# SECTION 1

## DESIGN CRITERIA

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## SECTION 1

## DESIGN CRITERIA FOR POTABLE WATER, NON-POTABLE IRRIGATION WATER AND WASTEWATER FACILITIES

## PART 1 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."

### 1.1 Pipe and Fitting Material

Potable water pipelines and fittings, except for service piping, shall be a minimum of six inches (6") in diameter, and have a minimum depth of thirty-inches (30") and a maximum depth of forty-eight inches (48") below finished grade. Non-potable irrigation water pipelines and fittings, except for service piping, shall be a minimum of four inches (4") in diameter, and have a minimum depth of thirty-inches (30") and a maximum depth of forty-eight inches (48") below finished grade. 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. Pipelines up to thirty inches (30") in diameter may be constructed of Fusible PVC.

All pipe and pipe fittings shall contain no more than eight percent (8.0%) lead, and any solder or flux used shall contain no more than two-tenths of a percent (0.2%) lead. All pipe and pipe fittings installed shall be color coded or marked in accordance with F.A.C. 62-555.320(21)(b)3.

All HDPE and PVC buried pipelines shall be color-coded as described in the Technical Specifications. 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, metal, and concrete buried water main pipelines shall have blue stripes applied to the pipe wall. Pipes striped during manufacturing of the pipe shall have continuous stripes that run parallel to the axis of the pipe, that are located at no greater than 90 degree intervals around the pipe, and that will remain intact during and after installation of the pipe. 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 (2') 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 locating tone wire 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 Professional Engineer.

## 1.2 Design of Pipeline Size and Location

### 1.2.1 Water Pipeline Sizing Criteria

All water mains to be maintained by the COUNTY shall be a minimum of six inches (6") in diameter. For dead end mains on short (300' or less) single family residential cul-de-sacs, hydraulic calculations shall show the capability of maintaining 750 gpm fire flow plus potable demand.

Water systems shall be designed to maintain adequate flows and pressures and water quality standards as established by Florida Department of Environmental Protection (FDEP), using the following criteria:

A. Designs shall assume a minimum COUNTY source pressure under peak hourly flow conditions of 50 psi and a minimum COUNTY source pressure with fire flow under maximum day conditions of 40 psi, delivered from the closest COUNTY transmission main to the project. Minimum residual node pressure within a proposed project system shall be 20 psi under peak hourly flow and maximum day with fire flow conditions.

B. The design Engineer shall model the proposed system, including all dead ends, for chlorine dissipation assuming a chloramine residual of 2.0 mg/l at the entrance point to the project.

The following criteria shall be used to analyze model chloramine dissipation unless otherwise approved by the Public Utilities Water Director upon the submittal of specific case data:

a) Occupancy of fifty percent (50%) to account for seasonal variations with the load evenly distributed throughout the project.
b) Average occupancy per dwelling of 1.81 for single family and 1.42 for multi-family as established by the Water Master Plan as amended and adjusted for peak with a factor of 1.2 shall be used when modeling system performance.
c) Consumption rate of 170 gallons per capita per day shall be used when establishing loading rates for system performance models.
d) Systems that are proposed to use or will use alternate irrigation sources shall use fifty percent (50%) of the loading rates for modeling chlorine/chloramine dissipation.

e) The standard decay rate is - 0.012 ppm per hour. The analysis assumes a static chlorine level of 2.0 ppm at the tapping point in front of a project. Using the decay rate and solving for the elapsed time from the initial chlorine level to the minimum chlorine level residual of 0.6 ppm in the following: 0.6 ppm = 2.0 ppm x e(-1=0.012 ppm x #hours) => time = 100.33 hours.

The Project Engineer shall submit an analysis letter to Community Development and Environmental Services as part of the review package, certifying that all points within the proposed system shall maintain a minimum level of 0.6 mg/l chlorine/chloramine residual under the conditions listed above.

Systems unable to meet minimum design requirements or maintain minimum chlorine 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.

1.2.2 Distribution System Layout

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. Water mains shall not be placed beneath any existing or proposed building structure.

Generally, new potable water distribution systems shall be designed as “looped” systems to avoid dead ends. If changes in design during construction result in dead ends to any new or relocated water mains, such dead ends shall be connected to the nearest water main. In cases where no nearby water main is available, a County approved automatic flushing device shall be provided at each dead end of a water main and, if applicable, also 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. For phased projects, temporary automatic flushing devices can be relocated for future phases, if not conveyed to County.

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).

Water mains shall have a minimum setback of seven feet and six inches (7’6”) from the centerline of the pipe to residential roadways, curb and gutters, permanent structures, or planting not specifically allowed by ordinance.

Water mains shall be designed parallel to accessible roadways and within the setbacks established herein above. 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.

1.2.3 Pipeline Separation Criteria

Potable water pipelines shall be separated from wastewater lines and /or stormwater lines by a minimum clear vertical distance of eighteen inches (18") and a horizontal distance of ten feet (10'). The eighteen inches (18") 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. Non-potable irrigation water pipelines 2" and larger shall be separated from potable water mains, wastewater lines and/or stormwater lines by a minimum clear vertical distance of eighteen inches (18") and a horizontal distance of five feet (5') as shown in the Utilities Detail Drawings. Wastewater lines shall be separated from stormwater lines by a minimum clear vertical distance of eighteen inches (18") and a horizontal distance of five feet (5'). All pipeline crossings with vertical clearance less than eighteen inches (18") shall be made using a full twenty foot (20') length of thickness Class 200 AWWA C900 PVC pipe, Class 235 AWWA C905 PVC pipe, or, if necessary, Pressure Class 250 ductile iron 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 (6") above the crown of the pipe. When this standard cannot be maintained, the sewer line shall be concrete encased for a distance of ten feet (10') each way from the water line and any other conduit, with a minimum vertical clearance of twelve inches (12") being provided at all times. All pipelines shall be successfully pressure tested to 150 psi after the concrete has properly cured.

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 eighteen inches (18") and horizontal distance of five feet (5').

Potable water, non-potable irrigation water, and wastewater lines shall be separated from raw water mains by a clear vertical distance of eighteen inches (18") and a horizontal distance of ten feet (10'). Stormwater lines shall be separated from raw water mains by a clear vertical distance of eighteen inches (18") and a horizontal distance of five feet (5').

Wastewater lines shall be separated from public drinking water supply wells by a horizontal distance of one hundred feet (100'). Wastewater lines shall be separated from private drinking water supply wells by a horizontal distance of seventy-five feet (75'). A County approved deviation form will be required if the separation distance cannot be maintained.

Also see separation requirements in Section 020500, 1.3.F (separation distances from existing County Utilities). In the event the required separation is not technically sensible, a Deviation Request can be submitted to the COUNTY. Such request shall contain the minimum criteria identified in F.A.C. 62-555.314(5); however, these criteria alone are not justification for COUNTY approval of a Deviation Request."

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

1.2.4 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 one thousand foot (1000') intervals when no other valves exist within internal distribution systems. All gate valves twenty inches (20") and smaller shall be of the resilient-seated wedge type, conforming to AWWA C509 or C515, or latest revisions thereof. All valves shall be furnished with valve boxes extending to finished grade as shown in the Utilities Detail Drawings.

## 1.3 Conflict Crossings

All storm sewer, non-potable irrigation 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 1.7 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 (5'). A minimum vertical clearance of eighteen inches (18") shall be provided between the water main and bottom of conflict. Wherever the eighteen-inch (18") minimum vertical clearance cannot be provided, a COUNTY approved deviation form will be required. (A deviation form will not be required for separation of sewer laterals and potable water pipeline.)

1.3.1 Subaqueous Canal Crossings

Potable and non-potable subaqueous crossings shall be designed to a minimum depth of thirty-six inches (36") 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 thirty-six inch (36") cover, alternative construction features must be installed to ensure adequate protection of the pipeline. Wherever the thirty-six inch (36") minimum vertical clearance cannot be provided, a COUNTY approved deviation form will be required.

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 CDES 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 (2) 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 ¾" meter to be attached;
d) The HPDE 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 (4') wide by two feet (2') high with a minimum of two inch (2") lettering.

## 1.4 Fire Service Systems

All private fire service systems for sprinkler systems, wet standpipe systems, and privately-owned or controlled distribution systems shall be metered with a Fire Service, line-sized, meter and shall be installed with an appropriate back flow prevention device. The meter 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 Back Flow 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 (¾" to 2") metering device shall be re-calibrated to manufacturer's specifications every five (5) years, replaced every ten (10) years, or replaced immediately upon meter failure. Fire meter devices greater than two inches (2") shall be re-calibrated to manufacturer's specifications every five (5) 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 sixty (60) days of the due date.

### 1.4.1 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.

### 1.4.2 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 AMR meter and approved backflow devices at no expense to the appropriate Water-Sewer District.

## 1.5 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. The jumper shall be replaced 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.

## 1.6 Water Services

### 1.6.1 Service Pipelines

All building lots and parcels of land within a development on the opposite side of the roadway from a water main, or that do not have an accessible water main fronting the location of the proposed meter location, shall be provided with a means for water service by the developer. Accessibility to these lands shall be provided by the installation of water service conduits. Conduits shall be a minimum of four-inch (4") diameter PVC, with a minimum cover of twenty-four inches (24"). Such pipelines shall extend at least five feet (5') past the edge of pavement, sidewalk, bike path or any other improvement and shall run from lot corners on one (1) 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 (1 ½") in diameter.

### 1.6.2 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, if the meter is two inches (2") or larger in size.

All water meters larger than two inches (2") 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 (2") and smaller meter units will be installed by the COUNTY. On meters three inches (3") 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. The water supply to any cooling tower(s) shall be measured by a separate, dedicated water meter. The water line from the dedicated water meter to the cooling tower(s) shall be used exclusively for the cooling towers.

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 forty eight (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.

### 1.7 Air Release Assemblies

Air release assemblies shall be installed at all high points on transmission 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 fourteen inches (14") and smaller, see the County Approved Product List, Appendix F. For potable water or non-potable irrigation water mains sixteen inches (16") 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.

### 1.8 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 (6") and the outside dimension of the pad and the

reinforcement shall be as shown in the Utilities Detail Drawings. Concrete shall have minimum compression strength of 3000 psi at twenty-eight (28) days.

## 1.9 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.

### 1.9.1 Pigging

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

### 1.9.2 Flushing

Full-bore flushing shall be coordinated with COUNTY Water Distribution personnel and shall require forty-eight (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.

### 1.9.3 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.

### 1.9.4 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 forty-eight (48) hour notice to Water Distribution prior to performance.

### 1.9.5 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 twenty-four (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.

1.9.6 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 forty-eight (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.

## 1.10 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 (1) day total of two hundred (200) non-coliform bacteria or greater shall be considered as failed samples. Samples containing one (1) coliform bacteria or greater shall be considered as a failed sample. All potable water systems shall pass bacteriological tests within thirty (30) 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 2 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 pressures and water quality standards as established by Florida Department of Environmental Protection (FDEP).

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.

## 2.1 Gravity Sewer Systems

2.1.1 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.

2.1.2 Design of Pipeline Size, Depth and Location

All gravity sewer mains constructed shall be a minimum of eight inches (8") in diameter. The minimum depth of cover over all gravity sewers shall be thirty-six inches (36"). 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 (8") 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. Drop connections will be required if the invert elevation is greater than two feet (2').

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 (2') 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 Community Development and Environmental Services Division or Public Utilities Planning and Project Management Department be permitted for use on any project.

Sewers to be located on 20% slopes or greater shall be designed with anchors secured into concrete with anchors spaced as follows:

| Grade Range | Anchor Spacing |
|---|---|
| 20% - 35% | 36 feet center to center |
| 35% - 50% | 24 feet center to center |
| 50% and higher | 16 feet center to center |

Pipeline separation criteria and conflict crossings criteria shall conform to the requirements described in Part 1, Sections 1.2.3 and 1.3.

All sewers shall be designed to prevent superimposed loads.

2.1.3 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.

### 2.1.4 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 (6") in diameter. Lateral shall have a minimum depth of thirty inches (30") and a maximum depth of forty-eight inches (48") below finished grade. In locations where a minimum depth of thirty inches (30") cannot be provided, laterals shall be ductile iron pipe unless the length of lateral is thirty feet (30') or less. In such cases the lateral shall be C900, DR 14 PVC pipe. At no time shall the depth of a lateral be less than twenty-four inches (24"). 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. Typical lateral and cleanout standards are shown in the Utilities Detail Drawings. The cleanout riser and cap shall be set twenty-four inches (24") above finished grade. All sewer lateral ends shall be provided with an electronic marker (see County Approved Product List, Appendix F). Electronic markers shall be placed twenty-four inches (24") 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 (6") diameter or larger lateral to each property or a single six inch (6") or larger lateral with a double wye shall be provided.

