

**SECTION 01100
DESIGN CRITERIA**

PART 1 -- GENERAL

1.1 GENERAL

- A. These general design criteria are established for the design of water distribution, wastewater collection and reclaimed water systems in the jurisdiction of St. Lucie County Utilities (SLCU). This portion of the document shall be utilized concurrently with the applicable sections of the Construction Standards and Technical Specifications.

- B. All design and construction drawings for water distribution and wastewater collection systems shall comply with these standards, or the standards titled "Recommended Standards for Water Works," and "Recommended Standards for Wastewater Facilities," established by the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, or the standards established by the Florida Department of Environmental Protection (FDEP), which ever is more stringent, unless otherwise approved by the SLCU.

- C. The Design Engineer/Developer should supply the following prior to making a utility construction plan submission to SLCU:
 - 1. Prepare plans on 24" X 36" sheets, appropriate scale. Three sets are to be submitted initially. The plans shall be signed and sealed by a professional engineer licensed by the State of Florida.
 - 2. Obtain and submit Fire Marshall approval of fire protection system.
 - 3. Submit paving and drainage plan, preliminary plat, master utility plan for multi-phase project, key sheet, cover sheet with relevant location sketch, lift station calculations and two copies of the preliminary DEP forms.
 - 4. Show appropriate clear phase lines and match lines.
 - 5. Re-use previously approved detail sheets to minimize comments.
 - 6. Provide all applicable detail drawings.
 - 7. Call out interferences with conflicting pipes with indication of "over" or "under" on plan sheet.
 - 8. Profile sheets are required for gravity sewers (show all crossings). Profiles may be required for off-site mains.
 - 9. All road crossing and pavement cuttings shall be detailed and shall be in accordance with requirements of the particular authority governing the area.

10. Specify details for all connections to existing facilities.
11. A minimum of three (3) sets of shop drawings for all materials used in construction and three (3) sets of final construction plans must be submitted for review by SLCU prior to scheduling of the pre-construction meeting.

PART 2 -- WATER DISTRIBUTION SYSTEM

2.1 WATER MAIN DESIGN

A. System Size

1. Minimum system size shall be based on a hydraulic analysis of the maximum day demand plus fire flow requirements or peak hour demands, which ever is greatest, while maintaining a minimum 20 psi residual pressure throughout the distribution system. Maximum day and peak hour demand and method of computation shall be subject to review and approval by SLCU.
2. Minimum pipe diameter allowed shall be six-inch within loop systems and eight inch on dead-ends, unless otherwise approved by SLCU.

B. Fire Flow Requirements

1. In residential areas, design fire flow requirements shall be 500 gpm, while maintaining a minimum 20 psi residual pressure in the system. For commercial and industrial areas design fire flow requirement shall be 1,200 gpm, while maintaining a minimum 20 psi residual pressure in the system. These flow rates represent the minimum system design conditions. Should local fire ordinance and/or the State Insurance Services Office require different flow conditions, then the more stringent requirements shall prevail.

C. Water Main Materials

1. Water mains shall be PVC, HDPE or DIP. PVC (4"-12") shall be DR-18 manufactured in compliance with AWWA C900, and PVC (14"-20") shall be DR-18 in compliance with AWWA C905. HDPE pipe shall meet the requirements of AWWA C901 and C906 or shall be manufactured and tested in accordance with ASTM F 714, ASTM D2837 and ASTM 3350. DIP shall be a minimum Pressure Class 350, conforming to the latest standards of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51 and shall be cement-mortar lined with asphalt coating.

