

SECTION 1

DESIGN CRITERIA

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PART 1 GENERAL

1.1. Pipeline Separation Requirements

Potable water pipelines shall be separated from wastewater lines and /or stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of 10 feet. The 18 inches minimum vertical separation distance does not apply to separations of sewer laterals and potable water pipeline installations. 57 stone shall be utilized for separation between wastewater lines and stormwater lines if separation is less than 18 inches.

Non-potable irrigation water pipelines two inches and larger shall be separated from potable water mains, wastewater lines and/or stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of five feet as shown in the Utilities Detail Drawings.

Wastewater lines shall be separated from stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of five feet. All pipeline crossings with vertical clearance less than 18 inches shall be made using a full 20 foot length of thickness Class 200 AWWA C900 PVC pipe or Class 235 AWWA C905 PVC pipe, centered on the crossing. The sewer pipe in these locations shall be back-filled with bedding stone or sand to a height six inches above the crown of the pipe.

Potable water, non-potable irrigation water, and wastewater pipelines shall be separated from telephone, power, cable and gas sleeves/lines and any other underground utilities by a minimum clear vertical distance of 18 inches and horizontal distance of five feet.

Potable water, non-potable irrigation water, and wastewater lines shall be separated from raw water mains by a clear vertical distance of 18 inches and a horizontal distance of 10 feet. Stormwater lines shall be separated from raw water mains by a clear vertical distance of 18 inches and a horizontal distance of five feet.

Wastewater lines shall be separated from public drinking water supply wells by a horizontal distance of 100 feet. Wastewater lines shall be separated from private drinking water supply wells by a horizontal distance of 75 feet.

Also see separation requirements in Section 020500, 1.3.F.

Potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a minimum setback of five feet from the centerline of the pipe to residential roadways, curb and gutters, structures, fence posts, walls, or plantings not specifically allowed by ordinance. Also, potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a minimum setback of 10 feet from the centerline of the pipe to a building and shall not be placed beneath any existing or proposed building or structure. Additionally, potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a five-foot minimum setback from the center line of pipe to the edge of a right of way (ROW) or County utility easement (CUE), unless there is an adjacent CUE.

1.2. Horizontal Directional Drilling

When horizontal directional drilling is used on any capital improvement project for the Public Utilities Department, detailed construction drawings shall be prepared by a Licensed

Professional Engineer registered in the State of Florida which, at a minimum, show the following information:

1. The proposed entry and exit point of the drill
2. The overall geometry of the drill include entry and exit angles, minimum and maximum bending radii, and the horizontal and vertical path of the drill
3. The minimum and maximum depth of the drill
4. Minimum separation distances between adjacent pipes, structures, watercourses, etc.
5. The estimated pull back force required for the drill

The design Engineer shall calculate the estimated pull back force required for the directional drill and ensure that it does not exceed the maximum allowable safe pull back forces as defined by the Plastic Pipe Institute's (PPI) Handbook for Polyethylene Pipe, Chapter 12 – Horizontal Directional Drilling.

		Safe Pull Back Force, lbs.	
Size	Nom. OD	DR 9	DR 11
4	4.800	8,217	6,876
6	6.900	16,980	14,208
8	9.050	29,210	24,442
10	11.100	43,942	36,770
12	13.200	62,141	51,998
14	15.300	83,486	69,859
16	17.400	107,977	90,353
18	19.500	135,613	113,478
20	21.600	166,395	139,235
24	25.800	237,395	198,647
30	32.000	365,201	305,592
36	38.300	N.A.	437,764

Source: Table 6, "PE4xxx 12 hour Pull DIPS Size", *Handbook for Polyethylene Pipe, Second Edition*, Plastic Pipe Institute

PART 2 POTABLE WATER AND NON-POTABLE IRRIGATION WATER SYSTEMS

All potable water, non-potable irrigation (including reclaimed or reuse) water and raw water pipe, material, equipment and appurtenances shall be new, and shall conform to Section 2, Technical Specifications and Section 3, Utilities Detail Drawings.

All material and equipment designed or used in connection with a potable (drinking) water system shall conform to the requirements of the National Sanitation Foundation (NSF) Standard 61, "Drinking Water System Components – Health Effects" and the Reduction of Lead in Drinking Water Act amending the Safe Drinking Water Act.

2.1 Pipe and Fitting Material

All potable water or non-potable irrigation water pipelines shall be constructed of ductile iron, HDPE, or PVC pipe, and shall utilize pipe meeting the requirements of the Technical Specifications. HDPE shall not be used for pipelines with service connections.

All pipe and pipe fittings shall contain no lead pursuant to the Reduction in Lead in Drinking Water Act. All pipe and pipe fittings installed shall be color coded or marked in accordance with F.A.C. 62-555.320(21)(b)3.

Potable water pipelines shall be blue in color. Raw water pipelines shall be white in color. Non-potable irrigation, reclaimed, and reuse water pipelines shall be pantone purple in color.

All Ductile Iron buried water main pipelines shall have blue stripes applied to the pipe wall. If tape or paint is used to stripe pipe during installation, the tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and that is located along the top of the pipe.