### 2.1.5 Manholes

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 four hundred feet (400') and shall be placed in roads. For sanitary sewers with a diameter greater than fifteen inches (15"), the recommended maximum distance between manholes is four hundred fifty feet (450'). All gravity collection mains shall terminate in a precast manhole.

Minimum inside diameter of all manholes shall be four feet (4'). A drop pipe shall be provided for a sewer entering a manhole at an elevation of twenty-four inches (24") 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.

## 2.2. Force Mains

### 2.2.1 Pipe and Fitting Materials

Force main pipelines and fittings shall be a minimum of four inches (4") in diameter. All force mains between four and fourteen inches (4"-14") in diameter shall be constructed of PVC or HDPE pipe and shall utilize pipe meeting the requirements of the Technical Specifications. Force mains sixteen inches (16") and larger in diameter shall be constructed of ductile iron, HDPE, or PVC pipe. Pipelines up to thirty inches (30") in diameter may be constructed of Fusible PVC.

Deviations from the minimum four inch (4") diameter pipeline design parameters shall only be approved in cases where such installations are necessary in order to comply with minimum FDEP velocity requirements. Whenever the minimum four inch (4") diameter pipeline cannot be

provided, a COUNTY approved deviation form will be required. The Owner shall be responsible for maintaining seven hundred feet (700') of the smaller diameter force main located within the County ROW. No check valve will be required.

Due to minimum velocity requirements as set forth by the FDEP, one and a half inch (1-1/2") diameter force mains may be required. If so, force mains shall conform to Section 2, Technical Specifications. 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 pipe and non-magnetic for ductile iron pipe. The metalized warning tape shall be placed in the pipe trench at two feet (2') 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 twenty-four inches (24") below final grade, above the force main, at all bends or changes in alignment, valves, and every two hundred fifty feet (250').

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 Professional Engineer.

### 2.2.2 Design of Pipeline Size and Location

Force mains shall be sized to provide a desired flushing velocity of two and one-half feet (2.5') per second with a minimum allowable velocity of two feet (2') per second. The minimum size force main conveyed to the Board shall be four inches (4") in diameter. When the Hazen-Williams formula is used to calculate friction losses through the force main, the value for "C" is 100 for unlined iron or steel pipes. For other smooth pipe materials, such as PVC, HDPE and lined ductile iron, the value for "C" shall not exceed 120.

Minimum cover for force mains shall be thirty inches (30"). Maximum cover shall be forty-eight inches (48") after final project grading is complete except when dipping under conflicts in which case the force main shall be returned to normal depth within ten feet (10') on either side of the conflict or as soon as possible using a fitting of forty-five degrees (45°) or less.

Force mains shall be interconnected with a gravity sewer system, for transmission purposes through that system, as shown in the Utility Standard Drawings, unless the connection is made directly in a terminus, upstream manhole at the manhole invert and the Engineer of Record has hydraulically demonstrated that connection to an in-line manhole will not cause a surge condition or disruption to the flow within the gravity sewer system. Connections to any manhole shall be made using a flexible boot with stainless steel strap. Thrust restraint transitioning to the

manhole shall be designed by the Engineer and detailed on the construction drawings. No force main laterals shall be core bored into manholes.

Pipeline separation criteria and conflict crossings criteria shall conform to the requirements described in Part 1, Sections 1.2.3 and 1.3. Force mains shall have a minimum setback of seven feet and six inches (7'6") from the centerline of the pipe to residential roadways, curb and gutters, permanent structures, or plantings not specifically allowed by ordinance and shall not be placed beneath any existing or proposed building structure.

2.2.3 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 one thousand foot (1,000') intervals per COUNTY requirements.

2.2.4 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.

2.2.5 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.

## 2.3 Pumping Stations

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

Pumping Station wetwells and valve vaults shall be designed to withstand flotation forces when empty and water elevation is at the top of the structures. The design shall consider the potential for damage or interruption of operation because of flooding. Pump station structures and electrical and mechanical equipment shall be designed to be protected from physical damage by the 100-year flood. Pump stations shall be designed to remain fully operational and

accessible during the 25-year flood unless lesser flood levels are appropriate based on local considerations, but not less than the 10-year flood. 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 twenty feet (20') from the edge of the CUE for the pump station to edge of a body of water and fifteen feet (15') from the edge of the CUE for the pump station to a residential structure (including appurtenances). Also see detail WW-7A for additional requirements.

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 shall have a compacted earth berm on three sides with 3:1 slopes to divert liquid toward the ROW. Top of berm shall be twelve inches (12") wide and six inches (6") higher than back of curb (with curb) or edge of pavement (without curb). Minimum berm height shall be six inches (6"). See detail WW-7A for further detail.

A Master Pumping Station is any station that (1) has a design flow per pump greater than 500 gpm or (2) may be determined by the Public Utilities Division as a Master Pumping Station. Such determination shall be made at the sole discretion of the Public Utilities Division where found to be in the public interest. A Master Pumping Station shall have permanent standby power generation, a pre-engineered biofiltration odor control system, and a one hundred foot (100') minimum separation from the edge of the CUE to the edge of a body of water or residential structure (including appurtenances). A Master Pump Station shall be designed with a spill containment area to retain thirty (30) minutes of peak design flow.

A Submaster Pumping Station is any station that (1) has a total design flow greater than 120 gpm with one pump operational and receives inflow from two or more upstream pump stations or (2) has a design flow per pump greater than 200 gpm or (3) may be determined by the Public Utilities Division as a Submaster Pumping Station. Such determination shall be made at the sole discretion of the Public Utilities Division where found to be in the public interest. A Submaster Pumping Station shall have permanent standby power generation and a pre-engineered biofiltration odor control system.

All pump stations shall have water available to them. Available water means a water main is accessible in the adjacent ROW or CUE. If the water main is on the opposite side of the street from the pump station CUE, provide a four inch (4") conduit from the nearest lot corner to on the opposite side of the street to a point five foot (5') beyond the back of sidewalk on the same side of the street as the pump station. If no water is available, a well is required to provide water to the pump station. Well separation requirements shall be in accordance with F.A.C. The well and supply line shall be located in a CUE for maintenance. All pump stations equipped with a pre-engineered biofiltration odor control system shall have a standard potable water service with appropriate water meter and backflow preventer.

Landscaping shall be installed around developer constructed pump stations that are intended to be conveyed to Public Utilities. Said landscaping shall be maintained by the developer, homeowners association, or land owner and shall NOT be located in the CUE. Landscaping

shall be located on the three sides without the gate and shall be at least 75% of the height of the fence at Final Acceptance of the pump station. Landscaping shall provide a minimum of 80% opacity at maturity and have a non-intrusive root structure. If required 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.

### 2.4 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.

### 2.5 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.

### 2.6 Wastewater Pumping 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 pumping 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 62-604.500.

Also refer to the Standard Details for additional information that applies to the above noted signage requirements.

## PART 3 ELECTRICAL AND CONTROL SYSTEMS

### 3.1 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

NO TEXT FOR THIS PAGE

SECTION 014127

NPDES REQUIREMENTS

FOR CONSTRUCTION ACTIVITIES IMPACTING MORE THAN ONE ACRE

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This Section describes the required documentation to be prepared and signed by the CONTRACTOR before conducting construction operations, in accordance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit, as required by Florida Administrative Code (F.A.C.) Chapter 62-621.

B. The CONTRACTOR shall be for responsible for implementation, maintenance and inspection of stormwater pollution prevention control measures in accordance with F.A.C. Chapter 62-621 including, but not limited to, erosion and sediment control, stormwater management plans, waste collection and disposal, off-site vehicle tracking, and other practices shown on the Drawings and/or specified elsewhere in this or other specifications. The stormwater pollution prevention control measures shall include protection of offsite public and private stormsewer facilities potentially impacted during construction. Stormwater facilities include streets, inlets, pipes, ditches, swales, canals, culverts, control structures, and detention/retention areas.

C. The CONTRACTOR shall prepare and review implementation of the Stormwater Pollution Prevention Plan (SWPPP) in a meeting with the County Manager or designee prior to start of construction.

### 1.2 UNIT PRICES

A. Unless indicated in the Unit Price Schedule as a pay item, no separate payment will be made for work performed under this Section. Include cost of work to be performed under this Section in pay items of which this work is a component.

### 1.3 REFERENCE DOCUMENTS

A. ASTM D3786 – Standard Test Method for Hydraulic Bursting Strength for Knitted Goods and Nonwoven Fabrics

B. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 NOTICE OF INTENT (NOI)

A. Fill out, sign and date a Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities, (FDEP Form 62-621.300(4)(b)). Submit the signed copy of the NOI to the County Manager or designee. The County Manager or designee will submit the completed form to the FDEP along with the required permit fee.

3.2 CERTIFICATION REQUIREMENTS

A. On the attached OPERATOR'S INFORMATION form, fill out the name, address and telephone number for the CONTRACTOR, persons or firms responsible for maintenance and inspection of erosion and sediment control measures, and all Subcontractors.

B. The CONTRACTOR and Subcontractors named in the Operator's Information form shall read, sign and date the attached CONTRACTOR'S/SUBCONTRACTOR'S CERTIFICATION form.

C. The persons or firms responsible for maintenance and inspection of erosion and sediment control measures shall read, sign and date the attached EROSION CONTROL CONTRACTOR'S INSPECTION AND MAINTENANCE CERTIFICATION form.

D. Submit all forms to the County Manager or designee before beginning construction.

3.3 RETENTION OF RECORDS

A. Retain a copy of the SWPPP at the construction site and at the Contractor's office from the date that it became effective to the date of project completion.

B. At project closeout, submit to the County Manager or designee all NPDES forms and certifications, as well as a copy of the SWPPP. Stormwater pollution prevention records will be retained by the County Manager or designee for a period of three (3) years from the date of project completion.

3.4 REQUIRED NOTICES

A. The following notices shall be posted from the date that the SWPPP goes into effect until the date of final site stabilization:

1. A copy of the submitted NOI and a brief project description, as given in the SWPPP, shall be posted at the construction site and at the CONTRACTOR's office in a prominent place for public viewing.

2. Notice to drivers of equipment and vehicles, instructing them to stop, check and clean tires of debris and mud before driving onto traffic lanes. Post such notices at every stabilized construction exit area.

3. Post a notice of waste disposal procedures in an easily visible location on site.

4. Notice of hazardous material handling and emergency procedures shall be posted with the NOI on site. Keep copies of Material Safety Data Sheets at a location on site that is know to all personnel.

5. Keep a copy of each signed certification at the construction site and at the CONTRACTOR's office.

REQUIRED FORMS FOLLOW

## OPERATOR'S INFORMATION

Owner's Name and Address: Collier County Public Utilities Planning and Project Management Department

3301 East Tamiami Trail
Naples, Florida 34112
(239) 252-4285

Contractors' Names and Addresses:

General Contractor: _____

_____

_____

_____

_____

Telephone: _____

Site Superintendent: _____

_____

_____

_____

_____

Telephone: _____

Erosion Control and:
Maintenance Inspection _____

_____

_____

_____

_____

Telephone: _____

Subcontractors' Names and Addresses:

_____ _____

_____ _____

_____ _____

_____ _____

Phone: _____ Phone: _____

**CONTRACTOR'S / SUBCONTRACTOR'S CERTIFICATION**

I certify under penalty of law that I understand the terms and conditions of Florida's National Pollutant Discharge Elimination System (NPDES) Construction General Permit that authorizes storm water discharges associated with activity from the construction site identified as part of this certification, and that I have received a copy of the SWPPP.

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

**EROSION CONTROL CONTRACTOR'S**
**INSPECTION AND MAINTENANCE CERTIFICATION**

I certify under penalty of law that I understand the terms and conditions of Florida's National Pollutant Discharge Elimination System (NPDES) Construction General Permit that authorizes storm water discharges associated with activity from the construction site identified as part of this certification, and that I have received a copy of the SWPPP.

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Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

_____

Date: _____

**STORM WATER POLLUTION PREVENTION PLAN**
**INSPECTION AND MAINTENANCE REPORT**

Project: _____

Contractor: _____

Inspector: _____

Date: _____

| CONTROLS | LOCATION | SEDIMENT HEIGHT | PROBLEM DESCRIPTION | MAINTENANCE REQUIRED | REPAIRED BY / DATE |
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END OF SECTION

SECTION 020500

CONNECTIONS TO EXISTING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General Requirements

B. Submittals

C. Scheduling of Shutdown

1.2 RELATED SECTIONS

A. Section 011000 – Summary of Work

B. Section 015000 – Construction Facilities and Temporary Controls

C. Section 015526 – Traffic Regulations and Public Safety

D. Section 320117 – Pavement Repair and Restoration

1.3 GENERAL REQUIREMENTS

A. Be responsible for all connection to existing systems, cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

B. Coordination: Before connection is performed, verify and provide for any pipe restraint that may be required for the new connection. Perform all cutting, fitting or patching of the Work that may be required to make the several parts thereof join in accordance with the Contract Documents. Perform restoration with competent workmen skilled in the trade.

