductile iron is used, Engineer shall take into account reduced pipe-to-soil friction in joint restraint design.

12. Line valves shall be provided at spacings of no greater than every 1,000 feet, except for portions that are installed via horizontal directional drilling or where service connections are absent or unlikely.

13. Sampling points and blow-offs installed for testing purposes shall be removed prior to completing construction.

14. Minimum tap size is 4 inches with a 4” gave valve. Size-on-size taps are not permitted.

D. **Sewer**

Force Mains

1. Head loss in force mains shall not exceed 5 feet per 1,000 feet.

2. Velocity in force mains greater than 10 inches shall not exceed 7 feet per second. Velocity in force mains 10 inches or less shall not exceed 5 feet per second.

3. Design for force mains shall be based on a Hazen-Williams coefficient of 120 for ductile iron and 130 for PVC.

4. Minimum size for force mains is 4 inches, unless approved otherwise by RCES/RCID.

5. Valves on force mains 12 inches and smaller shall be plug valves with 100% port opening. Valves on force mains greater than 12 inches shall be plug valves with minimum 90% opening.

6. Automatic air release valves shall be installed at all significant pipe profile break points where air can accumulate. The Design Engineer shall evaluate whether vacuum relief valves are necessary to relieve negative pressures.

7. Provide minimum 4-inch diameter clean-outs (pressure type) at bends greater than $22\text{-}1/2^{o}$ deflection in force mains less than 10 inches in diameter. Clean-outs shall also be provided every 400 feet on force mains less than 10 inches in diameter.

8. Where force mains manifold with other force mains, line valves shall be provided at appropriate points to allow isolating the various force mains.

9. Where force mains cross canals, valves shall be installed on either side of the canal with appropriate information signs.

10. Sanitary force mains shall not terminate directly into a sanitary gravity sewer main.

    a. Force mains shall terminate at a gravity sewer manhole at an elevation no greater than two (2) feet above the normal flow line. In an existing gravity sewer manhole that benching shall be built up to provide a smooth transition into the gravity flow channel.

    b. Where force mains are to extend into or through structures, Link-seal type penetration seals shall be provided at the wall face. Openings into existing structure shall be made with a core boring machine.

D. **Sewer (con't)**

Force Mains (con't)

c. New and existing manholes receiving sanitary force main discharges shall have an integrally cast PVC or fiberglass liner which is locked into the manhole casting, or shall use an equivalent spray or trowel applied liner, as approved by RCES/RCID. Ceramic or equivalent type manhole castings that provide equivalent portection shall also be considered.

d. Where an elevation drop is necessary to obtain the required discharge elevation, the drop in the elevation of the force main shall not exceed forty-five (45) degrees.

e. Designer shall verify that peak flow rate from sewer force main does not surcharge or overload downstream portions of gravity sewers.

11. For sewer force mains, all ductile iron pipe shall be ceramic epoxy lined.

12. Use of concrete thrust blocks is not allowed.

13. Joint restraint requirements shall be determined by the Design Engineer and exact locations of restrained joints shall be indicated on the drawings. Joint restraint requirements shall be based on DIPRA criteria. Where polyethylene encasement of ductile iron is used, Engineer shall take into account reduced pipe-to-soil friction in joint restraint design.

14. Where ductile iron pipe is used, Design Engineer shall determine whether cathodic protection is required based on soil properties, stray currents, etc. The DIPRA shall be utilized to determine whether such protection is warranted.

15. Minimum tap size is 2 inches. Size-on-size taps are not permitted.

D. **Sewer (con't)**

Gravity Sewer

1. For gravity sewer pipelines, minimum velocity shall be 2 feet per second when flowing full.

2. Minimum slopes for gravity sewer lines shall be such that a full or 1/2 full pipe will have a velocity of not less than two (2) feet per second. In no case shall slopes be less than those listed in the following table.

Pipe Diameter (inches)	Minimum Slope (ft/100 ft) * n = 0.013 **
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
30	0.06
36	0.05

* The tolerance at any one point in the system shall not exceed +/- 0.10 foot in the vertical plane or +/- 0.20 foot in the horizontal plane.
** For PVC pipe and ceramic epoxy lined ductile iron pipe.

3. For gravity sewer lines less than 24 inches in diameter, manhole spacings shall not exceed 400 feet. For gravity sewer lines 24 inch diameter or greater, manhole spacings shall not exceed 500 feet.

4. Minimum size for gravity sewer lines is 8 inches.

5. Where ductile iron pipe is used, Design Engineer shall determine whether cathodic protection is required based on solid properties, stray currents, etc. The DIPRA shall be utilized to determine whether such protection is warranted.

6. All gravity sewer ductile iron pipes shall be ceramic epoxy lined.

D. **Sewer (con't)**

Gravity Sewer (con't)

7. Where sanitary sewer pipes enter a manhole at an elevation of twenty-four (24) inches or more above the invert of the receiving manhole, a drop manhole with an outside drop pipe shall be provided. Concrete for the encasement of pipe for drop manhole connections shall be Class B, 3000 psi concrete.