All buried water pipelines and mains, except those installed by horizontal directional drilling or jack-and-bore methods, shall be marked using metalized warning tape for HDPE and PVC pipe and non-magnetic for ductile iron pipe. The locator tape shall be placed in the pipe trench two feet below grade or one-half the pipe's bury, whichever is less, and labeled "potable water" or "non-potable water" as applicable. Horizontal directional drilling shall include installation of at least two locating tone wires as described in the Technical Specifications.

All water main aerial crossings shall be Pressure Class 350 flanged ductile iron pipe and shall be coated on the exterior using a suitable grade of appropriately colored, field applied (or factory applied with field touch-up as required) epoxy coating. Potable water mains shall be painted Federal Safety Blue. Raw water mains shall be painted white. Non-potable irrigation, reclaimed, and reuse water mains shall be painted Pantone Purple 522C. Specific colors shall be subject to approval of the County Manager or designee. All nuts and bolts used in aerial crossings shall be stainless steel. All canal, river, or creek crossings shall be aerial, unless otherwise approved by the County Manager or designee. Aerial crossings shall be designed to incorporate valves or other flow regulation devices in accordance with F.A.C. 62-555.320(21)(b). Aerial crossings shall be designed to maintain existing or required navigational capabilities within the waterway and to reserve riparian rights of adjacent property Owners. Submit aerial pipe and flange computations, including support and anchor design, for review. The submittal must be signed and sealed by a Florida registered Licensed Professional Engineer.

2.2 Design of Pipeline Size and Location

2.2.1 Water Pipeline Sizing Criteria

All potable water mains to be maintained by the COUNTY shall be a minimum of six inches in diameter. Hydraulic calculations shall show the capability of maintaining required fire flow (according to NFPA 1) plus potable demand as required below.

Water systems shall be designed to maintain adequate flows and pressures and water quality standards as established by Florida Department of Environmental Protection (FDEP). The following criteria shall be used to design water systems and analyze model chloramine dissipation:

- A. Minimum residual node pressure within a proposed project system shall be 20 psi under peak hour with fire flow conditions, assuming a source pressure verified by the results of a fire flow test not older than six months. The design source pressure shall be calculated as follows: $P_d = P_s - (P_s - P_r) (D / Q)^{1.85}$, where P_d is the design source pressure (i.e. theoretical residual pressure for the design demand), P_s is the static pressure from the fire flow test, P_r is the residual pressure from the fire flow test, D is the design demand (i.e. peak hour demand plus required fire flow), and Q is the flow rate from the fire flow test.
- B. The design Engineer shall model the proposed system, including all dead ends, for chloramine dissipation and assume a chloramine residual of 2.0 ppm at the entrance point to the project.
- C. When estimating potable water demands multiply the estimated wastewater flows from Part 3 Wastewater Collection and Transmission Systems by 1.4.
- D. The standard chloramine decay rate is - 0.012 ppm per hour. Using the decay rate and solving for the elapsed time from the initial chloramine level to the minimum chloramine level residual of 0.6 ppm in the following: $0.6 \text{ ppm} = 2.0 \text{ ppm} \times e^{(-0.012 \text{ ppm} \times \text{\#hours})} \Rightarrow \text{time} = 100.33 \text{ hours}$.

The Project Engineer shall submit an analysis to the Growth Management Department as part of the review package, certifying that all points within the proposed system shall maintain a minimum level of 0.6 ppm chloramine residual under the conditions listed above.

Systems unable to meet minimum design requirements or maintain minimum chloramine residual levels shall not be eligible for ownership and maintenance by the COUNTY.

Water mains not designed to carry fire flows shall not have fire hydrants connected to them.

2.2.2 Distribution System Layout

Potable and non-potable irrigation water pipelines and fittings, except for service piping, shall have a minimum depth of 30 inches and a maximum depth of 48 inches below finished grade.

Water distribution systems shall be designed so that all systems are located adjacent to, and are accessible from, paved or unpaved roadways so as to allow access for short and long term maintenance, repair, and/or replacement of such system.

New potable water distribution systems shall be designed as “looped” systems to avoid dead ends. A “looped” system should have two independent connections off the source main (unless served by a master meter). If two independent connections aren’t possible, a stub out for future development in a location agreed to by the County shall be provided in an easement or ROW to the limits of the project. In cases where no nearby water main is available for looping, a County approved automatic flushing device (AFD) shall be provided at each dead end of a water main. An AFD shall also be provided near the mid-point of a looped water main unless the design engineer can provide information to confirm that the minimum residual chlorine will be maintained based on the predicted water consumption at the time of County acceptance of the water main. At no time shall a dead end serve more than 149 residential units. On dead end water mains that do not have service connections, no automatic flushing devices are required.

Installation of the automatic flushing devices shall be designed so as to prevent erosion of nearby areas as well as prevent silt and sediment transport.