D. Water Main Locations

1. Depth of Cover - Mains eight inches in diameter and less shall have minimum cover of 30 inches. Mains 12" and larger shall have 48 inches of cover.
2. Location within right-of-way - Water mains shall be no less than five feet from the edge of roadway improvements, such as edge of pavement or back of curb/gutter. Where practical and consistent with other main locations in the area, water mains shall be located on the north side of east-west streets and on the east side of north-south streets. Placement of mains on or adjacent to interior property lines or on private property is discouraged, and will only be approved when unavoidable or when necessary for looping and when sufficient easements are provided to the operation and maintenance entity.
3. Horizontal and Vertical Separation
 - a. For parallel installations, water mains shall be laid with a minimum of 10-foot horizontal separation, edge of main to edge of main, from existing and proposed sewers.
 - b. For water mains crossing sewers, a minimum of 18 inches shall be maintained from the outside of the water main to outside of the sewer main. At the crossing, one full-length joint of water main shall be laid in such a way that both joints will be as far from the sewer as possible. Sanitary sewers, force mains and storm sewers should cross under water mains, wherever possible.
 - c. Where it is not practical to design for these separations, specific requirements from the regulatory agencies must be followed.
 - d. Horizontal separations of 15 feet to buildings, top of banks of lakes and canals and other structures shall be maintained.
4. Dead Ends - Dead ends shall occur only when absolutely necessary and be equipped with a blow-off device or fire hydrant for flushing purposes. All mains that dead end and that are intended for future expansion shall include a line size valve and blow-off. The gate valve shall be mechanically restrained in accordance with applicable construction standards. The blow-off must be designed to be removed without interruption to service. Blow-off devices shall be sized to provide a minimum of 2.5 feet per second flushing velocity in the water main.
5. Mechanical Restraint Requirements
 - a. Pipelines shall be restrained at all valves, bends, tees, crosses and dead ends for specified distance. This distance shall be determined by the Design Engineer in accordance with specific conditions/circumstances on each pipeline design project.

Determination of distances shall occur during design and be specified within the construction drawing.

- b. Mechanical restraint devices and specified length of restrained pipe shall be as specified in UNI-Bell PVC Pipe Association specification "UNI-B-13" for PVC Pipe and the Ductile Iron Pipe Research Association "Thrust Restraint Design", for Ductile Iron Pipe.

2.2 VALVES

A. General

1. All distribution systems shall be valved to facilitate the isolation of each section of pipeline between intersections of the grid system. Generally, the number of valves at an intersection shall be one less than the number of pipes forming the intersection. It is the intent of this criteria to provide for the isolation of mains that serve areas containing more than 25 service connections.

B. Spacing

1. Valves shall generally be spaced no more than 1000 feet apart. In high-density areas, valves shall be installed as necessary to minimize the number of persons affected by a break.

C. Type and Size

1. Valves twelve inches and smaller shall be gate type, cast iron, resilient seat and mechanical joints conforming to AWWA C509 latest revision. Valves shall be designed for a working pressure of not less than 200 psi, and each shall have the pressure rating cast into the body and manufacturer's name or initial cast into the body or bonnet.
2. Valves larger than twelve inches shall be butterfly type, ductile iron with rubber seat and mechanical joint ends with side gear operator.
3. Buried valves shall have two piece or three piece valve boxes where they are deeper than 36" below grade. Where the depth of the operating nut is deeper than 36" (unless otherwise specified), operating extensions shall be provided to bring the operating nut to a point 6" below finish grade. The extension shall be high strength, corrosion resistant steel construction and permanent attached to the operating nut or handle on the valve. A steel centering plate shall be welded to the extension.

2.3 FIRE HYDRANTS

A. Spacing and Location

1. Fire hydrants shall be provided at each street intersection within the distribution system and at intermediate points that will provide a 600 foot spacing between each hydrant in all water mains, transmission and distribution systems, or in accordance with local fire ordinance and state Insurance Services Office whichever is more stringent. A Fire Marshall approved plan is required with all preliminary plan submissions.
2. Location of fire hydrants shall be at least one foot from right-of-way/property line and within 15 feet from edge of pavement, face of curb, etc. (except as required by FDOT), no less than five feet from driveways and not within the swale/ditch area. Hydrants shall be located so as to minimize vulnerability to traffic. When placed within five feet of the edge of the street or paved area without raised curbs, the hydrant shall be protected from damage by the installation of 4" X 6' steel posts set three feet in to 12 inch diameter concrete filled holes.

B. Type and Size

1. Fire hydrants shall conform to the latest AWWA specifications C502, and shall be of the traffic-model type. The hydrant branch shall be six inch in diameter and have a six-inch isolation gate valve on the branch as close as possible to the main and restrained to the main. Hydrants shall be furnished with a breakaway feature that will break cleanly upon impact. In commercial/industrial districts, hydrants must be installed on a minimum 8-inch main and hydrants in residential districts installed on a minimum 6 inch looped mains.

C. Flow Requirements

1. Each fire hydrant shall be capable of delivering a flow of at least 500 gallons per minute with a residual pressure of not less than 20 psi in residential areas.