C. If changes to a “looped” water distribution system occurring during construction result in dead ends to any new or relocated water mains, connect such dead

ends to the nearest water main. In cases where no nearby water main is available, provide a flushing device in coordination with the COUNTY at no additional cost to the COUNTY.

D. Improperly Timed Work: Perform all cutting and patching required to install improperly timed work, to remove samples of installed materials for testing, and to provide for alteration of existing facilities or for the installation of new Work in the existing construction.

E. Limitations: Except when the cutting or removal of existing construction is specified or indicated, do not undertake any cutting or demolition, which may affect the structural stability of the Work or existing facilities without the ENGINEER's concurrence.

F. Collier County Damage Prevention Policy:

1. This policy has been put in place to avoid damage to Collier County underground utilities. A minimum distance of five feet (5') horizontally and eighteen inches (18") vertically must be maintained away from Collier County utilities. Any and all variations from this order must be approved by the Water or Wastewater Department.

2. **Before commencement of any excavation, the existing underground utilities in the area affected by the work must be marked by Sunshine One Call after proper notification to them by either calling 811 in Florida or toll free at 1-800-432-4770. Visit www.callsunshine.com for more information. Before commencing excavation for the work, potholing of all potential conflicts must be performed.**

3. All lines in conflict must be physically located by the contractor and verified by Collier County Locate Department personnel before performing work. Utilities under concrete or pavement may require soft dig vacuum locates which also is the contractor's responsibility to perform. All utilities will be field marked per Sunshine State One Call's statutes and guidelines. For line verification or any other information concerning locates, please call the Locate Department at 239-252-5922 during normal business hours. For line verification or emergency locates after hours, call emergency numeric pager at 239-890-0809. **In the event the potholing and/or vacuum soft dig does not locate the marked utility, work must be stopped and the affected utility owner contacted.** Failure to comply with this policy and obtain required signature(s) may result in delay or denial of permit.

1.4 SUBMITTALS

A. Submit a written request to the ENGINEER well in advance of executing any cutting or alteration which affects:

1. Work of the COUNTY or any separate contractor.

2. Structural value or integrity of any element of the project or work.

3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

4. Efficiency, operational life, maintenance or safety of operational elements.

5. Visual qualities of sight-exposed elements.

B. Include in request:

1. Identification of the work.

2. Description of affected work.

3. The necessity for cutting, alteration or excavation.

4. Effect on work of the COUNTY or any separate contract, or on structural or weatherproof integrity of work.

5. Description of proposed work:

a. Scope of cutting, patching, alteration, or excavation.

b. Trades who will execute the work.

c. Products proposed to be used.

d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any separate contractor whose work will be affected.

C. SUBMIT WRITTEN NOTICE TO THE ENGINEER DESIGNATING THE DATE AND THE TIME THE WORK WILL BE UNCOVERED.

1.5 SCHEDULING OF SHUTDOWN

A. Connections to Existing Facilities: If any connections, replacement, or other work requiring the shutdown of an existing facility is necessary, schedule such work at times when the impact on the COUNTY's normal operation is minimal. If shutdown involves the water distribution or transmission system, provide notice to the COUNTY Water Department at least two (2) weeks prior to the proposed shutdown, including date, time and anticipated length of interruption of service. Overtime, night and weekend work without additional compensation from the

COUNTY, may be required to make these connections, especially if the connections are made at times other than those specified. The connection of new or existing pipelines is prohibited from starting until CONTRACTOR assures that the system can receive the new flow.

B. Interruptions of Service: Perform cut-ins into lines at a time approved in writing by the County Manager or designee. Whenever it is required to turn off valves which may interrupt the water supply of residents or businesses, notify all concerned parties or agencies with personal contact, door hangers or written notice at least forty-eight (48) hours in advance of such cut-off, after having obtained the approval of the County Manager or designee. Provide a copy of the written notice to the Water Distribution Section by fax. ONLY COUNTY PERSONNEL MAY OPERATE COUNTY-OWNED VALVES. Maintain water service to existing connections during construction, under any and all conditions and at no additional cost to the COUNTY. Thoroughly clean and swab all pipe and fittings for cut-ins with a concentrated solution of calcium hypochlorite.

C. Request for Water System Shutdowns: When plans call for connection to existing water distribution facilities or the CONTRACTOR plans to shut down existing utilities or where damage to such facilities is likely in order to complete construction of items under this contract, furnish the County Manager or designee with a written request for connection. The COUNTY Water Distribution Section will identify the locations of all water valves needed to isolate the point of connection in the event that the existing facilities are damaged while making the connection. Identify in the request means which the CONTRACTOR proposes to use in order to provide effective shutdown of the system. Include in a connection and shutdown schedule details of shutdown time and duration. No connections to existing utilities – or construction where shutdown of, or damage to, existing utilities may occur – shall commence prior to County Manager or designee approval of the connection and shutdown plan and schedule.

D. Request for Wastewater Diversion: Submit a request for each diversion necessary during construction to the County Manager or designee and the ENGINEER sufficiently in advance of any required diversion. Identify in the request the valves, bypass piping, portable pumper trucks or any other means which the CONTRACTOR proposes to use in order to provide effective shutdown of the system. Include in a connection and shutdown schedule details of shutdown time and duration. No connections to existing utilities – or construction where shutdown of, or damage to, existing utilities may occur – shall commence prior to County Manager or designee approval of the connection and shutdown plan and schedule.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Comply with specifications and standards for each specific product involved.

## PART 3 EXECUTION

### 3.1 INSPECTION

A. Inspect existing conditions of projects, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of the work.

C. Report unsatisfactory or questionable conditions to the ENGINEER in writing; do not proceed with work until the ENGINEER has provided further instructions.

### 3.2 PREPARATION

A. In cases where service to utility customers is interrupted, provide adequate equipment with backup onsite to assure prompt restoration of service.

B. Provide adequate temporary support as necessary to assure structural value or integrity or affected portion of work.

C. Provide devices and methods to protect other portions of project from damage.

D. Provide protection from elements for that portion of the project that may be exposed by cutting and patching work, and maintain excavations free from water.

E. Material Removal: Cut and remove all materials to the extent shown or as required to complete the work. Remove materials in a careful manner with no damage to adjacent facilities. Remove materials that are not salvageable from the site.

### 3.3 PERFORMANCE

A. Execute cutting and demolition by methods that will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. Employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

E. Restore work, which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish entire unit.

3.4 PAVEMENT RESTORATION

A. Restore all pavement or roadway surfaces in accordance with Section 320117 – Pavement Repair and Restoration.

B. Restore, replace or rebuild existing street paving, including underdrains, if any are encountered, where damaged, using the same type of construction as was in the original. Be responsible for restoring all such work, including subgrade, base courses, curb and gutter or other appurtenances where present. The County Manager or designee will obtain the permits listed in the Contract Documents. Obtain and pay for at CONTRACTOR’s expense any additional local or other governmental permits as may be required for the opening of streets and be satisfied as to any requirements other than those herein set forth which may effect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.

C. This section does not describe the construction of new road surfaces or the complete resurfacing of existing pavements.

D. In all cases, the CONTRACTOR will be required to maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract for a period of 12 months after the acceptance of the Contract, including the removal and replacement of such work wherever surface depressions or underlying cavities result from settlement of trench backfill.

E. Perform all the final resurfacing or repaving of streets or roads, over the excavations made and be responsible for relaying paving surfaces of roads that have failed or been damaged at any time before the termination of the maintenance period on account of work done by him. Resurface or repave over any tunnel jacking, or boring excavation that settles or breaks the surface, repave to the satisfaction of the County Manager or designee and at the CONTRACTOR's expense. Conform backfilling of trenches and the preparation of subgrades to the requirements of excavation and backfilling of pipeline trenches.

F. Where pipeline construction crosses paved streets, driveways or sidewalks, the CONTRACTOR may elect, at no additional cost to the COUNTY, to place the pipe by the jacking and boring, horizontal direction drilling, or tunneling method in lieu of cutting and patching of the paved surfaces. Such work shall be accomplished in accordance with all applicable sections of the Contract Documents.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 022501

LEAKAGE TESTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Testing for any signs of leakage in all pipelines and structures required to be watertight.

1. Test gravity sewers and drain lines by infiltration/exfiltration testing.

2. Test all other pipelines with water under the specified pressures.

B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities or other contractors working on the site.

1.2 PERFORMANCE REQUIREMENTS

A. Written Notification of Testing: Provide written notice when the work is ready for testing, and make the tests as soon thereafter as possible.

1. Personnel for reading meters, gauges, or other measuring devices, will be furnished.

2. Furnish all other labor, equipment, air, water and materials, including meters, gauges, smoke producers, blower, pumps, compressors, fuel, water, bulkheads and accessory equipment.

1.3 REFERENCES

A. Codes and standards referred to in this Section are:

1. AWWA C 600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

1.4 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Testing Report: Prior to placing the sewer system in service submit for review and approval a detailed report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.

1. Reference Sewer Line Data

a. For Low Pressure Testing

(1) The length and diameter of the section of line tested (MH to MH), including any laterals.

(2) A complete description of the test procedure, including:

(a) Trench backfilling and sewer cleaning status

(b) Type of plugs used and where

(c) Depth of sewer, and ground water pressure over sewer pipe

(d) Stabilization time period and air pressure

(e) Actual air test pressures used if ground water is present

(f) The time allowed by specifications

(g) The actual test time

(h) The air pressure at beginning and end of test

(3) The name of the inspector/tester and the date(s) and time(s) of all testing performed, including any retesting.

(4) A description of any repairs made.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 LEAKAGE TESTING

A. All new sewer and water pipelines installed shall be tested for leakage. The test used will be Hydrostatic Testing for pressure lines and Infiltration/Exfiltration Testing for gravity lines. Tests to be performed will be indicated by the ENGINEER and witnessed by the ENGINEER and the County Manager or designee.

1. Flushing

a. Full-bore flush all mains to remove all sand and other foreign matter. Flushing shall be terminated at the direction of the ENGINEER. Dispose of the flushing water without causing nuisance or property damage.

b. Install temporary flush out connections on all dead end water mains at the locations shown on plans and in accordance with the Collier County Standard Details.

2. Hydrostatic Testing for DIP and PVC Pipelines:

Perform hydrostatic testing of the system as set forth in the following, and conduct said tests in the presence of the County Manager or designee and other authorized agencies, with 48 hours advance notice provided.

Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from the County Manager or designee. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. Thoroughly clean and flush all piping prior to testing to clear the lines of all foreign matter. While the piping is being filled with water care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

Perform hydrostatic testing with a sustained minimum pressure of 150 psi for a period of not less than two (2) hours. If sustained pressure goes 5 psi above or below 150 psi during the first two (2) hours, the test fails (AWWA regulation). After two (2) hours, use the AWWA formula if less than 5 psi to determine whether test fails. Testing shall be in accordance with the applicable provisions as set forth in the most recent edition of AWWA Standards C600 for Ductile Iron Pipe and C605 for PVC Pipe. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

Where,

L = Allowable leakage in gallons per hour;
S = Length of pipe tested in feet;
D = Nominal diameter of pipe in inches;
P = Average test pressure maintained during the leakage test in pounds per square inch

For 150 psi, $L = (9.195 \times 10^{-5})\,SD$

The testing procedure shall include the continued application of the specified pressure to the test system, for the one-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced for the said container.

Should the test fail, repair the fault and repeat the test until results are within the established limits. Furnish the necessary labor, water, pumps, and gauges at specified location(s) and all other items required to conduct the required testing and perform necessary repairs.

General - All sanitary sewers and associated service lines shall be constructed watertight to prevent infiltration and/or exfiltration.

3. Hydrostatic Testing for HDPE Pipelines:

Perform hydrostatic testing of all HDPE pipelines as set forth in the following, and conduct said tests in the presence of the County Manager or designee and other authorized agencies, with 48 hours advance notice provided.

Provide all labor, equipment and material required for testing the pipeline upon completion of installation, pipe laying and backfilling operations, and placement of any required temporary roadway surfacing.

Disinfect all HDPE potable water mains prior to testing in accordance with the requirements of Section 025400 – Disinfection.

Test pipelines at 150 psi.

Field test all HDPE pipelines for leakage in accordance with manufacturer's recommendations for the size and class of pipeline installed. Unless other procedures recommended by the manufacturer are approved by the County Manager or designee, pressure test the pipeline as follows:

a. Fill pipeline slowly with water. Maintain flow velocity less than two (2) feet per second.

b. Expel air completely from the line during filling and again before applying test pressure. Expel air by means of taps at points of highest elevation.

c. Apply initial test pressure and allow to stand without makeup pressure for two (2) to three (3) hours, to allow for diametric expansion or pipe stretching to stabilize.

d. After this equilibrium period, apply the specified test pressure and turn the pump off. The final test pressure shall be held for not less than two (2) hours.

e. Upon completion of the test, the pressure shall be bled off from the location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the County Manager or designee at the point where the pressure is being monitored.

