SECTION 570

DESIGN STANDARDS SANITARY/GRAVITY WASTEWATER COLLECTION SYSTEM

PART 1: GENERAL

1.1 General Description of Work

A. The following minimum requirements are considered acceptable to the ECUA in the design of collection systems for wastewater from domestic and commercial customers.

Deviations from these standards may be allowed by ECUA only upon a finding by the ECUA that, in accordance with sound engineering standards, the granting of the deviation will not work to increase the likelihood of a system problem. No deviation will be allowed unless it is approved in writing by ECUA and is clearly noted on the approved construction plans.

B. All expansion shall conform to the "Master Plan for Wastewater" as maintained and amended by the ECUA.

C. When these standards differ from state and/or federal requirements, the more stringent requirement shall apply.

D. The collection system for wastewater includes the gravity mains, manholes, customer service pipes, lift stations, force mains, and other appurtenances. The system should be designed to provide for the collection of wastewater from the customer and for its safe and economical transport TO ECUA's Wastewater Reclamation Facilities.

PART 2: STANDARDS

2.1 U.S. Environmental Protection Agency and U.S. Public Health Service

The governing standards of these agencies will 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, and rules and regulations 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 on-site plumbing , except as provided for elsewhere in these criteria, shall apply.

2.4 Escambia County Utilities Authority

All wastewater collection systems that are to become a part of 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 Section 2570 of 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 STANDARDS FOR SANITARY COLLECTION SYSTEMS

3.1 Flow Requirements

In sizing the collection system gravity mains, the required design flow shall be the sum of the required sanitary flow as contained below, plus an allowance for infiltration and inflow.

A. Required Sanitary Flow (Residential)

Required average daily flow for sanitary use in residential areas shall be based on 350 gallons per day per unit (100 gpcpd x 3.5 persons) or as approved by the ECUA.

B. Required Sanitary Flow (Nonresidential)

The required flow for commercial, industrial, or other nonresidential areas shall be as determined by the Engineer and approved by the ECUA for each specific instance.

C. Required Allowance for Inflow and Infiltration

The required allowance for infiltration and inflow for developed areas shall be in accordance with the following table: (based on 25 gal/inch dia./mile/day for new construction).

Pipe Diameter (Inches)	Min. Allowance I&I Flow (GPD/1000 Feet)
8	38
10	47
12	57
15	71

3.2 Future Interconnections

Provisions for future connecting mains shall be made by providing appropriate easements and/or extending construction of all wastewater mains to the exterior boundaries of the subdivision or development wherever future connections to adjacent subdivisions or lots are anticipated.

3.3 Gravity Collection Mains

Gravity mains shall be of sufficient size to carry the required flow at velocities as herein provided. Mains shall be located to provide service to each lot within a development as herein provided. All mains shall be installed only in dedicated streets, alleys, public rights-of-way or utility easements, in favor of the ECUA for the use and benefit of the ECUA.. All main locations and sizes shall be in accordance with the ECUA's current "Master Plan for Works Improvements" and the approved subdivision master development plan and utility layout.

A. Minimum and Standard Main Size

Minimum gravity main diameter shall be 8 inches in all areas. Standard sizes of gravity mains used shall have nominal diameters of 8 inches, 10 inches, 12 inches, 15 inches, 18 inches, 21 inches, 24 inches, 30 inches, and 36 inches.

B. Slopes shall be designed with a hydraulic gradient sufficient to prevent deposition of solids, by developing a minimum velocity of 2.0 feet per second as computed using Manning's formula and a "n" value of not less than .013 while flowing full. The following table establishes the minimum allowable slopes for various size pipes:

1. Minimum slope allowable shall be:

Pipe Size Inches	Minimum Slope %
8	.4
10	.28
12	.22
15	.15
18	.12
21	.10
24	.08
30	.06
36	.05

Under special conditions, if full and justifiable reasons are given, slopes slightly less than those required for the 2 feet per second (0.61 m/s) velocity when flowing full may be permitted. Such decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater for design average flow. Whenever such decreased slopes are selected the engineer must furnish with his report his computations of the depths of flow in such pipes at minimum, average, and peak rates of flow. It is recognized that such flatter grades may cause additional sewer maintenance expense and odor nuisance. The selection of the size of pipe shall be determined on the basis of the most desirable flow characteristics obtainable. The owner of the sewer system will give written assurance to the appropriate reviewing agency that any additional sewer maintenance required by reduced slopes will be provided.