All commercial facilities must be metered separately from residential facilities with the exception of those commercial facilities that are within a master metered residential development and designed for the exclusive use of the residents within such development. Master meters and backflow assemblies shall be located within a County Utility Easement (CUE), which shall be located outside of, but contiguous to, the road Right-Of-Way (ROW).

Deviations from these design parameters shall only be approved in cases where such installations can be shown to be necessary in order to comply with minimum chlorine residuals or other FDEP quality parameters, unless otherwise approved by the County Manager or designee. In such cases, the water main shall be located within a separate tract of land or CUE dedicated to the Water-Sewer District. Such tracts shall be delineated with fencing, landscaping, signage, pavement, or other methods determined to be acceptable to the Water-Sewer District. All such installations shall require approval from the Water-Sewer District. In addition, an agreement shall be provided authorizing the COUNTY to traverse all private property outside of the CUE for the purpose of access, maintenance, repair, and/or replacement of such main. The agreement shall also hold the COUNTY harmless for any damage to the private property resulting from the COUNTY’s maintenance, repair and/or replacement activities within or outside of the CUE.

The encasement of potable water mains in concrete shall only be made after review and approval by the County Manager or designee.

2.2.3 Valve Locations

Valves shall be provided at all intersections and branches in sufficient numbers as to allow for zone isolation of distribution areas in order to limit impacts of line breaks and service disruptions to customers. In-line gate valves shall be provided in accordance with AWWA requirements and at no greater than 1,000 foot intervals when no other valves exist within internal distribution systems. All gate valves 20 inches and smaller shall be of the resilient-seated wedge type, conforming to AWWA C509 or C515, or latest revisions thereof. All gate valves or plug valves 30 inches or larger shall have a concrete slab placed under the valve to help distribute the total weight of the valve and reduce line sagging. See Technical Specifications 331200 2.3.A.2. All valves shall be furnished with valve boxes extending to finished grade as shown in the Utilities Detail Drawings (G-7).

2.3 Conflict Crossings

All storm sewer, non-potable irrigation water mains, and wastewater transmission system conflicts with water systems or portion(s) thereof that must be crossed shall be performed using AWWA C900 Class 200 or C905 Class 235 PVC with ductile iron fittings. All fittings shall be adequately restrained using retainer glands, stainless steel rods, or see County Approved Product List, Appendix F. Transitional fittings, when approved by the County Manager or designee, shall be located as close to the point of conflict as possible. Air release assemblies shall be provided as specified in Subsection 2.7 herein, below. Gradual deflection of the water line in lieu of using fittings to clear the conflict shall not be permitted if cover exceeds five feet. A minimum vertical clearance of 18 inches shall be provided between the water main and bottom of conflict. A deviation form will not be required for separation of sewer laterals and potable water pipeline. Maximum depth of 48 inches below final grade is exempt when dipping under conflicts in which case the water main shall be returned to normal depth within 10 feet on either side of the conflict or as soon as possible using a fitting of 45 degrees or less.

2.3.1 Subaqueous Canal Crossings

Potable and non-potable subaqueous crossings shall be designed to a minimum depth of 36 inches below the design or actual bottom, whichever is deeper, of a canal and other dredged waterway or the natural bottom of streams, rivers, estuaries, bays, and other natural water bodies. If not practical to design the project with a minimum 36 inch cover, alternative construction features must be installed to ensure adequate protection of the pipeline.

All subaqueous crossings must be introduced/discussed at a plan Pre-Submittal Conference. It is important that representatives from the Water Department or Wastewater Department and GMD be present for approval at the plan Pre-Submittal Conference.

A permanent easement is needed when there is no room available in the ROW.

When crossing watercourses, the following shall be provided:

- A. The pipe shall be of special construction (HDPE), having welded (butt fusion) watertight joints;
- B. Valves shall be provided at both ends of the subaqueous crossing for isolation, testing, or repair of the line. The valves shall be easily accessible and not subject to flooding. The valve closest to the supply source shall be in a below grade vault as per FDEP requirements and constructed to meet FDOT standards. All welding shall be done above ground. Water, reclaimed water, and wastewater lines shall have two air release valves between the two valves;
- C. Permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter to determine leakage and for sampling purposes. The taps will allow for a three quarter inch meter to be attached;
- D. The HDPE pipe shall be encased in HDPE DR11 casing;
- E. Pressure test according to Section 022501;
- F. Conform to HDPE Specifications, Section 330502.

Warning signs shall be placed along the banks of canals, streams, and rivers clearly identifying the nature and location of subaqueous crossings. The signs shall state the type of pipeline and the depth of pipeline below design or natural bottom of the water body. Warning sign shall be aluminum and have minimum dimensions of four feet wide by two feet high with a minimum of two inch lettering.