2.4 AIR RELIEF

- A. At points in the water main profile where entrapped air can accumulate, which may result in flow blockage, provisions shall be made to remove the air. This shall be accomplished in distribution systems by use of strategically placed fire hydrants or blow-offs. In general, air relief assemblies shall only be used at aerial crossings and other similar circumstances.

2.5 WATER SERVICE CONNECTIONS AND METERS

- A. Spacing and Length - Individual service taps shall not be placed closer than 18 inches apart. A minimum of 18 inches must be maintained from all water main joints and appurtenances. Individual service taps shall be constructed with double strap saddles and corporation stops. Services shall not exceed 100 feet in length to the meter with the meter generally placed at the property line, at an accessible location. Services shall have a minimum of 30" cover. All services crossing under roadways shall be installed in a casing with not less than 36" between the pavement and the top of the casing.
- B. Meters - Proper sizing of non-residential meters and services is the responsibility of the Developer or his Engineer subject to SLCU's approval. Dual metering of a single building service (i.e. two one-inch meters instead of one two-inch meter) shall not be permitted. Construction drawings shall include a typical meter installation for each meter to be installed. Standard piping configurations for all size meters are found in the standard details. Meters three inches and larger shall be installed above ground. The backflow prevention device shall be installed above ground, close to the meter. No taps or connections are allowed between the meter and the backflow prevention device. Meters shall be set in grassy unobstructed areas generally at property lines, clear from buildings, fences, shrubs, trees, fire hydrants, cable boxes, etc. Meter boxes shall be kept out of pedestrian walkways and out of driveway areas or other concrete/paved surface, unless approved by SLCU.
- C. Residential Meters - Meter size shall be as required by SLCU for single residences. Meters and boxes shall be provided and installed by SLCU in accordance with SLCU connection requirements. For water main construction in front of vacant lots, service lines shall be installed from the main to property line with a magnetic marker identifying the location of the end of the service. Service lines for existing residences shall be provided with a meter box installed at the end of the service in accordance with the standard construction details.

2.6 SURFACE WATER CROSSINGS

- A. For aerial or sub-aqueous crossing approvals, SLCU should be consulted before final plans are provided for review.
- B. Aerial Crossings - All pipelines must be adequately supported on an acceptable foundation/support. Plans must be signed and sealed by an engineer registered in the State of Florida. The installation must be protected from damage and must be accessible for repair or replacement. Valves should be placed at both ends of the water crossing, at the normal main depth, so that section of main can be isolated.
- C. Sub-aqueous Crossings - A minimum of three feet, or as establish by the regulatory agency, which ever is greater, shall be maintained from the top of the water main to the design bottom elevation of the open canal/ditch. Sub-aqueous pipe crossings shall be made of ductile iron pipe. For canal/ditches greater than fifteen feet in width the water main shall be designed with flexible, watertight joints. Valves should be installed at each end of the sub-aqueous crossing so that the sub-aqueous section of the water main can be isolated. Valves shall be easily accessible.

2.7 BACKFLOW PREVENTION/CROSS CONNECTION CONTROL

- A. There shall be no physical connection between a safe water supply and a questionable water supply, or a sanitary or storm sewage system that would allow unsafe water to enter the safe water system by direct pressure, vacuum gravity or any other means. All potable water services within sewage facilities shall be provided with an approved backflow-preventing device.
- B. The developer shall comply with the requirements of the St. Lucie County cross-connection control program.

2.8 CONNECTIONS TO EXISTING SYSTEM

A. Tapping Tees and Valves

- 1. Tapping sleeves shall be #304 stainless steel with flanged outlets. Tapping valves shall be resilient seat type with a flanged joint of the inlet side and a mechanical joint on the discharge side of the valves. Tapping valves shall have a 2-inch operating nut. Working pressure rating shall not be less than 200 psi. Gaskets between the flange faces of the tapping sleeve and tapping valve shall be 1/8" minimum thickness of neoprene rubber.

B. Size on Size Taps

- 1. Taps may be made on the same size main only when the main to be tapped is AWWA C900, C905 or Ductile Iron pipe.

PART 3 -- WASTEWATER COLLECTION

3.1 GRAVITY SEWER DESIGN

A. Flow

- 1. Sewer design shall be based on an average daily per capita flow of not less than 100 gallons of sewage flow for the estimated ultimate tributary population. Similarly for institutional, commercial, industrial parks, etc.; sewer systems shall be designed for the ultimate/buildout sewage flow. This may be estimated from existing records for similar developments. Average daily flow will then be adjusted with the appropriate design peak factors for lateral and trunk lines, which is to be based on factors outlined within "Recommended Standards for Wastewater Facilities" by the Committee of the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (Ten-State Standards).