2. In the case of sewers where the slope and volume are such that velocities will exceed 10 feet per second (3.0 m/s) at average flow, special provision

shall be made to protect against erosion. This protection may be secured utilizing C900 PVC, ductile iron, steel pipe or equivalent, when approved in writing by the ECUA.

a. Where velocities greater than 15 feet per second (4.6 m/s) are anticipated, special provision shall be made to protect against displacement by erosion and shock.

b. Sewers on 20 percent slopes or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

1) Not over 36 feet (11 m) center to center on grades 20 percent and up to 35 percent;

2) Not over 24 feet (7.3 m) center to center on grades 35 percent and up to 50 percent; and

3) Not over 16 feet (4.9 m) center to center on grades 50 percent and over.

3. Full advantage of suitable topography and paralleling of ground slopes shall be made. Minimum slopes should only be used when necessary, particularly with 8-inch pipe. When depth exceeds 10 feet, check pipe class for strength, and/or specify stricter bedding requirements.

4. Sewers shall be designed and laid with a uniform slope between manholes.

C. Change in pipe size shall not occur between manholes

1. Increasing Size. When a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered sufficiently to maintain the same hydraulic gradient. The crowns of pipes shall be at the same elevation within the manhole.

2. Decreasing Size. At times, due to increasing sewer slopes, a reduction in the size of the outgoing sewer from a manhole may be justified. Such a reduction shall not be permitted on sewers 24-inch in diameter or under, but may be permitted on sewers larger than 24-inch in diameter. Inverts of the pipes shall be matched in the manhole.

D. When crossing other utilities, vertical separation shall be shown.

E. There shall be a drop of .1 foot across each manhole with bends of 45° or more.

F. When crossing under existing paved streets or roads, it must be determined if open cut will be permitted. If jack and boring will be required complete details must be shown.

Extra effort should be expended to locate any possible conflict with existing utilities. Allow extra slope through bore and specify minimum and maximum allowable deviations.

G. The depth of the collector line shall be sufficient to receive flows by gravity from all buildings and lots to be served by service lines, installed in accordance with plumbing code specifications and slopes. A 30-inch minimum cover is required. Less cover may be considered with special provisions for protection of the pipe. It may be necessary to require buildings to pump into the line, by installing privately maintained lift station, the number of customers using stations should be kept at a minimum.

H. Privately maintained pump stations for individual buildings and individual commercial developments will be considered when gravity service is not feasible.

I. Alignment

1. Sewers shall be laid with straight alignment between manholes.

2. Horizontal separation at approximately same elevations as other utilities shall be maintained.

3. Sewers 48-inch and larger may be laid on a curve. Refer to pipe manufacturer for allowable curvature.
4. Bends of greater than 90° to be avoided.

J. Pipe Material: PVC pipe SDR35 will be utilized for gravity lines. C900 PVC or DI pipe will be specified where extra strength or joint integrity is required.

1. PVC pressure pipe (SDR26, 21, 18) may be considered in lieu of DI pipe for marginal demands, but care must be exercised as to availability of fittings that may be needed.

2. Pipe material will not be changed between manholes (except where additional structural protection is required).

3. Where ductile-iron pipe is to be installed, external pipe corrosion protection will be specified if soil resistivity is less than 1,000 ohms per square centimeter per centimeter. (Polyethylene sleeves or an anticorrosion embedment as directed by the ECUA.) Internal piper corrosion protection shall be provided by proven Hydrogen Sulfide and abrasion resistant coatings. Fused Epoxy coating is recommended, others shall be approved by ECUA Engineering Department.

K. Cover

1. A minimum cover of 30 inches must be provided where conditions permit.

2. At road crossings, a minimum separation distance of 24 inches shall be maintained from the bottom of the roadway base to the top of the pipe or the top of the casing when provided.