2.4 Fire Service Systems

All private fire service systems for sprinkler systems, wet standpipe systems, and privately-owned or controlled distribution systems shall be installed with an appropriate back flow prevention device with a leak detection meter. The backflow device shall be sized by the Developer's Engineer and shall be purchased, owned and maintained by the private service owner. The COUNTY requires all privately-owned backflow devices to be certified at the time of installation and on an annual basis by a Certified Backflow Tester (University of Florida, TREEO Center, or equivalent certification program). The results shall be submitted to the County Manager or designee. The County Manager or designee will require all privately owned metering devices to be certified for accuracy at the time of installation. Fire meter devices using a three quarter to two inch metering device shall be re-calibrated to manufacturer's specifications every five years, replaced every 10 years, or replaced immediately upon meter failure. Fire meter devices greater than two inches shall be re-calibrated to manufacturer's specifications every five years and replaced immediately upon meter failure. The County Manager or designee will inform the owner by mail prior to the due date. Private owner(s) shall submit certification results to the County Manager or designee within 60 days of the due date.

2.4.1 Fire Service Meters for Residential Systems

Residential projects such as, but not limited to, single family, multi-family condominiums, trailer parks, mobile home parks, etc. utilizing a master meter shall pass all fire flow through such meter. The meter shall be sized to pass the domestic coincident draft plus rated fire flow at the AWWA pressure loss specifications.

2.4.2 Fire Service Meters for Commercial and Other Non-residential Systems

Commercial projects such as, but not limited to, shopping centers, malls, retail, and industrial buildings shall pass all fire flow through a potable master meter or have a separate fire service connection to the water distribution main. The Fire Service meter and isolation valves shall be extended above final grade as shown in the Utilities Detail Drawings. For meter reading purposes, metering devices shall lie within a County Utility Easement (CUE) that shall be dedicated separately to the Board for the appropriate Water-Sewer District or in conjunction with the easements for any on-site utility system(s).

The Owner shall purchase and install an approved backflow device with a leak detection meter at no expense to the Water-Sewer District.

2.5 Connections to Collier County Facilities

Connections to existing COUNTY water mains shall be constructed as described in Section 2, Technical Specifications and shown in Section 3, Utilities Detail Drawings. These details shall apply to all connections to existing systems including, but not limited to, hot taps and extensions from existing dead end systems. A section of pipe shall be inserted into the gap to connect the

new construction to the existing systems for the purpose of accomplishing line flushing. Immediately upon completion of the flush, the connection shall be removed. A jumper shall be installed (see detail W-4) until final connection is authorized by the County Manager or designee and approved by the FDEP at the completion of construction and after satisfactory completion of all test procedures and bacterial clearance of the new water system or portion(s) thereof.

Steam condensate, cooling water from engine jackets, or water used in conjunction with heat exchangers shall not be returned to potable water mains.

2.6 Water Services

2.6.1 Service Pipelines

All building lots and parcels of land within a development shall be provided with a means for potable water service and non-potable irrigation water service by the developer. Accessibility to lands on the opposite side of a roadway shall be provided by the installation of water service conduits. Conduits shall be a minimum of four inch diameter PVC, with a minimum cover of 24 inches. Such pipelines shall extend at least five feet past the edge-of-pavement or back of curb where provided and shall run from lot corners on one side of the street to a lot corner on the opposite side and shall be capped and marked with an electronic marker (see County Approved Product List, Appendix F). Service pipelines shall be polyethylene of a minimum of one-and-one-half inches in diameter. Service pipelines under pavement shall be in conduits in all scenarios for County owned services.

2.6.2 Water Meters

Water meters shall be properly sized, based on the total calculated service demand for water, according to the Collier County Water Meter Sizing Form (Appendix B). The properly sized water meter shall be installed according to specifications and standards. Any deviation from the determined meter size shall require an approved Deviation Request.

All water meters larger than two inches shall be installed above ground. These meters shall be equipped with a backflow preventer and installed by the Contractor at his expense. The type of backflow device utilized shall be on the Water Department's list of Approved Backflow Devices (Appendix G).

All large potable meters shall be purchased by the owner and installed by the Developer's Contractor. The systems' master meter assemblies shall be built in accordance with the current design details shown in the Utilities Detail Drawings. Alternate designs may be permitted upon submission of design details for review and approval. The location of all meters (potable and non-potable) shall be clearly shown on the construction plans.

All potable water and/or non-potable irrigation water meters shall be equipped to accept the COUNTY's Automatic Meter Reading (AMR) units shown on the Utilities Detail Drawings. Two inch and smaller meter units will be installed by the COUNTY. On meters three inches and larger, contact the Water Distribution office to determine the necessary AMR equipment for the meters. All meters shall be turned over to the technician performing the full bore flush prior to the acceptance of the meter.

Temporary meters may be applied for by phoning the Water Distribution office between 7:30 a.m. and 4:00 p.m., Monday through Friday, under the conditions provided by the ordinance.

Temporary meters shall be installed for the purpose of supplying construction water to meet the COUNTY requirement for new water line construction as listed below and require a minimum of 48 hours advance notice. All backflow devices shall be reduced pressure type and shall be certified as required by the ordinance, provided by the Contractor, and be of an approved type.

Temporary meters shall be installed as shown in the Utilities Detail Drawings.