Allowable amount of makeup water for expansion of the pipeline during the pressure test shall conform to Table III, Test Phase Make-up Amount, contained in the manual "Inspections, Test and Safety Considerations" published by the Plastics Pipe Institute, Inc.

If any test of pipeline installed exceeds the amount of makeup water as allowed above, locate and repair the cause of leakage and retest the pipeline, without additional cost to the COUNTY. Repair all visible leaks regardless of the amount of leakage.

4. Force Main Pressure Testing: All force mains shall be subject to pressure testing at the following standards:

| System Operating Pressure | Test pressure | Duration |
|---|---|---|
| 50 PSI or less | 100 PSI | 2 hours |
| Greater than 50 PSI | 150 PSI or 2 times the operating pressure, whichever is greater. | 2 hours |

Allowable leakage on force mains shall be computed utilizing the standards for water loss in conformance with AWWA C600, the latest revision thereof.

5. Infiltration/Exfiltration Testing for Gravity Lines

The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 50 gallons per inch of inside pipe diameter per mile of pipe per 24 hours. No additional allowance shall be made for house service lines. Any part of or all of the system shall be tested for infiltration or exfiltration, as directed by the ENGINEER or as required by the County Manager or designee. The procedures and limitations for conducting infiltration/exfiltration tests shall be established at the pre-construction conference on a project-by-project basis. Air testing of gravity sewer mains may be required. All testing shall be run continuously for 24 hours, unless the County Inspector can visually verify that this test duration is not required due to the observed infiltration/exfiltration rate. The amounts of infiltration or exfiltration shall be determined by pumping water into or out

of calibrated drums, or by other methods approved by the Public Utilities Division, such as in-line V-notch weirs. Where infiltration or exfiltration exceeds the allowable limits specified herein, locate and repair the defective pipe, joints or other faulty construction at no additional cost to the COUNTY. If the defective portions cannot be located, remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits. All visible leaks shall be repaired regardless of the amount of leakage. Provide all labor, equipment and materials required and conduct all testing required under the direction of the ENGINEER.

a. Infiltration: Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The cumulative results of the entire collection system results shall not be a satisfactory method for gauging infiltration compliance. Each sewer section between manholes must permit infiltration no greater than the maximum allowable, as specified above.

b. Exfiltration: The exfiltration test, when required due to groundwater levels, will be conducted by filling the portion of the system being tested with water to a level 2 feet above the uppermost manhole invert in the section being tested. The cumulative results of the entire collection system results shall not be a satisfactory method for gauging exfiltration compliance. Each sewer section between manholes must permit exfiltration no greater than the maximum allowable, as specified above.

6. Low Pressure Air Testing

Contractor shall conduct air testing in accordance with ASTM specifications:

a. ASTM C-828 – for clay pipes.

b. ASTM C-924 – for concrete pipes.

c. ASTM F-1417 – for plastic pipes.

When low pressure air testing of gravity sewer mains is specifically required, all testing shall be run continuously for 24 hours, unless the County Inspector can visually verify that this test duration is not required due to the observed infiltration/exfiltration rate.

When air testing is specifically required, after completing backfill of a section of gravity sewer line, conduct a Line Acceptance Test using low pressure air. The test shall be performed using the below stated equipment, according to state procedures and under the supervision of the ENGINEER and in the presence of the County Manager or designee, with 48 hours advanced notice.

d. Equipment:

(1) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

(2) Pneumatic plugs shall resist internal bracing or blocking.

(3) All air used shall pass through a single control panel.

(4) Three individual hoses shall be used for the following connections:

(a) From control panel to pneumatic plugs for inflation.

(b) From control panel to sealed line for introducing the low-pressure air.

(c) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

e. Procedure:

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psi. The sealed pipe shall be pressurized to 5 psi. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

After a manhole-to-manhole reach of pipe has been backfilled and cleaned and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psi. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any ground water that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psi minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed “Acceptable”, if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psi (greater than the average back pressure of any ground water that may be over the pipe) is greater than the time shown for the given diameters in the following table:

| Pipe Diameter In Inches | Minutes |
|---|---|
| 8 | 4.0 |
| 10 | 5.0 |
| 12 | 5.5 |
| 16 | 7.5 |
| 18 | 8.5 |
| 24 | 11.5 |

Time in Minutes = 0.472 D
D = Diameter of pipe in inches

In areas where ground water is known to exist, install capped pipe adjacent to the top of the sewer lines. This shall be done at the time of the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water shall be determined by removing the pipe cap, and a measurement of the height in feet of water over the invert of the pipe shall be taken. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psi. This increases the 3.5 psi to 8.5 psi, and the 2.5 psi to 7.5 psi. The allowable drop of one pound and the timing remain the same).

If the installation fails to meet this requirement, determine the source of the leakage and repair or replace all defective materials and/or workmanship, all at no additional cost to the COUNTY.

B. DEP approval is required to use reclaimed (IQ) water for flushing and pressure testing of irrigation mains and potable water mains. The requirements for submitting a request to DEP are available from the County PUED.

3.2 LEAKAGE TESTS FOR STRUCTURES

A. Structure Leakage Testing: Perform leakage tests of manholes, wet wells, tanks, vaults and similar purpose structures before backfilling, by filling the structure with water to the overflow water level and observing the water surface level for the following 24 hours.

1. Make an inspection for leakage of the exterior surface of the structure, especially in areas around construction joints.

2. If visible leaks appear, repair the structure by removing and replacing the leaking portions of the structure, waterproofing the inside, or by other methods approved.

3. Water for testing will be provided by the COUNTY at the CONTRACTOR's expense.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 312316

EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for performing opencut excavations to the widths and depths necessary for constructing structures and pipelines, including excavation of any material necessary for any purpose pertinent to the construction of the Work.

B. Related Work Specified In Other Sections Includes:

1. Section 017416 – Site Clearing

2. Section 033100 – Concrete, Masonry, Mortar and Grout

3. Section 312319 – Groundwater Control for Open Cut Excavation

4. Section 312323 – Backfilling

5. Section 314000 – Shoring, Sheeting and Bracing

1.2 DEFINITIONS

A. Earth: "Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, wedging or special impact tools for their removal from their original beds, and removal of which can be completed using standard excavating equipment. Specifically excluded are all ledge and bedrock and boulders or pieces of masonry larger than one cubic yard in volume.

B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Engage the services of a Professional Engineer who is registered in the State of Florida to design all cofferdam and sheeting and bracing systems which the CONTRACTOR feels necessary for the execution of his work. Submit to the ENGINEER a signed statement that he has been employed by the CONTRACTOR to design all sheeting and bracing systems. After the systems have been installed, furnish to the ENGINEER an additional signed statement that the cofferdams and sheeting and bracing systems have been installed in accordance with his design.

C. If a detour is required, submit a traffic control plan for approval to County Manager or designee and/or the Florida Department of Transportation as described in Section 015526.

1.4 SITE CONDITIONS

A. Geotechnical Investigation: A geotechnical investigation may have been prepared by the COUNTY and ENGINEER in preparing the Contract Documents.

1. The geotechnical investigation report may be examined for what ever value it may be considered to be worth. However, this information is not guaranteed as to its accuracy or completeness.

2. The geotechnical investigation report is not part of the Contract Documents.

B. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions.

C. Underground Utilities and Collier County Damage Prevention Policy:

1. This policy has been put in place to avoid damage to Collier County underground utilities. A minimum distance of five feet (5') horizontally and eighteen inches (18") vertically must be maintained away from Collier County utilities. Any and all variations from this order must be the Water or Wastewater Department.

2. Before commencement of any excavation at road crossings or any boring or any drilling, the contractor shall mark the proposed run alignment with white paint or flags. Subsequent to placement of the white markings, the existing underground utilities in the area affected by the work must be marked by Sunshine One Call after proper notification to them by either calling 811 in Florida or toll free at 1-800-432-4770. Visit www.callsunshine.com for more information. Before commencing excavation for the work, potholing of all potential conflicts must be performed.

3. All lines in conflict must be physically located by the contractor and verified by Collier County Locate Department personnel before performing work. Utilities under concrete or pavement may require soft dig vacuum locates which also is the contractor's responsibility to perform. All utilities will be field marked per Sunshine State One Call's statutes and guidelines. For line verification or any

other information concerning locates, please call the Locate Department at 239-252-5922 during normal business hours. For line verification or emergency locates after hours, call emergency numeric pager at 239-890-0809. **In the event the potholing and/or vacuum soft dig does not locate the marked utility, work must be stopped and the affected utility owner contacted.** Failure to comply with this policy and obtain required signature(s) may result in delay or denial of permit.

4. The contractor must comply with all provisions of Florida Statute 556, the Underground Facility Damage Prevention and Safety Act.

D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 GENERAL

A. Clearing: Clear opencut excavation sites of obstructions preparatory to excavation. Clearing in accordance with Section 017416, includes removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during trench excavation.

B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 314000.

C. Safety: Whenever an excavation site or trench is left unattended by the CONTRACTOR or when an area is not within 100 feet of observation by the CONTRACTOR, the excavation site or trench shall be filled and/or, at the County's Manager or designee discretion, protected by other means to prevent accidental or unauthorized entry. Include barricades and other protection devices requested by the ENGINEER or County Manager or designee, including temporary fencing, snow fencing, or temporary "structure" tape. Such safety items shall not relieve the CONTRACTOR of any site safety requirements or liabilities established by Federal, State and local laws and agencies, including OSHA, but is intended as additional safety measures to protect the general public.

D. Hazardous Materials: If encountered, take care of hazardous materials not specifically shown or noted in accordance with Section 015000.

E. During excavation and any site work, take storm water pollution prevention measures to ensure that water quality criteria are not violated in the receiving water body and all state and local regulatory requirements are met.

## 3.2 STRUCTURE EXCAVATION

A. Excavation Size: Provide excavations of sufficient size and only of sufficient size to permit the Work to be economically and properly constructed in the manner and of the size specified.

B. Excavation Shape: Shape and dimension the bottom of the excavation in earth or rock to the shape and dimensions of the underside of the structure or drainage blanket wherever the nature of the excavated material permits.

C. Compaction: Before placing foundation slabs, footings or backfill, proof roll the bottom of the excavations to detect soft spots.

1. For accessible areas, proof roll with a ten wheel tandem axle dump truck loaded to at least 15 tons or similarly loaded construction equipment.

2. For small areas, proof roll with a smooth-faced steel roller filled with water or sand, or compact with a mechanical tamper.

3. Make one complete coverage, with overlap, of the area.

4. Overexcavate soft zones and replace with compacted select fill.

## 3.3 TRENCH EXCAVATION

A. Preparation: Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Unless shown or specified otherwise, preserve all trees and large shrubs. Hold damage to the root structure to a minimum. Small shrubs may be preserved or replaced with equivalent specimens.

B. Adequate Space: Keep the width of trenches to a minimum, however provide adequate space for workers to place, joint and backfill the pipe properly.

1. The minimum width of the trench shall be equal to at least 3.5 feet or the outside diameter of the pipe at the joint plus 8-inches for unsheeted trench or 12 inches for sheeted trench, whichever is greater. Conform the trench walls to OSHA Regulations.

2. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.

C. Depth:

1. Excavate trenches to a minimum depth of 8 inches, but not more than 12 inches, below the bottom of the pipe so that bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for pipe barrels and bells.

2. Standard trench grade shall be defined as the bottom surface of the utility to be constructed or placed within the trench. Trench grade for utilities in rock or other non-cushioning material shall be defined as additional undercuts backfilled with crushed stone compacted in 6-inch lifts, below the standard 8-inches minimum trench undercut. Backfill excavation below trench grade not ordered in writing by the ENGINEER with acceptable Class I, II or III embedment material to trench grade and compact to density equal to native soil.

D. Unstable or Unsuitable Materials: If unstable or unsuitable material is exposed at the level of the bottom of the trench excavation, excavate the material in accordance with the subsection headed "Authorized Additional Excavation".

1. Remove material for the full width of the trench and to the depth required to reach suitable foundation material.

2. When in the judgment of the ENGINEER the unstable or unsuitable material extends to an excessive depth, the ENGINEER may advise, in writing, the need for stabilization of the trench bottom with additional select fill material, crushed stone, washed shell, gravel mat or the need to provide firm support for the pipe or electrical duct by other suitable methods.

3. Crushed stone, washed shell and gravel shall be as specified in Section 312323.

4. Payment for such trench stabilization will be made under the appropriate Contract Items or where no such items exist, as a change in the Work.

E. Length of Excavation: Keep the open excavated trench preceding the pipe laying operation and the unfilled trench, with pipe in place, to a minimum length which causes the least disturbance. Provide ladders for a means of exit from the trench as required by applicable safety and health regulations.

F. Excavated Material: Neatly deposit excavated material to be used for backfill at the sides of the trenches where space is available. Where stockpiling of excavated material is required, obtain the sites to be used and maintain operations to provide for natural drainage and not present an unsightly appearance.