2. All developments where foods will be prepared, processed or served shall have a grease trap of adequate capacity installed prior to wastewater entering the sanitary sewer system.
3. Any industrial wastes that could subject SLCU to an industrial pretreatment program will not be allowed to be connected to the system. Industrial wastes from service stations and manufacturing plants shall not be connected into the sanitary sewage system without pre-treatment and approval by SLCU.

B. Diameter and Slope

1. The minimum allowable diameter for gravity sewer systems shall be eight inches and more specifically sized to accommodate the flows as outlined under 3.1.A.1.
2. Slope - Gravity sewer mains shall maintain hydraulic slopes sufficient to maintain a minimum velocity of two feet per second, based on Manning's formula using an "N" value of 0.013, when flowing full or half full. As a guideline the following minimum slopes shall be provided; however, slopes greater than these are desirable. Installations where velocities of fifteen feet per second are proposed, due to topography or other unique circumstances, main and appurtenances must be protected against displacement and impact.

Gravity Sewer Diameter (inches)	Minimum Slope, % (feet per 100 feet)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08

C. Alignment

1. Gravity sewer mains shall be designed and constructed in straight alignments with uniform slope. Straight alignment shall be checked by either using a laser beam, lamping or other approved method.
2. Gravity sewer mains of different diameters shall connect at a sewer manhole. The invert of the larger main shall be lowered sufficiently below the smaller main to maintain the same energy gradient.
3. Gravity sewer main direction changes, within a sewer manhole, cannot exceed 90 degrees. Flow direction changes in excess of 45 degrees shall include an extra 0.1 feet of drop across the inflow and outflow of the manhole.

4. All gravity sewer mains shall terminate at sewer manholes.
5. Horizontal separation from water mains shall be 10 feet. Separation from reclaimed water mains shall be five (5) feet. Vertical separation from a water main shall be a minimum of 18 inches between the outside of the pipes. Sanitary sewers and force mains should cross under water mains. Reference Part 2 of this section for additional requirements related to separation of water and sewer piping.

D. Pipe Materials

1. All gravity sewer mains shall be designed to prevent damage from all anticipated live and dead loads. Where necessary, as determined by the Engineer, special bedding, haunching and initial backfill or other special construction methods will be required.
2. Polyvinyl Chloride (PVC) and Ductile Iron (DI) shall be acceptable as gravity sewer mains. PVC pipe shall meet the requirements of ASTM D3034 for SDR 35. Ductile Iron (DI) pipe shall be used in specific areas such as those discussed below and as otherwise requested by SLCU. DI pipe shall be a minimum Pressure Class 350 conforming to ANSI/AWWA C150/A21.50 (latest revision) and ANSI/AWWA C151/A21.51 and shall meet or exceed the requirements set forth in Part 2 of this section. DI pipe shall be required in specific areas such as:
 - a. Gravity main passing under or over any other pipeline with less than 18 inches clearance.
 - b. When there is less than three feet of cover between the top of the main to the finished grade. Absolute minimum cover on PVC pipe shall be three feet to the top of the pipe.
 - c. Any time sewer is separated from a water main by less than ten feet, horizontally, and approval is given by SLCU.
 - d. When the main is placed out of the road right-of-way, between buildings, along property lines, or in areas that will have extensive surface improvements or landscaping.
 - e. The last standard length joint of main entering a pumping station wet well.
 - f. Carrier pipe inside jack and bore casings.
3. When the maximum cover over the gravity main is greater than twelve feet then DIP, Pressure Class 350, is required to be installed.

4. Unspecified transitions from DIP to PVC are not allowed.

E. Service Connections

1. Magnetic markers shall be placed at the end of each service lateral.

3.2 MANHOLES

A. Location

1. Manholes shall be installed at the termination of all gravity sewer mains, grade breaks, changes in the sewer main diameter, changes in alignment and at distances not exceeding 400 feet.

2. Manholes shall be placed preferable in pavement, in accessible areas and shall be flush with the finished grade. If manholes are placed outside of hardened surfaces, a concrete collar shall be installed around the manhole ring.