2.7 Air Release Assemblies

Air release assemblies shall be installed at all high points on all County owned mains where air will not be released through service lines, and on both sides of conflict crossings (unless it can be demonstrated by hydraulic analysis that air pockets will not accumulate at individual high points). In cases where reversal of flow is not expected, the air release assembly shall be provided at high points and on the upstream side of conflict crossings. A high point is defined by the hydraulic gradient and is considered the upper end of any pipe segment that slopes up to the hydraulic gradient or runs parallel to it. The design engineer shall review and apply the pertinent provisions of AWWA-C512 and AWWA Manual of Water Supply Practices M51, "Air-Release, Air Vacuum, and Combination Air Valves". Air valves shall be suitable for use with potable water or non-potable irrigation water. For all water or non-potable irrigation water mains 14 inches and smaller, see the County Approved Product List, Appendix F. For potable water or non-potable irrigation water mains 16 inches and greater, the design engineer shall be responsible for air valve selection and sizing. An isolating valve shall be provided below the air valve to allow removal of the valve assembly. All air release assemblies shall be installed as shown in the Utilities Detail Drawings.

2.8 Concrete Collars

All gate valve boxes, air release assemblies, and permanent sample points outside paved surfaces shall be provided with a concrete collar set to finish grade. Such collar(s) shall have a minimum thickness of six inches and the outside dimension of the pad shall be as shown in the Utilities Detail Drawings. Concrete shall have minimum compression strength of 3000 psi at 28 days.

2.9 Testing and Clearance Procedures

All water systems or portion(s) thereof shall be subjected to pressure testing and disinfection conforming to the AWWA Standards C600, C602, C605, and C606, or latest revision(s) thereof.

Under no circumstances shall any person other than an authorized COUNTY Water Department employee operate valves, make service taps or otherwise tamper with COUNTY Distribution system or portion(s) thereof. Failure to comply with these requirements will place such individual in jeopardy of legal action by the COUNTY pursuant to US Code, COUNTY Ordinances and/or Resolutions in effect at the time of the violation.

2.9.1 Pigging

All lines larger than 12 inches in diameter shall be pigged with a new pig to clear debris prior to flushing. Refer to specifications section 025400, 3.1.

2.9.2 Flushing

Full-bore flushing shall be coordinated with COUNTY Water Distribution personnel and shall require 48-hour notice to Water Distribution prior to performance. During flushing the Contractor will be permitted to install a spool piece to close the gap as shown in the Utilities Detail Drawings. Upon completion of such flushing, connection to the COUNTY's systems or portion(s) thereof shall be returned to the configuration shown in the Utilities Detail Drawings. Refer to specifications section 025400, 3.1.

2.9.3 Line Filling

Lines under construction shall be filled utilizing water supplied by the temporary meter and such filling shall be performed by the Contractor in accordance with required procedures including those outlined herein below.

2.9.4 Chlorination

Line chlorination shall be performed utilizing water supplied by the temporary meter for the purpose of chlorinating newly constructed potable water lines. Such procedure shall be performed by the Contractor, and shall require 48-hour notice to Water Distribution prior to performance.

2.9.5 Post-Chlorination Flushes

The Contractor using the temporary construction meter shall perform Post Chlorination Flushes. All chlorine injected into the system for disinfection shall be flushed from the system at least 24 hours prior to collection of Bacteriological Samples.

The initial flush volume equal to the volume of water main being flushed shall be captured and properly disposed of, such that no chlorinated water enters into a storm water system and/or is discharged to the ground; all regulatory requirements for the protection of the environment shall be met.

2.9.6 Bacteriological Samples

Bacteriological sample collection shall be performed utilizing water supplied by the temporary meter in order to supply pressure during sample collection of newly constructed potable water lines. Such procedure shall require 48-hour notice to Water Distribution prior to performance. These procedures shall be performed on Monday through Thursday, excluding holidays, unless otherwise directed by the County Manager or designee.

2.10 Laboratory Testing and Sample Collection

All new potable and raw water systems shall be subject to bacteriological sample collection and testing. Sample collection and laboratory analyses shall be performed by COUNTY certified laboratory technicians only. The Contractor or his agent shall provide the equipment required in Section 2, Technical Specifications, to supply a continuous sample at the points indicated on the engineer's construction drawings. Sample points having a one day total of 200 non-coliform bacteria or greater shall be considered as failed samples. Samples containing one coliform bacteria or greater shall be considered as a failed sample. All potable water piping up to and including 8-inches in diameter shall pass bacteriological tests within sixty (60) days of being

placed in service. All potable water piping greater than 8-inches shall pass bacteriological tests within forty-five (45) days of being placed in service.

Sample collection and sample laboratory analyses costs shall be borne by the developer. For Utilities Capital Projects that are run by the COUNTY for the COUNTY, one set of tests (including water costs) are provided by the COUNTY free of charge and the contractor shall pay for any additional tests.

PART 3 WASTEWATER COLLECTION AND TRANSMISSION SYSTEMS

All wastewater pipe, material, equipment and appurtenances shall be new, and shall conform to Section 2, Technical Specifications and Section 3, Utilities Detail Drawings.