G. Water: Allow no water to rise in the trench excavation until sufficient backfill has been placed to prevent pipe flotation. Provide trench dewatering in accordance with Section 312319.

## 3.4 EXCAVATION FOR JACKING AND AUGERING

A. Jacking and Augering Requirements: Allow adequate length in jacking pits to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks, auger rig, and the jacking pipe. Provide sufficient pit width to allow ample working space on each side of the jacking frame. Allow sufficient pit depth such that the invert of the pipe, when placed on the guide frame, will be at the elevation desired for the completed line. Tightly sheet the pit and keep it dry at all times.

## 3.5 ROCK EXCAVATION

A. Rock Excavation: Excavate rock within the boundary lines and grades as shown, specified or required.

1. Rock removed from the excavation becomes the property of the CONTRACTOR. Transport and dispose of excavated rock at an off site disposal location. Obtain the off site disposal location.

2. Remove all shattered rock and loose pieces.

B. Structure Depths: For cast-in-place structures, excavate the rock only to the bottom of the structure, foundation slab, or drainage blanket.

C. Trench Width: Maintain a minimum clear width of the trench at the level of the top of the pipe of the outside diameter of the pipe barrel plus 2 feet, unless otherwise approved.

D. Trench Depth: For trench excavation, in which pipelines are to be placed, excavate the rock to a minimum depth of 8 inches below the bottom of the pipe or duct encasement. Provide a cushion of sand or suitable crushed rock. Refill the excavated space with pipe bedding material in accordance with Section 312323. Include placing, compacting and shaping pipe bedding material in the appropriate Contract Items.

E. Manhole Depths: For manhole excavation, excavate the rock to a minimum depth of 8 inches below the bottom of the manhole base for pipelines 24 inches in diameter and larger and 6 inches below the bottom manhole base for pipelines less than 24 inches in diameter. Refill the excavated space with pipe bedding material in accordance with Section 312323. Include placing, compacting and shaping pipe bedding material for manhole bases in the appropriate Contract Items.

F. Over-excavated Space: Refill the excavated space in rock below structures, pipelines, conduits and manholes, which exceeds the specified depths with 2,500 psi concrete, crushed stone, washed shell, or other material as directed. Include refilling of over-excavated space in rock as part of the rock excavation.

G. Other Requirements: Follow, where applicable, the requirements of the subsections on "Trench Excavation" and "Structure Excavation".

H. Payment: Rock excavation, including placing, compacting and shaping of the select fill material, will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.6 FINISHED EXCAVATION

A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.

B. Finish Methods: Provide a degree of finish that is ordinarily obtainable from blade-grade operations and in accordance with Section 312323.

3.7 PROTECTION

A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.

B. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.

C. It shall be the CONTRACTOR’s responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, coordinate work with the facility owner and perform work so as to cause as little interference as possible with the service rendered by the facility disturbed in accordance with Section 020500. Repair and/or replace facilities or structures damaged in the prosecution of the work immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the CONTRACTOR’s expense.

D. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Division 1.

3.8 AUTHORIZED ADDITIONAL EXCAVATION

A. Additional Excavation: Carry the excavation to such additional depth and width as authorized in writing, for the following reasons:

1. In case the materials encountered at the elevations shown are not suitable.

2. In case it is found desirable or necessary to go to an additional depth, or to an additional depth and width.

B. Refill Materials: Refill such excavated space with either authorized 2500 psi concrete or compacted select fill material, in compliance with the applicable provisions of Section 312323.

C. Compaction: Compact fill materials to avoid future settlement. As a minimum, backfill layers shall not exceed 6-inches in thickness for the full trench width and compaction shall equal 95% of maximum density, or 98% if under paved area of roadway, as determined by using ASTM D 1557. Perform compaction density tests at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.

D. Payment: Additional earth excavations so authorized and concrete or select fill materials authorized for filling such additional excavation and compaction of select fill materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.9 UNAUTHORIZED EXCAVATION

A. Stability: Refill any excavation carried beyond or below the lines and grades shown, except as specified in the subsection headed "Authorized Additional Excavation", with such material and in such manner as may be approved in order to provide for the stability of the various structures.

B. Refill Materials: Refill spaces beneath all manholes, structures, pipelines, or conduits excavated without authority with 2500 psi concrete or compacted select fill material, as approved.

C. Payment: Refill for unauthorized excavation will not be measured and no payment will be made therefor.

3.10 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.

B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.

C. Excess Materials: Be responsible for transport and disposal of surplus excavated material and excavated material unsuitable for backfilling or embankments at an off site disposal location secured by the CONTRACTOR.

3.11 REMOVAL OF WATER

A. Water Removal: At all times during the excavation period and until completion and acceptance of the WORK at final inspection, provide ample means and

equipment with which to remove promptly and dispose of properly all water entering any excavation or other parts of the WORK.

B. Dry Excavations: Keep the excavation dry, in accordance with Section 312319.

C. Water Contact: Allow no water to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.

D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other work under construction.

E. Protection: Provide adequate protection for water discharged onto streets. Protect the street surface at the point of discharge.

F. Sanitary Sewers: Discharge no water into sanitary sewers.

G. Storm Sewers: Discharge no water containing settleable solids into storm sewers.

H. Repair: Promptly repair any and all damage caused by dewatering the Work.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330502

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) pressure pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.

B. High Density Polyethylene (HDPE) – Collier County Utilities has the option of approving the use of HDPE for pipeline crossings of roadways, ditches, canals, and environmentally sensitive lands. HDPE mains shall have the same equivalent internal diameter and equivalent pressure class rating as the corresponding PVC pipe, unless otherwise approved by the County Manager or designee. For all roadway crossings requiring casing pipe, a steel or DR 11 HDPE casing pipe must be provided. The Department of Transportation having jurisdiction of said road and right-of-way must grant specific approval.

1.2 REFERENCED STANDARDS

A. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

1.3 QUALIFICATIONS

A. Furnish all HDPE pipe, fittings, and appurtenances by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.

1.4 SUBMITTALS

A. Submit to the ENGINEER, a list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for all HDPE pipe and fittings.

B. Submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

C. Submit shop drawings showing installation method and the proposed method and specialized equipment to be used.

1.5 INSPECTIONS AND TESTS

A. All work shall be inspected by the County Manager or designee who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the County Manager or designee, may order further construction to cease until all deficiencies are corrected.

1.6 WARRANTY AND ACCEPTANCE

A. Warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, the CONTRACTOR shall correct them without additional charge to the COUNTY before final acceptance. During the warranty period, the ENGINEER will determine if warranty repairs or replacement work shall be performed by the CONTRACTOR. The decision of the ENGINEER shall be binding upon the CONTRACTOR.

B. Installer Certification for The CONTRACTOR installing thermal butt fused HDPE pipe.

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE AND FITTINGS

A. Provide polyethylene pressure pipe manufactured from PE3408 polyethylene meeting AWWA C906 standards. When specified by the ENGINEER on the construction drawings, as an alternate to PVC, HDPE (ductile iron pipe sized) piping can be used for buried applications. Iron pipe sized (IPS) HDPE piping can be used for below-ground applications as determined by the ENGINEER.

B. The diameter of DR 11 HDPE, or Fusible PVC, casing pipe provided for roadway crossings or other purposes shall conform to the following table:

For PVC, DIP and HDPE Pressure Carrier Pipes:

| Carrier Pipe Nominal Size | Casing Pipe Nominal Diameter |
|---|---|
| Inches | Inches |
| 2 | 10 |
| 4 | 14 |
| 6 | 16 |

For PVC, DIP or HDPE Pressure Carrier Pipes (Continued):

| Carrier Pipe Nominal Size | Casing Pipe Nominal Diameter |
|---|---|
| Inches | Inches |
| 8 | 18 |
| 10 | 20 |
| 12 | 24 |
| 14 | 28 |
| 16 | 30 |
| 18 | 34 |
| 20 | 36 |
| 24 | 42 |

For Gravity Sewer Carrier Pipes:

| Carrier Pipe Nominal Size | Casing Pipe Nominal Diameter |
|---|---|
| Inches | Inches |
| 8 | 14 |
| 10 | 16 |
| 12 | 20 |
| 15 | 24 |
| 18 | 26 |
| 21 | 30 |
| 24 | 32 |
| 27 | 36 |

C. HDPE to HDPE pipe connections shall be by thermal butt fusion. Thermal fusion shall be accomplished in accordance with the pipe manufacturer and fusion equipment supplier specifications. The CONTRACTOR installing thermal butt fused HDPE pipe shall be certified in this type of work and have a minimum of five years experience performing this type of work. The CONTRACTOR shall provide certification to the Engineer of Record, who will provide the Engineering Review Services Department with the certification.

D. Qualification of Manufacturer: The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications. The Manufacturer's production facilities shall be open for inspection by the County Manager or designee. Qualified manufacturers shall be approved by the County Manager or designee.

E. See the County Approved Product List, Appendix F, for manufacturers that are qualified. Products from other manufacturers proposed for the work must receive approval from the County Manager or designee prior to ordering.

F. Materials: Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408 high density polyethylene meeting cell classification 345434C or 345434E per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

G. Polyethylene Pipe: Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter or ASTM D3035, Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and either quick burst or ring tensile strength (equipment permitting).

H. Color Identification: HDPE must have at least three equally spaced horizontal colored marking stripes. Permanent identification of piping service shall be provided by adhering to the following colors.

Blue – potable water (Underground HDPE pipe shall be one of the following:

a. Solid-wall blue pipe;
b. Co-extruded blue external skin; or
c. White or black pipe with blue stripes incorporated into, or applied to, the pipe wall.

White – raw water
Green – wastewater, sewage
Pantone Purple – non-potable irrigation, reclaimed or reuse water

I. Polyethylene Fittings and Custom Fabrications: Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.

J. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.

K. X-Ray Inspection: The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection for voids, and shall certify that voids were not found.

L. Fabricated Fittings: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16" IPS and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets. Part drawings shall be submitted for the approval of the ENGINEER.

M. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.

N. Back-up Rings and Flange Bolts: Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. The lap joint flange bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

2.2 MANUFACTURER'S QUALITY CONTROL

A. The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing materials shall be checked for:

1. Outside diameter, wall thickness, and eccentricity as per ASTM D2122 at a frequency of at least once/hour or once/coil, whichever is less frequent.

2. Out of Roundness at frequency of at least once/hour or once/coil, whichever is less frequent.

3. Straightness, inside and outside surface finish, markings and end cuts shall be visually inspected as per ASTM F714 on every length of pipe.

B. Quality Control shall verify production checks and test for:

1. Density as per ASTM D1505 at a frequency of at least once per extrusion lot.

2. Melt Index as per ASTM D1238 at a frequency of at least once per extrusion lot.

3. Carbon content as per ASTM D1603 at a frequency of at least once per day per extrusion line.

4. Quick burst pressure (sizes thru 4-inch) as per ASTM D1599 at a frequency of at least once per day per line.

5. Ring Tensile Strength (sizes above 4-inch equipment permitting) as per ASTM D2290 at a frequency of at least once per day per line.

6. ESCR (size permitting) as per ASTM F1248 at a frequency of at least once per extrusion lot.

C. X-ray inspection shall be used to inspect molded fittings for voids, and knit line strength shall be tested. All fabricated fittings shall be inspected for joint quality and alignment.

2.3 COMPLIANCE TESTS

A. In case of conflict with Manufacturer's certifications, the CONTRACTOR, ENGINEER, or County Manager or designee may request re-testing by the manufacturer or have re-tests performed by an outside testing service. All re-testing shall be at the requestor's expense, and shall be performed in accordance with the Specifications.

B. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

PART 3 EXECUTION

3.1 INSTALLATION OF HIGH DENSITY POLYETHYLENE PRESSURE PIPE AND FITTINGS

A. Install all high density polyethylene (HDPE) pressure pipe by direct bury, directional bore, or a method approved by the COUNTY or ENGINEER prior to construction. If directional bore is used, or if directed by the County Manager or designee or ENGINEER, surround the entire area of construction by silt barriers.

Install all high density polyethylene pressure pipe and fittings in accordance with Manufacturer's recommendations, and this specification. Take all necessary precautions to ensure a safe working environment in accordance with the applicable codes and standards.

3.2 HEAT FUSION JOINING

A. Make joints between plain end pipes and fittings by butt fusion, and joints between the main and saddle branch fittings by using saddle fusion using only procedures that are recommended by the pipe and fitting Manufacturer. Ensure that persons making heat fusion joints have received training and certification for heat fusion in the Manufacturer's recommended procedure. Maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

3.3 MECHANICAL JOINING

A. Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. A stainless steel sleeve insert shall be used with a mechanical coupling. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical cooling will cause the pipe to yield before the mechanical coupling disjoins. Do not use external joint restraints in lieu of fully restrained mechanical couplings.