8. Drop connections shall not be installed in the interior of the manhole unless approved by the Owner.

9. Where the difference in elevation between the incoming sewer invert and manhole is less than twenty-four (24) inches, the manhole invert shall have a built-up flow channel and bench from the higher invert to the lower invert to provide a smooth flow transition and to prevent the deposition of solids.

10. Shallow or flat top manholes shall be used where the depth of cover is less than four (4) feet. Manholes shall have vertical walls with a flat precast top slab. The precast top slab shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.

11. Brick manholes are not allowed.

12. Precast manholes sections shall have a wall thickness of not less than six (6) inches. Minimum inside diameter of manholes shall be five (5) feet. Minimum manhole cover size is 30 inches.

13. Manhole base slabs shall not be less than eight (8) inches thick and shall be reinforced with a minimum number of five (5) bars at nine (9) inches on centers, each way and shall have minimum number of four (4) bars around each pipe opening. Engineer is responsible for providing base design considering applicable loads and groundwater table.

14. Where pipes enter or exit manholes, a neoprene rubber resilient connector conforming to ASTM C923 shall be sued to provide a watertight connection for the pipe penetration into the manhole.

D. **Sewer (con't)**

Gravity Sewer (con't)

15. Unless approved by the District, lateral sewers and fittings shall be a minimum of four (4) inches in diameter and shall be less than one hundred (100) feet in length from the main to a point not more than five (5) feet from the proposed building line.

    a. Service laterals shall be constructed perpendicular to the sewer main, on a straight line and a constant grade of not less than one (1) percent, and not greater than one hundred (100) percent, (i.e. forty-five [45] degrees from horizontal). Terminal inverts of service laterals shall not be less than three (3) feet in depth.

    b. Service laterals from manholes will not be permitted, except at terminal manholes.

    c. When installing service laterals from existing sewer mains not having wyes or tees, tapping sleeves shall be utilized.

    d. Clean-outs shall be provided in each service lateral, at all wyes and tees and at all changes in direction. Clean-outs shall be the same diameter as the service lateral.

    e. Laterals shall comply with the Epcot Plumbing Code, latest edition.

16. Provide 0.1 foot headloss across manholes or calculate actual loss through manhole.

E. Sanitary Lift Stations

1. For non-master lift stations, peak factors shall be no less than 3 times average daily flow. Design Engineer shall provide calculations to justify peak factor(s) utilized if deviating from 3x ADF.

2. Design calculations for wet well sizing, pump sizing, etc. shall be submitted to RCES for review.

3. All lift stations shall have potable or reclaimed water on site for wash downs (reclaimed preferred if available). Minimum hose bib size to be provided is 1-inch. Water to be metered and a reduced pressure backflow preventer provided.

4. Diesel fueled emergency generators and appropriately sized automatic transfer switches shall generally be provided at lift stations where pump capacity exceeds 500 gpm. Determination of generator requirement shall be on a case-by-case evaluation and shall consider the nature of the facility(s) served, remoteness of site, electric service reliability and other factors. Generators shall be provided with base-mounted, double-walled fuel tanks which shall provide a minimum of 24 hours fuel capacity at full load.

5. Where available, fiber optic line(s) from the RCID fiber optic network shall be installed to the lift station for connection of the lift station alarms to the RCID Process Control (SCADA) system. Where fiber optic lines are not available, a radio system shall be installed in its place. Details of the systems and connections will be provided by RCES.

6. Lift stations shall be located to provide adequate access for maintenance. Vehicle access driveway shall be at a lower elevation than the top of the wet well.

7. Lift stations with capacity of 1,000 gpm or less shall also meet the requirements stipulated on the RCID standard drawing and in RCID Standard Specification 02734. Lift stations with a capacity greater than 1,000 gpm shall be custom designed under the direction of Reedy Creek Energy Services.

8. Lift stations with capacity of 1,000 gpm or less shall utilize pressure transducers or float balls in the wet well for pump control and alarms. Alarms shall include high and low level. High level alarm shall bring all pumps on.

9. Lift stations greater than 1,000 gpm capacity shall utilize a combination of pressure transducer (primary) and float balls (secondary/backup) for control.

    a. A back-up high and low well alarm float shall be provided and connected to the RCID Process Control system. High level alarm float shall sequence all pumps on. The low level alarm float shall shut off all pumps.

E. Sanitary Lift Stations (con't)

10. Conduit for electrical cable from wet well to motor control panel shall be large enough to allow for easy removal and installation of the cable. Conduit shall be routed through a fiberglass termination cabinet 18"W x 20"H x 8"D. All pump motor cables and control cables shall be terminated a this point in copper terminal blocks. Standard THHN copper wire shall run from the termination cabinet to the motor control.

11. Where a flow meter is required and located in a vault, the vault shall contain a drain to the wet well and weatherproof duplex receptacle. Also provide a sump in the meter pit to allow for a sump pump to be dropped in.

12. Where a flow meter is required, provide for a flow meter bypass, unless the meter is an external strap-on type.

13. Adequate surge protection shall be provided for the flow meter power and signal lines.

14. All lift stations shall have adequate lighting for night work. Minimum of two 120 watt flood lights.