B. Size and Depth

1. The minimum inside diameter of sanitary sewer manholes shall be four feet and have a minimum top opening of two feet. The minimum depth of manholes shall be four feet from the finished grade to invert of the manhole. If DIP gravity sewer main is used, minimum depth can be three feet with approval of SLCU.

C. Drop Manholes

1. Outside drop manholes shall be installed when the invert of the influent pipe is greater than 2.5 feet above the outgoing invert of the manhole. Where the difference in inverts is equal to or less than 2.5 feet, the invert across the manholes shall be grouted to prevent deposition of solids.

D. Flow Channel

1. The manhole shall have flow channels across the bottom and made to conform as closely as possible in shape and slope to that of the connecting sewers. The channel walls shall be shaped to the full height of the crown of the outgoing pipe in such a way as to not obstruct maintenance or hydraulic capacity of pipe. The minimum drop across a manhole with influent pipes greater than a 45 degree turning angle from the outgoing pipe shall be increased by one-tenth (0.1) of a foot.

E. Pipe and Service Connections

1. Pipe connections to manholes shall be made by use of prefabricated, rubber ring, water-stop type boots cast directly into the manhole at the factory or other type system approved by SLCU. The boot shall be a rubber-like sleeve cast in the precast manhole base with a stainless steel strap used to seal the sleeve to the pipe. The stainless steel strap shall be protected from corrosion with a bituminous coating.
2. Service connections shall generally be one size smaller than the gravity sewer main. Only one collector service connection may be directed into an end manhole with approval from SLCU. This is acceptable only if it is treated like a main, has proper elevations stated and has proper slopes and flow channels. Service connections will not be allowed into other manholes. Service lines that fall under the responsibility of the operating and maintenance entity of SLCU shall generally be limited to 50 linear feet of pipe.

PART 4 – RECLAIMED WATER SYSTEMS

4.1 GENERAL REQUIREMENTS

The design and construction of reclaimed water facilities shall be based on the criteria outlined in Chapter 62-610 Florida Administrative Code (FAC). Supplemental specifications for individual components of the reclaimed water system will be provided by SLCU.

4.2 RECLAIMED WATER MAIN DESIGN

A. Pressure

1. All reclaimed water mains shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 30 psi at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 65 psi and not less than 35 psi.

B. Diameter

1. The minimum size of reclaimed water mains used as trunk systems shall be 6 inches. Where applicable larger pipe shall be specified. Any departure from these minimum requirements shall be justified by hydraulic analysis and future reclaimed water demand, and must be approved by SLCU.

C. Pipe Materials

1. Reclaimed Water mains shall be PVC, HDPE or DI pipe. PVC pipe shall meet the requirements of AWWA C900 or C905. HDPE shall meet the requirements of

AWWA C906. DI pipe shall be minimum Pressure Class 350, conforming to the latest standards of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

D. Service Connections

1. There are two Customer Classifications established for the SLCU North Hutchinson Island service areas.
 - a. Class 'M' customers: All wastewater customers who are required to connect to SLCU reclaimed water system within 90 days of notification of availability by SLCU. Class 'M' customers shall agree to purchase and to use a volume of reclaimed water equal to the volume of wastewater discharged on a weekly, monthly or equivalent average basis.
 - b. Class 'V' customers: Class 'V' customers were connected to the SLCU wastewater collection system prior to the availability of reclaimed water in their area but have voluntarily connected to SLCU reclaimed water system. Class V customers shall not be required to use any minimum volumes of reclaimed water.

E. Basis for Design:

1. Initial projections of reclaimed water use for new developments shall be based on the number of Equivalent Residential Connections (ERCs) represented by the development and historical data for average wastewater flow per ERC. Reclaimed water use commitments by the customers shall be estimated as 85 percent of potable water demand or 100 gpcd, whichever is greater.
2. In order to establish connection requirements and provide guidelines for use of reclaimed water and construction of irrigation systems within developments on North Hutchinson Island, a Reclaimed Water Protocol was adopted by SLCU. The protocol describes procedures for notifying developers of required connections; establishes reclaimed water connection fees, rates charges and required usage; specifies requirements for private irrigation systems and design reports; addresses irrigation schedules; establishes inspection procedures; and describes penalties for noncompliance. This protocol shall be utilized as it applies to all developments on North Hutchinson Island.