3.4 BRANCH CONNECTIONS

A. Make branch connections to the main with saddle fittings or tees. Saddle fuse polyethylene saddle fittings to the main pipe.

3.5 EXCAVATION

A. Excavate trenches in conformance to this specification, the plans and drawings, or as authorized in writing by the County Manager or designee, and in accordance with all applicable codes. Remove excess groundwater. Where necessary, shore or reinforce trench walls.

3.6 LARGE DIAMETER FABRICATED FITTINGS

A. Butt fuse fabricated directional fittings 16" IPS and larger to the end of a pipe. Make up the flanged directional outlet connections in the trench.

3.7 MECHANCIAL JOINT AND FLANGE INSTALLATION

A. Install mechanical joints and flange connections in accordance with the Manufacturer's recommended procedure. Center and align flange faces to each other before assembling and tightening bolts. Do not use the flange bolts to draw the flanges into alignment. Lubricate bolt threads, and fit flat washers under the flange nuts. Tighten bolts evenly according to the tightening pattern and torque

step recommendations of the Manufacturer. At least one hour after initial assembly, re-tighten flange connections following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be 100 ft-lbs or less as recommended by the Manufacturer.

3.8 FOUNDATION AND BEDDING

A. Lay pipe on grade and on a stable foundation. Remove unstable or mucky trench bottom soils, and install a 6-inch foundation or bedding of compacted Class I material to pipe bottom grade. Remove excess groundwater from the trench before laying the foundation or bedding and the pipe. A trench cut in rock or stony soil shall be excavated to 6 inches below pipe bottom grade, and brought back to grade with compacted Class I bedding. Remove all ledge rock, boulders, and large stones.

3.9 PIPE HANDLING

A. When lifting with slings, use only wide fabric choker slings to lift, move, or lower pipe and fittings. Do not use wire rope or chain. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Do not use worn or defective equipment.

3.10 TESTING

A. Hydrostatic Pressure Testing: Pressure test and flush HDPE pipes after swabbing in accordance with Section 022501 and 025400.

END OF SECTION

SECTION 330503

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing buried PVC pipe, fittings and appurtenances.

1. Provide PVC pipe and fittings complete with all necessary jointing facilities and materials, specials, adapters and other appurtenances required for installation in and completion of the pipelines to be constructed.

2. Provide plain end or rubber gaskets (push-on or mechanical joint) of the types, sizes and classes shown or specified.

B. Related Work Specified In Other Sections Includes:

1. Section 022501 – Leakage Tests

2. Section 025400 – Disinfection

3. Section 330504 – Ductile Iron Pipe and Fittings

4. Section 330518 – Laying and Jointing Buried Pipelines

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

2. ASTM F679 - Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 12 In., for Water Distribution

4. AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 36 In.

5. AWWA C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 In. through 8 In.

6. ASTM D2321 - Underground Installation of Flexible Thermoplastic Sewer Pipe

7. ASTM F477 - Elastomeric Seals (Gaskets) For Joining Plastic Pipe

8. ANSI A21.10 - Ductile-Iron and Gray-Iron Fittings 3 inches through 48 inches, for Water and Other Liquids

9. ANSI A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings

10. Uni-Bell B-11

1.3 SYSTEM DESCRIPTION

A. Gravity Sewer Pipe - PVC pipe shall be of the integral wall bell and spigot joint type, which meets or exceeds all requirements set forth in ASTM D3034, latest revision. Minimum wall thickness shall conform to ASTM SDR 26. PVC pipes used for gravity sewers shall be green in color. Fittings shall be made of PVC plastic as defined by ASTM SDR 26 1784, latest revision. Flexible gasketed joints shall be compression type conforming to ASTM D3201, latest revision. Elastomeric joint gaskets shall conform to ASTM F477, latest revision. At all conflict crossings using 4”-12” substitute C900 PVC, Class 200, DR 14 and for PVC pipe 14” and larger use C905 PVC, Class 235, DR 18.

B. Force Main Pipe – PVC pipe meeting the latest revision of AWWA C900 or AWWA C905 shall be provided. For installation of 4” – 12” pipe, the pressure class shall be 150 with a DR of 18. For installation of 14” – 24” pipe, use pressure class 165, DR 25, meeting or exceeding the requirements of Uni-Bell B-11. PVC pipes used for force mains shall be green in color. Outside diameters shall be equivalent to ductile iron pipe of the same nominal size. Joints between successive lengths of straight PVC pipe shall be compression type using a single elastomeric gasket, per ASTM C-3139 and F477. Fittings for C900 pipe shall be C900 rated PVC. Joint restraint devices shall be provided for horizontal or vertical alignment changes using uni-flange type collars, epoxy coated, with high strength, and low alloy hardware (see County Approved Product List, Appendix F). PVC pipe direct buried beneath roadways, parking lots or parking lot entrances shall meet AWWA Specification C900 or C905, latest revision. All 4” to 12” pipe in such locations shall be a minimum of Class 200, DR 14, and all 14” to 24” pipe shall be a minimum of Class 235, DR 18. Pressure Class 250 ductile iron pipe may be used instead of PVC in these locations if approved by the County Manager or designee.

C. Potable, Raw and Non-Potable Irrigation Water Main Pipe - PVC shall conform to AWWA Specification C900 or C905, latest revision. All 6” to 12” pipe shall be a minimum of Class 150, DR 18 and all 14” to 24” pipe shall be a minimum of Class 165, DR 25 and shall meet or exceed Uni-Bell B-11. All potable water pipe shall bear the seal of the National Sanitation Foundation (NSF) for potable water pipe. All pipe shall be marked with the manufacturer's name, nominal size, type of

plastic and pressure rating. All PVC pipe used for potable water lines shall be predominately blue in color. Underground PVC pipes used for potable water lines shall be solid-wall blue pipe, will have a co-extruded blue external skin, or will be white or black pipe with blue stripes incorporated into, or applied to, the pipe wall. PVC pipes used for raw water shall be white in color. PVC pipes used for non-potable irrigation, reclaimed or reuse water shall be purple in color. Pipe O.D. shall be equivalent to cast iron pipe of the same nominal size. PVC pipe direct buried beneath roadways, parking lots or parking lot entrances shall meet AWWA Specification C900 or C905, latest revision. All 4" to 12" pipe in such locations shall be a minimum of Class 200, DR 14, and all 14" to 24" pipe shall be a minimum of Class 235, DR 18. Pressure Class 250 ductile iron pipe may be used instead of PVC in these locations if approved by the County Manager or designee.

D. Provide pipe of the various sizes and classes as specified in the schedule or shown. Restrain all pressure pipe joints.

E. Construct concrete encasements only with written permission from the Water Director.

1.4 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Submit the following shop drawings:

1. Pipe joints, fittings, sleeves and cleanouts. Where special designs or fittings are required, show the work in large detail and completely describe and dimension all items.

2. Fully dimensioned drawings of piping layouts, including fittings, couplings, sleeves, cleanouts, valves, supports and anchors. Label pipe size, materials, type, and class on drawings and include the limits of each reach of restrained joints. Provide cross sections showing elevations of cleanouts, pipes, fittings, sleeves, and valves.

3. Catalog data for pipe, joints, fittings, sleeves, harnessing and cleanouts.

C. Quality Control: Submit certificate of compliance for pipe, fittings, gaskets, coatings, specials, sleeves and cleanouts in accordance with this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all pipe, fittings and appurtenances as specified in Division 1 and Section 330518.

PART 2 PRODUCTS

2.1 MATERIALS

A. PVC Pipes and Fabricated Fittings: PVC pipe and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454-B as defined in ASTM D1784, and shall qualify for a hydrostatic design basis of 4,000 psi (27.58 MPa) at 73.4°F (23°C) per the requirements of PPI TR-3.

B. Fittings for Pressure Pipe: Provide all fittings meeting the requirements of Sections 330504.

C. Joints and Fittings for Gravity Sewer Pipe: Provide all fittings meeting the requirements of ASTM D 3034 and ASTM F 679. Provide joints that are a molded integral part of the pipe section. Do not use joints or couplings furnished loose. Provide joints with elastomeric gasket joints.

D. Joints for Pressure Pipe: Provide pipe with bell ends in accordance with AWWA C900 and AWWA C905. Provide joints with elastomeric gasket joints.

E. Elastomeric Gasket Joints: Provide elastomeric gasket joints in accordance with ASTM F 477.

F. Rubber Gasket Joints: Provide mechanical joints meeting the requirements of ANSI A21.11.

G. Color: Provide pipe made of 100 percent of the color specified. Provide green sewer or force main pipe. Provide blue potable water pipe. Provide white raw water pipe. Provide purple non-potable irrigation, reclaimed or reuse water pipe.

H. Pipe Marking: Provide mark on each pipe at internals of 5 feet or less to designate compliance with applicable ASTM or AWWA specification.

I. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed and are not ready to connect.

1. Remove all temporary bulkheads when they are no longer needed.

J. Date of Manufacturer: Provide pipe and fitting manufactured no earlier than 12 month period proceeding the date of the Agreement.

K. Wall Thickness for Pressure Pipe:

1. 4 through 12 inches diameter – provide AWWA-C900 DR 14, Class 200 for pressure pipe installed under pavement.

2. 14 through 24 inches diameter – provide AWWA-C905 DR 25, PR 165 for pressure pipe installed under pavement.

L. Restraining Devices: Joint restraining devices (see County Approved Product List, Appendix F) shall be placed at all bends, tees, plugs, reducers, and other fittings to provide lateral support, and shall conform to the Collier County Standard Details. Concrete thrust blocks shall only be utilized if approved by Collier County Utilities.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install all buried PVC pipe and fittings in accordance with the manufacturer's recommendations, approved shop drawings, as specified in Division 1, and Section 330518. For horizontal directional drilling of Fusible PVC, see Section 330502 for casing and execution requirements.

### 3.2 LEAKAGE TESTING

A. Cleaning: Flush clean and test all pipes after installation.

B. Testing: Test pipes for leaks and repair or tighten as required.

C. Procedures: Conduct tests in accordance with Section 022501.

### 3.3 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water before they are placed in service as specified in Section 025400.

### 3.4 SCHEDULES

A. Refer to the Schedules contained in Section 330518 Laying and Jointing Buried Pipelines for information on the piping that is to be constructed using the pipe materials and methods specified herein.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330518

LAYING AND JOINTING BURIED PIPELINES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.

1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.

2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.

3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.

4. Close off all lines with bulkheads when pipe laying is not in progress.

B. Related Work Specified in Other Sections Includes:

1. Section 022501 – Leakage Tests

2. Section 025400 – Disinfection

3. Section 312316 – Excavation - Earth and Rock

4. Section 312319 – Groundwater Control for Open Excavation

5. Section 312323 – Backfilling

6. Section 330502 – High Density Polyethylene (HDPE) Pipe and Fittings

7. Section 330503 - Polyvinyl Chloride (PVC) Pipe and Fittings

8. Section 330504 - Ductile Iron Pipe (DIP) and Fittings

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D 2774 - Practice for Underground Installation of Thermoplastic Pressure Piping

2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile

4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800

5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges

6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges

8. Uni-Bell - Handbook of PVC Pipe

9. Collier County - Utilities Standards and Procedures Ordinance

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.

C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.

1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.

2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.

D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.

1. Under no condition pass the sling through the pipe. Interior of pipe is to be kept free of dirt and foreign matter at all times.

2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.

3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.

E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.

F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.

1. Obtain approval for the type of blocking and stakes, and the method of installation.

G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed. Store gaskets in a sealed container (such as a vented drum). When long-term storage with exposure to direct sunlight is unavoidable, PVC pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation (Uni-Bell PVC Handbook).

1. Do not use any gaskets showing signs of cracking, weathering or other deterioration.

2. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

A. Repair of Sanitary Sewers and Services: Rebed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.

2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.

3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

## PART 2 PRODUCTS

A. The materials allowed for buried sewer pipes are PVC, HDPE or Ductile Iron Pipe.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.

1. Where groundwater is encountered, make every effort to obtain a dry trench bottom in accordance with Section 312319.

2. Perform trench excavation and backfill in accordance with Sections 312316 and 312323.

### 3.2 INSTALLATION

A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Where pipe deflections are used, do not exceed 80 percent of the maximum deflection limits shown in AWWA C600. Gravity systems will contain no deflection.

1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.

B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D 2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.

C. Pipe Laying - General:

1. Thoroughly inspect all pipe for damage and cleanliness. If found to be defective, tag, remove and replace pipe with satisfactory pipe or fittings at no additional charge to COUNTY.

2. Generally, lay all pipe with bells pointing ahead.

3. Carefully place all pipe, pipe fittings, valves and hydrants into trench by means of a derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage and check for alignment and grade.

4. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.

5. Wedging or blocking up the pipe barrel is not permitted.

6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.

7. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.