3. At buried stream crossings, a minimum cover of 36 inches is required.

L. Crossings

1. Major road crossings shall be encased per Section 2224 of Standard Specifications or made using ductile iron pipe. Additional requirements of the regulatory agency responsible for the road shall be met.

2. Buried stream crossing shall be encased in steel casing or made with ductile iron pipe. This protection shall extend 10 feet beyond the bank and the pipe or casing shall be anchored to prevent shifting.

3. Aerial stream crossing shall be encased in steel casing or made with ductile iron pipe. This protection shall extend until 30 inches of cover is provided.

4. When crossing under pipes, conduits, or other structures greater than 24 inches in diameter, and a 6-inch separation distance cannot be maintained, the pipe shall be encased in steel casing or made with ductile iron pipe for a minimum of 5 feet distance on either side of the crossed pipe.

M. Manholes: Shall be installed at the end of each sewer line, at all junctions, at all changes in grade, size or alignment; with the following added considerations

1. Maximum spacing shall be 400 feet up to and including 36-inch pipe, controlled by available ECUA cleaning equipment. Spacing for pipes larger than 36-inch may be increased up to, but not to exceed 1,000 feet, controlled by cleaning requirement.

2. Lamp hole may be substituted at ends of short lines, not to exceed 150 feet in length. Lamp holes shall not be used on any gravity sewer line larger than 8 inches in diameter.

3. A drop manhole shall be provided when a sewer invert enters a manhole at an elevation of 2 feet or more above the manhole invert. Where the difference in elevation is less than 2 feet, the invert shall be formed to a half-round concrete channel of equivalent diameter of the outlet pipe to prevent solids deposition. Drop manholes shall use an outside drop connection, except inside drops may be approved for building services and laterals. Inside drops shall be securely fastened to the interior wall of the manhole with stainless steel clamps or pipe hangers. Inside drops shall be extended to the invert of the manhole on a 45° bend installed to direct flow correctly. The drop shall be installed so it does not block manhole access or inhibit maintenance.

4. The inside diameter of manholes shall be a minimum of 48 inches up to and including 24-inch pipe. For pipe larger 24 inches, the inside diameter of the manhole shall be increased so as to provide at least a 12-inch shelf on each side of the pipe.

5. Manholes shall be precast reinforced concrete unless special conditions would dictate a cast in place or other type.

6. The manhole flow channel should be constructed in the field to ensure a smooth flow line from all incoming lines to the outgoing. All channels must provide a smooth transition to the outgoing line with the maximum possible radius on all curves. Precast manhole channels or inverts may be approved, but only if they meet the above requirements. Channels shall have the equivalent diameter of the manhole effluent pipe.

7. Manholes shall be ventilated if the manhole is a receiving manhole for a force main, downstream of such a receiving manhole, is expected to experience conditions of turbulence, or has a drop main or lateral entering it. Ventilation may be required by the ECUA Engineering Department as conditions dictate. Ventilation methods shall be approved by the ECUA Engineering Department in writing before installed.

N. Inverted Siphons

Inverted siphons shall be avoided whenever possible. However, if used, inverted siphons shall have not less than 2 barrels, with a minimum pipe size of 6 inches and shall be provided with necessary appurtenances for convenient flushing and maintenance. The manholes shall have adequate clearance for rodding and in general, sufficient head shall be provided and pipe sizes selected to secure velocities of at least 3.0 feet per second for average flows. The inlet and outlet details shall be arranged so that the normal flow is diverted to one barrel, and so that either barrel may be cut out of service for cleaning.

3.4 Wastewater Services

A. Service Lines

Service lines shall be provided to all lots within a subdivision in accordance with the ECUA regulations. Customer service connections to industrial or commercial lots may be omitted provided approval of the ECUA is obtained prior to approval of plans and specifications.

B. Flow Measurement

The ECUA may require the flow measuring devices where flows in excess of 50,000 gpd can be expected. This includes apartment complexes, trailer parks, shopping centers, etc. The ECUA must approve method and location of flow measurements. Acceptable methods will include pre-approved open channel flow devices with meter/totalizer, pipe meters and hour meters on private lift stations.

C. Cleanouts

When a service line is excessively long, a cleanout shall be provided at the property line for all 4-inch and 6-inch laterals.