PART 5 -- FORCE MAINS

5.1 FORCE MAIN DESIGN

A. Size

1. Force mains shall not be less than four-inch diameter and have a minimum design velocity of two feet per second. The main shall be sized to adequately handle the build-out peak operational pump flow of the wastewater lift station(s) serving particular areas. The requirements of sufficient scouring velocity, two feet per second, shall apply to the ultimate minimum operational pumping flow. Scouring velocities less than two feet per second, that are temporary, will be considered under special circumstances as approved by SLCU.

B. Location

1. Location within Right-of-Way - As a general guide, force mains shall be on the opposite side of the right-of-way as water mains.
2. Force mains should be installed under water mains at crossings. Maintain a minimum vertical separation of 18" and a horizontal separation of 10' between outside of pipes. Reference Part 2 of this section for additional requirements related to separation between sewer and water mains.

C. Materials

1. PVC sewer force main 4" – 12" in diameter shall be DR-18 manufactured in compliance with AWWA C900.
2. PVC Sewer force main 14" – 20" in diameter shall be DR-21 manufactured in compliance with AWWA C905.
3. Ductile iron pipe shall conform to latest standards of ANSI/AWWA C150/A21.50 for thickness design and ANSI/AWWA C151/A21.51 for manufacture.

D. Minimum Cover

1. Minimum cover to finish grade over force main shall be 48 inches.

5.2 VALVES

- A. Gate valves shall be used with the installation of force mains. Gate valves shall be ductile iron, resilient seat type with mechanical joints conforming to AWWA C509, latest revision.
- B. Buried valves shall have two piece or three piece valve boxes where they are deeper than 36" below grade. Where the depth of the operating nut is deeper than 36" (unless otherwise specified), operating extensions shall be provided to bring the operating not to a point 6" below finish grade. The extension shall be high strength,

corrosion resistant steel construction and permanent attached to the operating nut or handle on the valve. A steel centering plate shall be welded to the extension.

- C. Location of valves along subsidiary force mains shall generally be every 1,500 feet and at the point of connections to larger trunk mains. Where force mains are to be extended, a valve and plug shall be installed at the future point of connection. In high density areas, valves shall be installed at closer intervals as necessary to minimize the number of persons affected by the break.
- C. A valve shall be placed at the Right-of-Way line to delineate the change in maintenance responsibilities. SLCU shall control said valve.

5.3 AIR RELIEF

- A. Automatic air release valves shall be incorporated into the design of force mains at all high points of the main to prevent air accumulation within the main. The force main must be designed with a minimum of grade breaks and as flat as possible to consistently maintain a full pipe flow. Vacuum relief valves may be necessary to relieve negative pressures at extreme high points. Force main configuration and pumping conditions shall be evaluated for the placement and need of relief valves. Valve body shall be cast iron with stainless steel valve and float, suitable for the application, rated for 150 psi working pressure. Automatic air release valves shall be Crispin Model S20 (for 2" size) manufactured by Multiplex Manufacturing Co. or approved equal. Air release valves shall be installed in a manhole as shown on the standard construction details.

5.4 TERMINATION

- A. Force mains shall enter a termination wet well at a point equivalent to the operating level of the wet well. At a termination gravity manhole, the force main shall enter no higher than two feet above the flow line of the receiving manhole. Force mains shall never enter a manhole from a direction contrary to the direction of flow out of the manhole.

5.5 CONNECTIONS FOR FORCE MAINS

- A. Tapping Tees and Valves
 - 1. Tapping sleeves shall be split type epoxy coated iron body with flanged outlets for connecting to tapping valve. Finish to be fusion applied epoxy in accordance with AWWA C213. Tapping valves shall be gate valves with resilient seat type with flanged X mechanical joint connections meeting the requirements of 5.2.A of this section and shall be compatible with connecting sleeve and specially designed for wet tapping installations. Valve shall be Mueller H-667, or approved equal.

PART 6 -- WASTEWATER PUMPING STATIONS

6.1 STATION DESIGN

A. Type

1. All pumping stations shall be of the below ground type utilizing submersible pumps, unless otherwise justified and approved by SLCU.

B. Pumps

1. Pumping stations shall have a minimum of two, equal capacity, submersible pumps. When pumping rates exceed 1,000 gallons per minute, three or more pumps shall be required. Pumps will be sized such that with any one pump off-line, then the remaining pump(s) can handle the design flow.
2. Pumps shall be designed to pass a sphere three inches in diameter. Pump suction and discharge shall be at least four inches in diameter.
3. Pumps shall be designed to operate under a positive suction head. Pumps shall be explosion proof.
4. Pump curves and specifications shall be submitted to SLCU before installation of the pumps. Only pump brands approved by SLCU are acceptable.

