Section 576

Wastewater Force Main Systems

PART 1: General

1.1 *General Description of Work* – This section applies to all wastewater force main systems which are to be extensions to the ECUA system. All wastewater force main systems shall be designed and constructed in accordance with these standards. Wastewater force main systems include transmission mains, service lines, valves, air relief valves, and other appurtenances. Wastewater force main materials, installation, and construction methods and procedures shall be in accordance with current ECUA Specifications. Technical Specifications for wastewater transmission and service lines are included in Section 2576 of this Manual.

~~This section applies to all new developments requiring or requesting a new or modified wastewater force main system. For these new developments, a Pre-Design Meeting is required (see below) to assist in defining the appropriate point of service. ECUA reserves the right to specify the point of service, the size of service, the type of service, and the general layout of the overall system within the guidelines established in this manual.~~

~~All wastewater force main systems that are to be additions or extensions to the ECUA collection system shall be designed in accordance with these Standards (see Part 2) and constructed in accordance with technical requirements outlined in ECUA Manual Section 2576 "Wastewater Force Main Systems".~~

Force mains shall be laid to minimize the number of high points. Air release and combination vacuum /air release valves (ARV) shall be installed at all high points in force mains yet should be in the furthest downstream portion of each high point. ARVs shall be installed at locations in such a manor to minimize the potential for odor complaints. Adequate depth is to be provided for ARV structures, valves, and other appurtenances.

The Engineer shall coordinate the location of the wastewater force main system and related sewer facilities with other utilities (electric, gas, telecommunication, drainage and cable) to minimize conflicts. Facilities shall be designed such that conflicts with trees, driveways and sidewalks are minimized. Minimum 1.0' separation from other utilities at crossings, ECUA prior approval is required for anything less.

~~In general, gravity sewers are preferable to pressure sewers. However, costs and conditions often make gravity sewers not feasible. A low-pressure sewer system (small diameter force mains designed to receive wastewater flow from individual pumping systems at each point of service) shall be considered for areas with conditions not favorable for the installation and operation of conventional gravity sewage collection systems. A low-pressure sewer system shall be allowed only by special exception with approval by ECUA and with appropriate permits from the FDEP. Design shall be in accordance with the most recent edition of the "Design and Specification Guidelines for Low Pressure Sewer Systems".~~

~~1.3~~ *Pre-Design Meeting* – System extensions shall be designed to utilize gravity systems where able and avoid ~~small~~ lift stations and low pressure systems to the maximum extent practicable. A combination low pressure system with a lift station may be required in areas where manifolding into the existing force main system may create maintenance issues or facilitate growth of the

collection system through gravity sewer. A pre-design meeting can be held with ECUA Engineering personnel to discuss the utilization of the correct and most current ECUA standards and to allow ECUA the opportunity to coordinate the design with the ECUA Master Plan for Wastewater and other known proposed projects within the service area.

~~1.4 *Utility Construction Notes* – The following notes, at a minimum, shall be included on all plan submittals. Any deviation from the standards shall be requested by the Design Engineer and shall be approved, in writing, by ECUA.~~

~~All wastewater force main system work shall be constructed in accordance with the latest ECUA Design Standards, all applicable local and state regulatory rules and regulations, and other applicable ECUA rules.~~
~~All wastewater force main system construction work shall be provided by a contractor qualified as required under the current Florida Statute or by an Underground Utility Contractor, licensed under the provisions of Chapter 489 FS.~~
~~The Contractor shall be responsible for obtaining City or County Right-Of- Way (R/W) permits for work in the City R/W, County R/W or a FDOT permit for work in the FDOT R/W.~~
~~The Contractor shall contact ECUA's Field Inspector a minimum 48 hours prior to initiating the wastewater force main system work, including all utility main taps by the constructor.~~
~~The minimum horizontal and vertical separation requirements for the wastewater force main system or sewer improvements shall conform to the latest ECUA and FDEP rules. The minimum horizontal separation requirements between the proposed sewer utilities and ponds or structures shall conform to the latest ECUA Design Standards.~~
~~Typically, wastewater force main system pipes shall be constructed with a minimum of 30 inches of cover in unpaved areas and a minimum of 36 inches of cover in paved areas. The maximum cover for utilities utilizing Horizontal Directional Drill methods shall comply with the latest ECUA Design Standards.~~

~~1.11~~1.2 ~~The Contractor shall minimize service interruptions to existing ECUA customers. If ECUA approves a service interruption, then the Contractor will be responsible for coordinating the notification of impacted customers in accordance with the latest ECUA rules.~~

~~1.12~~1.3 *Calculations* – Hydraulic calculations including influent flow data, hydraulic analysis of the system, pump operating points, etc. shall be signed and sealed by a Florida registered Professional Engineer and submitted to ECUA for review and acceptance prior to construction. Hydraulic modeling may be required to demonstrate capacity within ECUA's collection system and to identify any negative impacts to the operation of ECUA lift stations.