8. Keep all lines absolutely clean during construction.

9. Lay pipelines accurately to line and grade.

10. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Carefully lay all pipelines in trench excavations piece by piece using suitable tools or equipment on select fill bedding (refer to Utilities Standards and Procedures Ordinance, Section 9.1.2), concrete cradle or other foundations as shown, specified or ordered in writing. Prevent damage to materials, protective coatings and linings.

2. Do not dump or drop pipe or pipe materials into trench.

3. Properly secure the pipe against movement and make the pipe joints in the excavation as required.

4. Carefully grade and compact pipe bedding.

5. Bell Holes:

a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.

b. Thoroughly tamp bell holes full of select fill material following the making of each joint to provide adequate support to the pipe throughout its entire length.

E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

F. Field Cuts of Pipelines: For shorter than standard pipe lengths, make field cuts in a manner producing a cut square and perpendicular to the pipe axis. Remove any sharp, rough edges which otherwise might injure the gasket.

G. Procedure for sealing cut ends and repairing field damaged areas of polyethylene lined pipe and fittings is as follows:

1. Remove burrs caused by field cutting of ends or handling damage and smooth out edge of polyethylene lining if made rough by field cutting or handling damage.

2. Remove oil or lubricant used during field cutting operations.

3. Areas of loose lining associated with field cutting operation must be removed and exposed metal cleaned by sanding or scraping. For larger areas, remove loose lining and dirt, then roughen bare pipe surface by scratching or gouging with a small chisel to provide an anchor pattern for the epoxy. It is recommended that the polyethylene lining be stripped back by chiseling, cutting, or scraping about 1 inch to 2 inches into well adhered lined area before patching. This ensures that all areas of undercutting have been removed. Be sure to roughen an overlap of 1 inch to 2 inches of polyethylene lining in area to be epoxy coated. This roughening should be done with a rough grade emery paper (40 grit), rasp, or small chisel. Avoid honing, buffing, or wire brushing since these tend to make surface to be repaired too smooth for good adhesion.

4. With area to be sealed or repaired clean and suitably roughened, apply a thick coat of a two-part coal tar epoxy (see County Approved Product List, Appendix F). The heavy coat of epoxy must be worked into the scratched surface by brushing. Mixing and application procedure for the epoxy must follow the epoxy manufacturer's instructions.

5. It is important that the entire freshly cut, exposed metal surface of the cut pipe be coated. To ensure proper sealing, overlap at least 1 inch of the roughened polyethylene lining with this two-part epoxy system.

H. Ductile Iron Pipe Mechanical Joints:

1. Assembly: In making up mechanical joints, center the spigot in the bell.

   a. With a wire brush just prior to assembly of the joint thoroughly brush 8 inches outside of spigot and inside of bell with which the rubber gasket comes in contact. Remove all oil, grit, tar (other than standard coating) and other foreign matter from joint.

   b. Brush lubricant over the gasket just prior to installation. (Note: There is only one rubber gasket size for each diameter of pipe.)

   c. Press the gasket into place within the bell and move the gland into position, bolts inserted, and the nuts tightened finger tight.

   d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in AWWA C111. Spanner type wrenches not longer than specified in

AWWA C111 may be used with the permission of County Manager or designee.

e. Prime all bolts by dipping with a bituminous coating, except the threads. Coat threads immediately prior to installation of nuts.

f. Tighten all nuts 180 degrees apart alternately in order to produce equal pressure on all parts of the gland.

2. Torques: Apply the following range of bolt torques:

| Size Inches | Range of Torque - ft. lbs |
|---|---|
| 5/8 | 40 - 60 |
| 3/4 | 60 - 90 |
| 1 | 70 - 100 |
| 1-1/4 | 90 - 120 |

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

I. Ductile Iron Pipe Rubber Gasket Joints:

1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.

a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.

b. Apply a thin film of lubricant (AWWA C600) to the inside surface of the gasket that will come in contact with the entering pipe.

c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.

d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.

2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.

a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.

b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.

3. Optional Mechanical Joints: Use mechanical joint fittings that meet the requirements of Section 330504 with the rubber gasket joint pipe when specified or when rubber gasket fittings are not available.

J. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.

K. Temporary Blow-Off Assembly: Dead-end water lines shall be temporarily ended with a blow-off as shown in Collier County Standard Details. After full bore flush replace with a fire hydrant meeting the requirements of Section 331619.

L. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.

1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.

M. Concrete Encasement: Concrete encasement shall be constructed in accordance with Collier County Standard Details when:

1. A potable water main crosses at a depth that provides less than 18 inches clear distance from sewer lines in which case a Deviation Form request should be completed. Encase the sewer main unless specifically approved by Collier County Utilities. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Pressure test both pipelines to 150 psi after the concrete has properly cured.

2. A water main running parallel to a sewer line provides less than 10 feet separation from sewer lines, in which case a Deviation Form Request needs to be completed. Encase the sewer main unless specifically approved by Collier County Utilities.

3. The ENGINEER has ordered the line encased. NO POTABLE WATER MAIN SHALL BE ENCASED IN CONCRETE UNLESS SPECIFICALLY AUTHORIZED BY THE COUNTY MANAGER OR DESIGNEE.

The points of beginning and ending of pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

N. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Adjust valve-box to final grade at the time designated by the County Manager or designee.

2. Build a reinforced collar, as shown in the standard details, 18 inches by 18 inches by 6 inches with 2, #4 reinforcing bars around the valve box head in pavement, flush to grade of top of box. Similar collar shall be poured flush with grade and top of unpaved areas.

3. Satisfactorily reset any valve box that is moved from its original position, preventing the operation of the valve.

4. Replace any valve box that has been damaged.

O. Identification:

1. Metallized Warning Tape: For DIP and PVC pipe (other than gravity sewer pipe and laterals) to be installed, 3-inch detectable marking tape, of appropriate color and appropriate warning statement, shall be placed along the entire pipe length. In all cases, marking tape shall be installed two feet (2') below grade or one-half the pipe's bury, whichever is less, during backfill operations (refer to Utilities Standards Manual Section 1 – 1.1 and 2.2.1). All PVC pipe, PVC fittings, and identification tape shall be color-coded per Collier County Standards. HDPE pipe installed by horizontal directional drilling will not be required to be marked with metalized warning tape.

2. Electronic Markers (see County Approved Product List, Appendix F): Install electronic markers twenty-four inches (24") below final grade, above pipe, at all bends or changes in alignment and every two hundred and fifty feet (250') along the pipe between bends.

P. Separation From Other Pipe Systems:

1. Parallel Water and Sewer or Non-Potable Lines: Sanitary sewer lines, storm sewers or force mains shall be separated from water mains by a minimum clear vertical distance of 18 inches and a horizontal distance of 10 feet. Non-potable, reclaimed or reuse water mains shall be separated from water mains, gravity sewers or force mains by a minimum clear vertical distance of 18 inches and a horizontal distance of 5 feet center to center or 3 feet outside to outside. When this standard cannot be maintained, the sewer line shall be concrete encased for a distance of 10 feet each way from the water line and any other conduit, with a minimum vertical clearance of 12 inches

being provided at all times. See Section 1 - Design Criteria, Subsection 1.2.3.

2. Crossing Water and Sewer or Non-Potable Lines: Water mains crossing over a sewer or non-potable water line shall be (bottom of water main to top of sewer) separated by at least 18 inches unless local conditions or barriers prevent an 18 inch vertical separation. All crossings with vertical clearance less than 18 inches shall be made using sewer pipe thickness Class 200 AWWA C900 PVC pipe, and water pipe of Class 51 Ductile iron pipe, for a distance of 10 feet on each side of the crossing. The gravity sewer pipe in these locations shall be backfilled with USCS Class I bedding stone to a height of 6 inches above the crown of the pipe. When water mains cross under a sewer, both mains shall be constructed of C900 Class 200 PVC pipe with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing with no intermediate joints. Additionally, a section of water main pipe shall be centered at the point of crossing. See Section 1 – Design Criteria, Subsection 1.3.

Q. Aerial Crossings:

1. Pipes spanning elevated pier crossings shall be flanged ductile iron Pressure Class 350 pipe conforming to AWWA C115, C150 & C151. Pipe spanning on piers spaced further apart than normal pipe length of 18 or 20 ft. shall be multiple length pipe with interior flanged joints with a rubber gasket pipe (see County Approved Product List, Appendix F). The pipe wall thickness and flanged joints shall be designed to safely span the elevated piers under working pressure without exceeding the allowable stresses and conform to AWWA C150. Limit pipe deflection at center of span with pipe full of water to 1/720 of span length. Provide expansion joints for between above ground and below ground wastewater lines.

2. Flanges shall conform to AWWA C150 and C115. All bolts and nuts used in aerial crossings shall be stainless steel. Gaskets shall be full faced or recessed "O-Ring" type to prevent leaks in pipe under stress in the aerial crossing.

3. Outside surface of all pipe, flanges or spool pieces shall be shop coated with zinc primer, High Build Epoxy protective coat and a finish coat of polyurethane high gloss. Color shall be Federal Safety Blue for potable water mains and Pantone Purple 522 C for non-potable irrigation water mains.

4. Install operating valves or other flow regulating devices on each shoreline or at a safe distance from each shoreline to prevent discharge in the event the line is damaged.

5. Install supports for all joints in pipes utilized for aerial crossings and to prevent overturning and settlement. Expansion jointing is specified between above ground and below ground sewers and force mains.

3.3 FIELD QUALITY CONTROL

A. Testing: Test pipelines in accordance with Section 022501.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.

2. Gravity Sewer Lines: Test in accordance with Section 022501

B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.

1. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. Do not use any cracked, broken, or defective pieces in the work.

3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

3.4 CLEANING

A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.

B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

3.5 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water in accordance with Section 025400.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330523.13

HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Provide all necessary tools, materials, labor, supervision and equipment to successfully complete the installation of directionally drilled piping as specified herein and shown on the drawings.

B. Furnish all items necessary to perform the horizontal directional drilling operation and construct the pipe to the lines and grade shown on the drawings.

C. Use techniques of creating or directing a borehole along a predetermined path to a specified target location. Use mechanical and hydraulic deviation equipment to change the boring course and use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.

D. Accomplish drilling with fluid-assist mechanical cutting. Use a mixture of bentonite and water or polymers and additives. Use bentonite sealants and water to lubricate and seal the mini-tunnel. Use minimum pressures and flow rates during drilling operation as not to fracture the sub-grade material around and or above the bore.

E. Utilize small diameter fluid jets to fracture and mechanical cutters to cut and excavate the soil as the head advances forward.

F. Install an offset section of drill stem that causes the cutter head to turn eccentrically about its centerline when it is rotating for steering. When steering adjustments are required, rotate the cutter head offset section toward the desired direction of travel and advance the drill stem forward without rotation.

G. Drill a 2-inch to 3-inch diameter pilot hole using the mobile drilling system launched from the surface at an inclined angle. Enlarge the pilot hole with reamers as required.

1.2 REFERENCE STANDARDS

A. See Section 330502 for casing and carrier pipe diameter requirements.

B. American Association of State Highway and Transportation Officials (AASHTO).

C. Occupational Safety and Health Administration (OSHA).

1.3 DEFINITIONS

A. CONTRACTOR's Construction Drawings shall be defined as drawings by which the CONTRACTOR proposes to construct, operate, build, etc., the referenced item. Submit Construction Drawings for the sole purpose of providing the sufficient details to verify that the CONTRACTOR's work in progress is in accordance with the intent of the design.

1.4 SUBMITTALS

A. The ENGINEER will base the review of submitted details and data on the requirements of the completed work, safety of the work in regards to the public, potential for damage to public or private utilities and other existing structures and facilities, and the potential for unnecessary delay in the execution of the Work. Such review shall not be construed to relieve the CONTRACTOR in any way of his responsibilities under the contract. Do not commence work on any items requiring CONTRACTOR's Construction Drawings or other submittals until the drawings and submittals are reviewed and accepted by the ENGINEER.

B. The CONTRACTOR shall:

1. Submit for review complete construction drawings and/or complete written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunnel excavation approved. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER that the proposed materials and procedures will meet the requirements of this specification. Submit arrangement drawings and technical specifications of the machine and trailing equipment (including any modifications), three-year experience record with this type of machine and a copy of the manufacturer's operation manual for the machine.

2. Submit CONTRACTOR's Construction Drawings for the following items.

a. Complete details of the equipment, methods and procedures to be used, including but not limited to primary lining installation, timing of installation in relation to the excavation plan and sequence, bulkheads, etc.

b. Grouting techniques, including equipment, pumping procedures, pressure grout types, mixtures and plug systems.

c. Method of controlling line and grade of excavation.

d. Details of muck removal, including equipment type, number, and disposal location.

e. Proposed contingency plans for critical phases and areas of directional drilling, including repair of any existing utilities damaged during construction.