C. Design Flows

1. The pumping design flow (peak design flow) rate shall be the maximum contiguous three month average daily flow multiplied by the appropriate peak hourly factor, as established by the Design Engineer, based on established standard engineering practices. The maximum contiguous three months average daily flow shall be from all contributory areas within the individual pumping station service area based on existing flows within the service area and anticipated flows through the next five years. Average daily flow figures shall be as specified within these standards.
2. All pumping units shall have the capacity to pump the peak design flow at the maximum computed system total dynamic head (TDH). This flow condition shall be coordinated for the proper force main sizing to ensure scouring velocities of at least two feet per second.

D. Wet Well Design

1. Wet well diameter shall be a minimum of six feet. The floor of the wet well shall have a minimum slope of one to one to the pump intake. Station

structures shall be of pre-cast concrete (Class II, 28 day compressive strength of 4000 psi, minimum) and lined on the interior with a fiberglass insert. The insert manufacturer must certify that the liner is intended for use in domestic wastewater lift stations.

2. The effective operational capacity of the wet well shall be sized for the maximum average daily flow, while not allowing the pump to operate more frequently than once every ten minutes.
3. Low water level shall be set to provide complete submergence of pumps at shut-off. Operational water-level shall generally be set two feet above the low water-level. The high water alarm shall be set at the invert elevation of the lowest influent pipe.
4. Buoyancy calculations shall be performed that do not take into consideration the wet well interior fillets, top slab, pumps and piping. Ground water elevation shall be assumed at natural ground level, unless special circumstances dictate other assumptions.
5. Wet well top slab elevation and electrical components of the station shall be above the 100-year flood elevation.
6. Submersible pumps shall be installed with guide rails, discharge connections, and lifting chains or lifting cables.

E. Controls

1. Power supply for all lift stations shall not be less than 230 volts, 3 phase, and 60 cycle service with emergency power feed hookup. A non-fused main disconnect shall be provided.
2. Electrical fixtures within enclosed areas where gas may accumulate shall comply with the National Board of Fire Underwriter's specifications for hazardous conditions. Electrical fixtures/components at the station shall be sized for expansion of the pump and load. Pump control panel housing shall be NEMA type 4X, constructed of stainless steel (14 gauge, minimum).
3. Pump level controls shall be "multi-level" or "probe stick" controller in lieu of the float type switches. Probe shall be capacitance type capable of sensing water level at several heights to control the pumps on/off levels and required level alarms. Level controllers shall be located in such a way that they will not be influenced by incoming flows. High-level alarms shall be provided with all pump stations.
4. Control circuitry within the control panel will provide automatic alternation of each pump during each cycle.

5. Each control panel shall have a main and emergency circuit breaker.
6. A generator power receptacle shall be provided on the exterior of the pump control panel and shall be compatible with SLCUs potable generators.

F. Valves and Piping

1. Gate valves shall be provided on the discharge of each pump. A swing check valve with spring and weighted lever arm shall be provided between the pump and gate valve. A valve pit or vault shall be provided for access to the valves.
2. Piping shall be a minimum of 4" in diameter and all piping and valves at the pump station and valve vault shall be flanged.

G. Water Service

1. Each pumping station shall be provided with a minimum one inch potable water supply. Each supply shall have a hose bibb and reduced pressure zone, backflow preventer.

H. Site Enclosures

1. All pumping stations shall be enclosed by six (6) feet high fencing with a twelve foot wide double gate centered on the wet well. Easements and/or right-of-way of sufficient size shall be provided for vehicle access to the station. An easement or deed for the lift station site will be required.
2. All pumping station sites shall be provided with minimum 6" thick stabilized/rock (over 2 ply 40 visqueen) or 6" thick concrete within the fenced area driveway that will allow routine access and connected to a paved road which will support all anticipated loads. Necessary driveway culverts shall also be provided in accordance with jurisdictional agency requirements.
3. The lift station control panel shall be located to meet all applicable codes.
4. Hinges for access hatches on both the pumping station top slab and valve pit shall be configured to allow both hatches to open outward or away from the other.

**** END OF SECTION ****