PART 2: Standards

2.1 *U.S. Environmental Protection Agency and U.S. Public Health Service* – The governing standards of these agencies shall be followed when applicable.

2.2 *State of Florida Department of Environmental Protection* – The wastewater collection system shall conform to the applicable Florida State Department of Environmental Protection laws, policies, standards, rules, and regulation for public wastewater collection systems.

2.3 *Plumbing Codes* – The provisions of the Plumbing Code of the City of Pensacola or Escambia County as it pertains to sanitary wastewater collection, service line locations and materials, and onsite plumbing, except as provided for elsewhere in these criteria, shall apply. It is the intent of

this standard that the applicable Plumbing Code(s) apply to sewer collection infrastructure constructed beyond the public right-of-way or public utility easements.

2.4 *Recommended Standards for Wastewater Facilities* – Policies for the Design, Review, and Approval of Plans and Specifications for Wastewater Collection and Treatment Facilities; Great Lakes—Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers as adopted by the Florida Department of Environmental Protection.

2.5 *Emerald Coast Utilities Authority* – All wastewater collection systems that are to be connected to the ECUA system shall be designed and constructed in accordance with these standards. Materials, installation of materials, and construction methods and procedures shall be in accordance with the current ECUA material and installation specifications. Refer to the Technical Specifications of the ECUA Engineering Manual. All discharges into the ECUA sewer system shall meet the requirements of the ECUA Code.

PART 3: Design Parameters and Functional Criteria

~~3.1 *General* – This section provides the minimum guidelines for the design of wastewater force main systems. The method of design and/or construction shall be according to accepted engineering practices, with these Standards (see Part 2), the latest edition of the Recommended Standards for Sewage Works (Ten State Standards), and all applicable Sections of the Florida Department of Environmental Protection Rules and Regulations for Water and Sewer Systems.~~

~~3.2~~3.1 *Design Flows* –

~~3.2.1~~3.1.1 Design flows for new wastewater force main system shall be based upon Table I of the State of Florida Department of Health (FDOH), Chapter 64E-6.008 F.A.C., Standards for Onsite Sewage Treatment and Disposal Systems or other approvable method where historical data is not available.

~~3.2.2~~3.1.2 An Equivalent Dwelling Unit (EDU) is the equivalent flow that can be anticipated from one residential connection. In the ECUA system, 300 gallons per day per EDU is to be used. ~~assume 100 gallons per capita per day (gpcd) to calculate the average daily flow (ADF). To calculate the ADF from a single EDU, multiply the gpcd by 3.5.~~

~~3.2.3~~3.1.3 Sewer systems and facilities shall be designed for peak flows calculated in accordance with the Recommended Standards for Sewage Works, latest edition (Ten State Standards), and as shown below.

Peak Flow = Peaking Factor * Average Daily Flow (ADF)

Peaking Factor = $[18+\sqrt{(\frac{\text{Population}}{1000})}] / [4+\sqrt{(\frac{\text{Population}}{1000})}]$

~~3.3~~3.2 *"C" Factor* – Use the following Hazen-Williams roughness coefficients for new construction:

Hazen-Williams Roughness Coefficients	
Pipe Size / Type	**Coefficient of Roughness**
16" diameter and larger ductile iron pipe	120
Less than 16" diameter ductile iron pipe	125
PVC	130

HDPE	140

~~3.4~~3.3 *Rate of Flow* – The design shall give appropriate consideration to rate of flow as it relates to pipe sizes in the riser, force main, and receiving sewer as described below.

~~3.4.1~~3.3.1 The force main velocity at the initial pumping rate shall not be less than 2.5 feet per second (fps). The force main velocity at the design pumping rate shall preferably not be greater than 6 fps, with 8 fps maximum.

~~3.4.2~~3.3.2 The velocity in a wet well discharge riser shall not be less than 5 fps nor more than 10 fps.

~~3.4.3~~3.3.3 The capacity in the receiving sewer and downstream lift stations shall be checked for ability to accept the flows generated by the proposed lift station.