Wastewater systems shall be designed to maintain adequate flows and standards as established by Florida Department of Environmental Protection (FDEP), using the equivalent residential connection (ERC) value of 250 gallons per day per residential unit (broken down to 100 gallons per day per person and 2.5 people per household) and F.A.C. 64E-6.008 for non-residential. The peak hour factor shall be determined using the equation:

$$\frac{(18+\sqrt{\text{population in thousands}})}{(4+\sqrt{\text{population in thousands}})}$$

Populations for non-residential units shall be derived using the estimated average daily flows calculated using Table 1 in Rule 64E-6.008 of the Florida Administrative Code, divided by the average daily flow per capita of 100 gallons.

All wastewater projects shall be designed to preclude the deliberate introduction of storm water, surface water, groundwater, roof runoff, subsurface drainage, swimming pool drainage, air conditioning system condensate water, non-contact cooling water, and sources of uncontaminated wastewater as specified in F.A.C. Chapter 62-610 and comply with Ordinance 2012-13 "Collier County Industrial Pretreatment Ordinance."

3.1 Gravity Sewer Systems

3.1.1 Pipe and Fitting Materials

Gravity sewer pipe and materials shall conform to Technical Specifications for polyvinyl chloride (PVC) pipe and fittings. All pipelines shall be green in color.

3.1.2 Design of Pipeline Size, Depth and Location

All gravity sewer mains constructed shall be a minimum of eight inches in diameter. The minimum depth of cover over all gravity sewers shall be 36 inches. All gravity sewer designs shall consider buoyancy of sewers, and appropriate construction techniques to prevent floatation of the pipe where high groundwater conditions are anticipated.

All gravity mains eight inches or larger are allowed to be core bored into existing manholes. The manhole must be restored as per Section 333913. An inspector from the Wastewater Collections Department must be present during manhole restoration.

Hydraulic Design Requirements - All gravity sewers shall be designed to give mean velocities, when flowing full or half-full of not less than two feet per second, based on Manning's formula. When calculating full-flow velocity, use a Manning's Roughness Coefficient of $n=0.013$. Design wastewater system with uniform slope between manholes. The following are the minimum allowable design slopes that may be provided for each pipe size listed:

Minimum Slope in Feet per One Hundred Feet (ft/100’):

Sewer Size	Slope (ft/100 ft)	Sewer Size	Slope (ft/100 ft)
8 inch	0.40	18 inch	0.12
10 inch	0.28	21 inch	0.10
12 inch	0.22	24 inch	0.08
15 inch	0.15		

Special attention shall be given to gravity lines that receive flows from wastewater transmission or re-pumping facilities. Due care shall be taken in these cases to ensure that no surcharge conditions occur downstream due to excessive flow rates. Under no conditions shall pipe of a diameter larger than that necessary for proper hydraulic design as determined by the COUNTY Growth Management Division or Public Utilities Engineering and Project Management Department be permitted for use on any project.

All sewers shall be designed to prevent superimposed loads.

3.1.3 Gravity Sewer Main Extension Stubs

All main-line extension stubs to future developments and/or parcels shall terminate in a stub-out if it is part of a phased project. The stub-out shall end with a bell or manhole.

3.1.4 Gravity Sewer Laterals

Laterals shall be extended to the property line or easement limit for all installations.

Laterals shall be a minimum of six inches in diameter. Lateral shall have a minimum depth of 30 inches and a maximum depth of 48 inches below finished grade. In locations where a minimum depth of 30 inches cannot be provided, laterals shall be C900, DR 14 PVC pipe. At no time shall the depth of a lateral be less than 24 inches. At no time shall a lateral be core bored into manholes. Upon installation, all lateral ends shall be plugged. A cleanout shall be provided at the end of each lateral prior to the end plug and a maximum of every 75 feet. Intermediate cleanouts shall be located on the back side of the curb or gutter (where available). Typical lateral and cleanout standards are shown in the Utilities Detail Drawings. The cleanout riser and cap shall be set 24 inches above finished grade. All COUNTY-owned sewer cleanouts shall be provided with an electronic marker and concrete collar as shown in Utilities Detail Drawings(see County Approved Product List, Appendix F). Electronic markers shall be placed 24 inches below final grade at the cleanout, for COUNTY inspector to see during final plumbing tie-in inspection. At no time shall the connection to the lateral be made to the cleanout riser or any part of the vertical assembly. Either a single six inch diameter or larger lateral to each property or a single six inch or larger lateral with a double wye shall be provided.

3.1.5 Manholes

Precast concrete manholes shall be installed at the end of each wastewater main, at all changes in grade, size, or horizontal alignment, and at all main pipe intersections, shall be spaced at distances not greater than 400 feet and shall be placed in pavement or equivalently stabilized surface (or future pavement). For sanitary sewers with a diameter greater than 15 inches, the maximum distance between manholes is 450 feet. All gravity collection mains shall terminate in a precast concrete manhole.