C. Quality Control Methods. Submit a description of quality control methods at least 10 days prior to the start of directional drilling to the ENGINEER. The submittal shall describe:

1. Procedures for controlling and checking line and grade.

2. Field forms for establishing and checking line and grade.

D. Safety. Submit procedures including, but not limited to, monitoring for gases encountered.

E. Submit hazardous chemical list as well as all MSDS and technical data sheets.

1.5 DESIGN CRITERIA

A. Compatibility of Methods.

1. The methods of excavation, lining, and groundwater control shall be compatible.

1.6 JOB CONDITIONS

A. Safety Requirements

1. Perform work in a manner to maximize safety and reduce exposure of men and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards.

2. Whenever there is an emergency or stoppage of work which is likely to endanger the excavation or adjacent structures, operate a full work force for 24 hours a day, including weekends and holidays, without intermission until the emergency or hazardous conditions no longer jeopardize the stability and safety of the work.

B. Air Quality.

1. Conduct directional drilling operations by methods and with equipment, which will positively control dust, fumes, vapors, gases or other atmospheric impurities in accordance with applicable safety requirements.

1.7 PERMITS

A. Obtain any and all other permits required for prosecution of the work.

## PART 2 PRODUCTS

### 2.1 GENERAL

A. Refer to Section 330502 for HDPE pipe material.

B. Refer to Section 330503 for Fusible PVC pipe material.

## PART 3 EXECUTION

### 3.1 GENERAL

A. The CONTRACTOR shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the CONTRACTOR's employees, the public, and adjacent property, whether public or private.

B. Obtain locations of all existing utilities within the horizontal directional drilling project area, whether shown on the plans or not, in coordination with the owners of such utilities. Be responsible for protection of such utilities from damage, and repair of any utilities damaged during or as a result of construction.

C. Anticipate that portions of the drilled excavation will be below the groundwater table.

D. Comply with all local, state and federal laws, rules and regulations at all times to prevent pollution of the air, ground and water.

### 3.2 EQUIPMENT

A. Diesel, electrical, or air-powered equipment will be acceptable, subject to applicable federal and state regulations.

B. Any method or equipment that the CONTRACTOR can demonstrate will produce the specified results will be considered.

C. Employ equipment that will be capable of handling the various anticipated ground conditions. In addition, the equipment shall:

1. Be capable of minimizing loss of ground ahead of and around the machine and providing satisfactory support of the excavated face at all times.

2. Provide a system to indicate whether the amount of earth material removed is equivalent to that displaced by the advance of the machine such that the advance rate may be controlled accordingly.

D. Provide adequate secondary containment for any and all portable storage tanks.

3.3 DIRECTIONAL DRILLING DATA

A. Submit daily logs of construction location, progress and events, including observations on the following:

1. Location and elevation of significant soil strata boundaries and brief soil descriptions.

2. Jacking pressures and torsional forces, if applicable.

3.4 CONTROL OF THE TUNNEL LINE AND GRADE

A. Construction Control.

1. Establish and be fully responsible for the accuracy of control for the construction of the pipeline to be installed, including structures, tunnel line and grade.

2. Establish control points sufficiently far from the tunnel operation so as not to be affected by construction operations.

3. Maintain daily records of alignment and grade and submit three copies of these records to the ENGINEER. However, the CONTRACTOR remains fully responsible for the accuracy of his work and the correction of it, as required.

4. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of tunnel constructed, or more often as needed or directed by the ENGINEER.

3.5 INSTALLATION OF TRACKING/LOCATING WIRE

A. Install all facilities such that their location can be readily determined by electronic designation after installation. For non-conductive installations, attach a minimum of two (2) separate and continuous conductive tracking (tone wire) materials, either externally, internally or integral with the product. Use either a continuous green-sheathed solid conductor copper wire line (minimum #12 AWG for external placement or minimum #14 AWG for internal placement in the conduit/casing) or a coated conductive tape. Conductors must be located on opposite sides when installed externally. Connect any break in the conductor line before construction with an electrical clamp, or solder, and coat the connection with a rubber or plastic insulator to maintain the integrity of the connection from corrosion. Clamp connections must be made of brass or copper and of the butt end type with wires secured by compression. Soldered connections must be made by tight spiral winding of each wire around the other with a finished length minimum of three (3) inches overlap. Tracking conductors must extend two (2) feet beyond the bore terminal points. Test

conductors for continuity. Each conductor that passes must be identified as such by removing the last six (6) inches of the sheath. No deductions are allowed for failed tracking conductors. Conductor ends must be wound into a small coil and left for future attachment to isolation valve boxes.

3.6 DISPOSAL OF EXCESS MATERIAL

A. Where such effort is necessary, cost for groundwater control during the course of the tunnel work shall be included in the unit contract price for the work.

B. Dewatering required during the course of the project to lower water table, to remove standing water, surface drainage seepage, or to protect ongoing work against rising waters or floods shall be considered incidental to the work being performed.

END OF SECTION

SECTION 333913

SEWER MANHOLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing sewer manholes and all other appurtenances for a complete installation. Provide precast reinforced concrete manholes conforming to ASTM C478 in accordance with the Collier County Standard Details.

B. Related Work Specified in Other Sections Include:

1. Section 055600 – Metal Castings

2. Section 099723 – Concrete Coatings

1.2 REFERENCE

A. Codes and standards referred to in this Section are:

1. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

2. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections

3. ASTM C 32 - Specification for Sewer and Manhole Brick (Made for Clay or Shale)

4. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings of sewer manholes as specified in Division 1.

B. Quality Control: Submit shop and field test reports of concrete samples tested in an approved laboratory.

## 1.4 DELIVERY, STORAGE AND HANDLING

A. General: Take every precaution to prevent injury to the manhole sections during transportation and unloading. Unload manhole sections using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and keep the sections under control at all times. Do not allow the manhole sections to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Division 1.

B. Damaged Section: If any manhole section is damaged in the process of transportation or handling (see Section 2.3.C below), contact the Public Utilities Wastewater Department for visual inspection. If the Wastewater Department deems it necessary to reject the manhole section, reject and immediately remove such sections from the site, and replace the damaged manhole sections at no increase in Contract Amount.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. See County Approved Product List, Appendix F, for acceptable manufacturers of plastic joint sealing compound and sewer manhole from and covers.

## 2.2 MATERIALS

A. Concrete, Steel Reinforcement and Aggregates: Provide reinforced concrete, cementitious materials, aggregates and steel reinforcement conforming to the requirements of ASTM C 478, with 4000 psi concrete, Grade 40 reinforcement bars, Type II cement, and a minimum wall thickness of 8 inches.

B. Manhole Frames and Covers: Provide manhole frames and covers as shown on the Collier County Standard details. Castings for manhole frames, covers and other items shall conform to the ASTM Designation A48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. The scating surfaces between frames and covers shall be machined to fit true so the frames and covers do not shift under traffic conditions or permit entry of storm water from flooding. Lifting or “pick” holes shall be provided, but shall not penetrate the cover. The words SANITARY SEWER, as well as COLLIER COUNTY shall be cast in all manhole covers except those owned by a private party. All manhole frames and covers shall be traffic bearing unless otherwise specified. Frames and covers shall be fully bedded in mortar to the correct finished grade elevation with materials shown in the COUNTY’s Standard Detail Drawings.

C. Preformed Joint Sealing Compound: Provide preformed joint sealing compound for joining manhole sections.

D. Concrete Protective Liner: Provide concrete protective liner conforming to Section 099723.

E. Pipeline Connections: Provide neoprene boots with type 316 stainless steel clamps of a design approved by the County Manager or designee for joining sewers to manhole riser sections. Fill the unfilled portion of the connection with mortar or concrete to guarantee a watertight seal.

F. Doghouse Manholes: Doghouse manholes over existing sanitary sewer pipes are permitted, and in a number of instances, preferred. Provide a concrete base a minimum of 8 inches thick, with proper reinforcing rods to prevent cracking. Pour concrete base upon a 12-inch base of gravel. Precast manhole rings may be set in the concrete over the existing pipe. Concrete should then be used to form both the bench and to seal the pipe entrances, both inside and especially outside. Once dry, remove the top of the pipe in the manhole.

G. Standard Manholes: The standard manhole shall be 4 feet or more in depth measured from the base of the cover frame to the top of the concrete footing and shall be of the concentric cone type, as shown in the Standard Details. If the manhole is 4 feet or less in depth, it shall be classified as a "Shallow Manhole" as specified below.

H. Shallow Manholes: The shallow manhole shall be 4 feet or less in depth measured from the base of the cover frame to the top of the concrete footing and shall be of flat top construction, as shown in the Standard Details.

I. Manhole Inverts: Form manhole inverts from concrete having a minimum 28 day compressive strength of 2500 psi, and as shown in the Standard Details. Inverts for "straight-through" manholes may be formed by laying the pipe straight through the manhole, pouring the concrete invert, and then cutting out the top half of the pipe. Construct curved inverts of concrete, as shown in the Standard Details, and form a smooth, even, half pipe section. Precast inverts may be used, however, no large "bowls" shall be permitted in the center of the manhole. To alleviate this problem, grout the invert to form a smooth, uniform invert as shown in the Standard Details. Maintain a 0.1 foot drop across the manhole.

J. Inflow Protectors: In all manholes, install an inflow protector manufactured from a high-quality 304 stainless steel with a consistent thickness of not less than 18 gage. The inflow shall have a deep-dish bowl design to allow easy and unobstructed removal of the manhole cover. The manhole inflow protector is to be manufactured with a one-piece rubber gasket installed at the factory for a tight, consistent fit. The rubber gasket is to be designed to securely wrap around the entire leading edge of the inflow protector at the point where it comes in contact with the manhole frame and cover. The wrap around rubber gasket is to be manufactured to a width of no less than 3/8 inches, consistent on top and bottom of the leading edge of the inflow protector. The gasket shall

be no more than 3/32 inches thick. The insert removal handle shall be manufactured of a high-quality stainless steel for strength and durability. The handle is installed in such a way that it does not interfere with the installation or removal of the manhole lid. The insert handle will be manufactured to withstand a minimum pull force of 500 pounds before it fails or separates from the insert. The inscription “PROPERTY OF COLLIER COUNTY UTILITIES” shall be etched, at the base of the handle frame, to provide a long-lasting identification marker for the COUNTY.

K. Chimney Seals: Install a minimum of two (2) precast concrete or HDPE riser rings with a chimney seal (see County Approved Product List, Appendix F) between manhole and cast iron frame.

2.3 SOURCE QUALITY CONTROL

A. If requested by the County Manager or designee, at least three cylinders shall be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each 9 cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.

B. The County Manager or designee reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.

C. Components of the manhole shall be free of fractures, cracks, and undue roughness. Concrete shall be free of defects, which indicate improper mixing or placing, and surface defects such as honeycomb or spalling. Cracks or broken ends due to improper handling will not be acceptable. No lift holes will be allowed except in rise and corbel sections. These holes shall not penetrate the wall and shall be filled with non-shrink grout after installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Lifting Holes: Grout lifting holes through the structure with non-shrink grout.

B. Precast Base: Provide a precast base of not less than 8 inches in thickness with a minimum dimension across the precast base of 72 inches poured monolithically

with the bottom section of the manhole walls, reinforced, with a minimum 28-day compressive strength of 3000 psi.

C. Joining Manhole Sections: Join precast sections using plastic joint sealing compound (see County Approved Product List, Appendix F) and trimmed prior to grouting. The first construction joint shall be not less than 2 feet above the base slab. Use tongue and groove joints suitable for the flexible gasket. Use non-shrink grout inside and outside for sealing between manhole precast sections. Grout shall be of a type acceptable to the County Manager or designee and designed for use in water. Seal all openings and joints watertight.

D. Top Termination: Terminate manhole tops at such elevations as will permit laying up grade rings under the manhole frame to make allowances for future street grade adjustments.

E. Drop Connections: Manufacture drop connections, where required on precast manholes, with the manhole elements at the casting yard. Drop manholes shall be constructed per the Collier County Standard Details.

F. Internal Protection: Provide internal protection for all manholes by either of the following:

1. Sewpercoat, calcium-aluminate mortar blend coating system, or

2. IET Coating system – surface preparation shall include pressure washing at 5,000 psi, dry abrasive blasting with black beauty steel slag and application of the IET coat at three (3) different intervals to a total thickness of 125 mils.

Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto manhole ring, seal onto and around pipe openings, and any other protrusions, completely cover the bench and flow invert. Provide a five (5)-year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system, and shall protect the structure for at least five (5) years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.
Repair internal coating of existing manholes cored during tie-in of new sewers by applying approved coating material as listed above in accordance with the manufacturer's recommendations. If existing manhole has an internal coating other than that listed above (e.g. epoxy coating), sandblast the interior of the existing manhole and apply an approved coating in accordance with the manufacturer's recommendations.

G. Coal Tar Epoxy: Coat all manhole, wet well, and valve vault exteriors with two (2) coats of coal tar epoxy to a minimum thickness of 8 dry mils.

END OF SECTION

NO TEXT FOR THIS PAGE