~~3.4.4~~3.3.4 When the force main will manifold into an existing force main, the impact on the receiving force main and connected lift stations shall be considered. ECUA may require hydraulic modeling of the impacted portion of the collection system.

~~3.4.5~~3.3.5 When there exists an alternative to connect a new force main to an existing lift station or to manifold with the force main exiting the existing lift station, an analysis shall be performed to determine which is best in the long-term interest of ECUA.

~~3.5~~3.4 *Optimal Size Selection* – When and where applicable, and feasible, calculate system head: static, friction, and velocity. For projects involving a lift station or pump upgrades or the manifolding of force mains, both the maximum and minimum flow and head conditions must be calculated for consideration.

~~3.5.1~~3.4.1 Force main sizing calculations may require several iterations to arrive at optimum design for sound economic selection over the proposed design period. The determination of optimum size must consider initial and future demands.

~~3.5.2~~3.4.2 Force mains shall be a minimum 4-inch diameter in the right-of-way or within ECUA easement if the main is to be dedicated. Exceptions may be granted for low pressure systems or low flow pump stations which discharge directly into a gravity sewer system.

3.5 Check Valves

3.5.1 All force mains 2-inches and larger in diameter connecting to an ECUA force main shall include a check valve and vault per Detail D-23. All check valves shall require a bypass.

3.5.2 When a new force main manifolds into an existing force main, ECUA may require check valves to be installed on the existing force main.

3.5.3 Engineer shall provide a plan and profile view on the design drawings with all surrounding utilities shown for the location of the proposed check valve vault. Engineer may be required to perform a Level “A” quality utility locate near major intersections as identified by ECUA.

3.5.4 The inside depth of the check valve vault shall not exceed 6-feet. If the inside depth of the proposed check valve is greater than 6-feet the Engineer shall coordinate with ECUA staff to determine an optimal location.

3.6 *Low Pressure Sewer Systems* – The following serves as guidelines for the design and construction of Low Pressure Sewer Systems.

3.6.1 *Number of Connections for Designated Pipe Sizes* – ~~The beginning of a low pressure sewer system (the farthest point from discharge) in a residential application should use a pipe diameter of 2 inches~~Low pressure service laterals shall connect to a force main no less than 2-inches in diameter. As more connections are made to the system the diameter of the common collection pipe may increase. It is the responsibility of the designer to size the low pressure sewer system adequately and within documented velocity limits. The table below, suggesting pipe diameters for cumulative numbers of homes connected to the system, is provided as a reference only.

Number of Connections for Designated Pipe Sizes	
Cumulative # of Service Connections*	**Pipe Diameter**
0 – ~~8~~10	2 inch
~~9~~11 – ~~82~~0	3 inch
~~82~~1 – ~~50~~220	4 inch

*low pressure sewer systems may require installation of ECUA lift station

3.6.2 Low Pressure System Connection - Low pressure sewer systems shall be designed to discharge to a gravity sewer system or ECUA lift station to the extent possible. The proposed low pressure system extension may manifold into another low pressure sewer system only with ECUA approval. Low pressure force mains may only connect to existing force mains with a pressures less than 30 psi when the force main is in use.

3.6.3 Transmission Force Main Connection – Residential low pressure sewer systems may not be connected to ECUA's high pressure transmission force mains. If it is determined that the ECUA force main is not available for low pressure sewer connection, then an ECUA gravity system with an ECUA lift station shall be required to serve the new development.

~~3.6.2~~3.6.4 *Low Pressure Service Laterals* - Pipe from a single grinder pump or other low pressure sewer system to be connected to an ECUA force main shall be 1.5 inches in diameter from the right-of-way to the main (see Detail D-20) unless otherwise approved by ECUA. ~~All residential~~ Low pressure sewer service lateral connections ~~s~~ shall not be located ~~in the center of the property line nearest to the collection system~~under the roadway, driveway, or hardscaping without approval from ECUA. Costs to relocate service connections and abandon existing connections shall be at the property owners expense.

~~3.6.3~~ *Flushing Stations* – Flushing stations are to be sized and constructed as per Detail D-22 – "Low Pressure Flushing Connections". Inline Flushing Connections shall be installed approximately 20 feet upstream of significant bends (45° & 90°), upstream of changes in line size and generally at 1,000 foot spacing along the force main. Flushing Stations shall be installed in vicinity to side property lines to minimize impact from construction of future driveways, drainage features, etc.