Minimum inside diameter of all manholes shall be four feet. The angle between the inlet and outlet pipe within manholes shall be no less than 90 degrees. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Drop manholes shall be constructed with an outside drop connection encased in concrete, as shown in the Utilities Detail Drawings. See FDEP Wastewater Checklist Form 62-604.300(8)(a), "Manholes" section, for further design requirements, as well as Specification Section 333913 and the Detail Drawings.

3.2 Force Mains

3.2.1 Pipe and Fitting Materials

Force main pipelines and fittings shall be a minimum of four inches in diameter. All force mains shall be constructed of PVC, HDPE, or ductile iron pipe and shall utilize pipe meeting the requirements of the Technical Specifications. The use of ductile iron pipe on force mains is restricted to aerial crossings and above ground flanged pipe only. A plug valve is required to delineate ownership between County owned and privately owned force mains.

All HDPE and PVC buried pipelines shall be color-coded as described in the Technical Specifications. Force main pipelines shall be green in color.

Buried force mains, except those installed by directional drill or jack-and-bore methods, shall be marked using metalized warning tape for PVC. The metalized warning tape shall be placed in the pipe trench at two feet below grade or one-half the depth of the pipe's bury, whichever is less, and labeled "WASTEWATER FORCE MAIN." Electronic markers (see County Approved Product List, Appendix F) shall be placed 24 inches below final grade, above the force main, at all bends or changes in alignment, valves, and every 250 feet. Horizontal directional drilling shall include installation of at least two locating tone wires as described in the Technical Specifications.

All force main aerial crossings shall be Pressure Class 350 flanged ductile iron pipe and shall be coated on the exterior using a suitable grade of Safety Green colored, field applied (or factory applied with field touch-up as required) epoxy coating. Specific color shall be subject to approval of the County Manager or designee. All nuts and bolts used in aerial crossings shall be stainless steel. All canal, river, or creek crossings shall be aerial, unless otherwise approved by the County Manager or designee. Aerial crossings shall be designed to incorporate valves or other flow regulation devices in accordance with F.A.C. 62-604.400(2)(k)5. Aerial crossings shall be designed to maintain existing or required navigational capabilities within the waterway and to reserve riparian rights of adjacent property Owners. Submit aerial pipe and flange computations, including support and anchor design, for review. The submittal must be signed and sealed by a Florida registered Licensed Professional Engineer.

3.2.2 Design of Pipeline Size and Location

Force mains shall be sized to provide a desired flushing velocity of two and one-half feet per second with a minimum allowable velocity of two feet per second. The maximum allowable velocity in wastewater force mains is six feet per second. The minimum size force main conveyed to the CCWSD shall be four inches in diameter. Approved mechanical thrust restraints are required at pipe joints where specified in the Utility Standards.

Minimum cover for force mains shall be 30 inches. Maximum cover shall be 48 inches after final project grading is complete except when dipping under conflicts in which case the force main shall be returned to normal depth within 10 feet on either side of the conflict or as soon as possible using a fitting of 45 degrees or less. The design engineer shall strive to minimize the number and frequency of dips (maintaining a horizontal run line through intermittent grade changes, by deviation). An air release valve is required at all dips. Engineers should evaluate possibilities of lowering storm drainage piping or dipping potable water and non-potable irrigation water main to avoid dips in the force main.

When force mains are interconnected with a gravity sewer system, for transmission purposes through that system, interconnection shall be as shown in the Utility Standard Drawings. No force main laterals shall be core bored into manholes.

3.2.3 Valves

All connections of privately-owned and maintained wastewater force mains to the Wastewater Department's force mains shall be connected through a check valve housed in a structure as shown in the Utilities Detail Drawings which shall allow performance of required maintenance, and shall be owned and maintained by the property owner.

Sufficient plug valves shall be provided to allow for zone isolation of wastewater transmission areas in order to limit the impact of line breaks. In-line plug valves shall be provided at no greater than 1,000 foot intervals per COUNTY requirements.

3.2.4 Force Main Extension Stubs

All main-line extension stubs to future developments and/or parcels shall terminate in a stub-out if it is part of a phased project. The stub-out shall end with a valve and cap/plug.

3.2.5 Air Release Assemblies

Air release assemblies shall be provided at all high points and on the upstream side of conflict crossings at which the force main passes under the conflict (unless it can be demonstrated by hydraulic analysis that air pockets will not accumulate at individual high points). A high point is defined by the hydraulic gradient and is considered the upper end of any pipe segment that slopes up to the hydraulic gradient or runs parallel to it. Air valves (see County Approved Product List, Appendix F) utilized on raw sewage facilities shall be designed and manufactured specifically for use with domestic sewage. The design engineer shall review and apply the pertinent provisions of AWWA-C512 and AWWA Manual of Water Supply Practices M51, "Air-Release, Air Vacuum, and Combination Air Valves". When installed, the air valve shall be provided with a shut-off valve to allow isolation and removal of the valve assembly. All air release assemblies shall be installed as shown in the Utilities Detail Drawings.

3.3 Wastewater Pump Stations

Wastewater pump stations shall be designed and constructed in accordance with FDEP regulatory requirements, Section 2 Technical Specifications, National Electrical Code (NEC) Requirements, and Section 3 Utilities Detail Drawings.

Pump Station wetwells shall be designed to withstand flotation forces with the assumption that the structures are empty and ground/flood water elevation is at the top of the structures. The

design shall consider the potential for damage or interruption of operation due to flooding. Pump station structures and electrical and mechanical equipment shall be designed to be protected from physical damage by the 100-year flood event. Pump stations shall be designed to remain fully operational and accessible during the 25-year flood event. Pump stations shall be designed to avoid operational problems from the accumulation of grit.

Pump stations shall be designed to be readily accessible by maintenance vehicles, including pumper trucks, during all weather conditions. Pump stations shall be designed and located on the site to minimize adverse effects from odors, noise, and lighting. Pump stations shall be located on the site to have a minimum separation of 20 feet from the edge of the CUE for the pump station to edge of a body of water and 15 feet from the edge of the CUE for the pump station to a residential structure (including appurtenances).

The effective volume of wet wells shall be based on design average flows and a filling time not to exceed 30 minutes unless the facility is designed to provide flow equalization. The pump manufacturer's duty cycle recommendations shall be utilized in selecting the minimum cycling time. Pump stations requiring a pump motor of twenty horsepower or greater shall operate by a VFD (variable frequency drive) that varies the operating speed of the pump based on wet well water levels. Pump stations shall have a compacted earth berm on three sides with 3:1 slopes to divert liquid toward the ROW. Top of berm shall be 12 inches wide and six inches higher than back of curb (with curb) or edge of pavement (without curb). Minimum berm height shall be six inches.

When a pump station has a peak design flow coming into the station greater than 500 gpm, contact Public Utilities Engineering and Project Management Department for specifications.

A pump station that is connected directly to the County transmission force main from a development (Community Pump Station) and any pump station that receives flow from one or more upstream pump stations or discharges through a force main 12 inches or larger (see FAC 62-604.400 (2)(a)1) shall have uninterrupted pumping capability (standby diesel pump or generator) with three days of fuel storage (compliant with Technical Specification 263213) and a concrete pad for a future odor control system.

Except for grinder pump stations, which require Deviation approval, no new private pump stations are allowed. Grinder pump stations are required to have a standard generator receptacle. All other pump stations shall conform to these standards and shall be conveyed to the Collier County Water-Sewer District in accordance with the utilities conveyance policies and procedures outlined in the Collier County Utilities Standards and Procedures Ordinance (Ord. No. 2004-31 as amended).

All pump stations shall have water available to them. Available water means a water main is accessible in the adjacent ROW or CUE.

Landscaping is not required, per these standards, to be installed around wastewater pump stations. If landscaping is provided, it shall be maintained by the developer, homeowners association, or land owner and shall NOT be located in the CUE. Landscaping, if provided, shall be located as to not block access or interfere with operations. If plant material dies, it is the responsibility of the landscaping owner to replace it. The landscaping shall be maintained to not block telemetry antenna line of site.

3.4 Connections to Collier County Facilities

Connections to existing COUNTY wastewater mains shall be constructed as described in the Technical Specifications and shown in the Utilities Detail Drawings. These details shall apply to all connections to existing systems.

All projects shall be designed with no physical connections between a public or private potable water supply system and a sewer or force main and with no water mains passing through or coming into contact with any part of a sewer manhole.

3.5 Tests and Inspections

Tests and inspections of all wastewater systems or portion(s) thereof shall be performed in accordance with the Technical Specifications before acceptance of the systems or portions thereof by Collier County.

3.6 Wastewater Pump Station Asset Management

Asset management is required for proper use and maintenance of these wastewater facilities. State of Florida DEP regulations state: "...systems shall be operated and maintained so as to provide uninterrupted service..." To accomplish this obligation on privately owned wastewater pump stations, the owner(s) of each such station shall:

- A. Maintain a permanent fence with a sign mounted thereon, which sign shall include the correct name and phone number(s) of at least one emergency contact individual and the correct name(s) and phone number(s) of the station's operator as well as the station's owner(s). The text on the sign must be immediately updated if and when any of the information on the sign becomes outdated.
- B. The station's owner shall continuously retain (contract with) an operator qualified under Florida laws, rule or regulation, for operations, preventive maintenance, and to respond to each service interruption, if any, at that station.

The above requirements are mandated by the Florida Department of Environmental Protection regulations: Florida Administrative Code, Subsection 62-604.400(2)(d).

PART 4 ELECTRICAL AND CONTROL SYSTEMS

4.1 Electrical and Control System Material

All electrical devices such as motor starters, breakers, and control centers shall be manufactured to current NEMA standards. The construction of each device shall conform to the NEMA rating for the environment of that device.

All programmable logic controllers (PLC) shall be manufactured by Allen-Bradley. The PLC model for each specific application shall be coordinated with the Utilities Engineering Department.

END OF SECTION 1

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**COLLIER COUNTY WATER-SEWER DISTRICT
UTILITIES STANDARDS MANUAL**

SECTION 1

DESIGN CRITERIA

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