SECTION 14

GENERAL DESIGN and CONSTRUCTION DATA

SECTION 14

GENERAL DESIGN DATA

14.01 GRAVITY SEWERS

A. A terminal manhole shall be constructed no more than 20 feet upstream of the lift station. There shall be only one pipe connection from the manhole to the lift station. The pipe between the lift station and the manhole shall be C-900 PVC, DR18 pipe.

B. All sanitary sewers shall be constructed as required by the IRCDUS. Design to be done according to Recommended 10 State Standards for Wastewater Facilities, latest edition, and current regulatory agencies requirements.

C. Gravity sewers shall be designed for estimated peak flow at build-out of development, which shall be the product of a selected peaking factor and the projected or known average daily flow at ultimate system development.

D. Projections of average daily flow shall be made using a per capita sewage flow of 100 gallons per day and in accordance with Indian River County ordinances. Peak hour (design) flows shall be estimated using a peaking factor as outlined within Recommended 10 State Standards for Wastewater Facilities, latest edition.

E. All sewers shall be sized to provide ample capacity for peak design flows. The minimum allowable pipe size shall be 8-inch for collection lines and 6-inch for service laterals. Sewers shall be designed at slopes providing minimum velocities of 2 feet per second when flowing full or half-full, using a Manning's Roughness Coefficient (n) of 0.013. In general, the following minimum slopes shall be provided for sewer sizes 8-inch to 24-inch or approved by IRCDUS:

Pipe Diameter (inches)	Design Slope	Min Constructed
8	0.35%*	0.30%
10	0.28%	0.22%
12	0.22%	0.17%
16	0.15%	0.12%
18	0.12%	0.10%
24	0.08%	0.07%

The minimum design slope for the upper run of an 8-inch gravity sewer main is 0.40% with the minimum acceptable constructed slope being 0.35%.

F. Manholes shall be installed at the end of each line, at all changes in grade, size or alignment, at all junctions (excluding service laterals) and at distances no greater than 400 feet apart.

G. Sewer laterals shall not be connected directly into manholes unless approved by IRCDUS. IRCDUS will direct industrial wastewater into manholes on case-by-case basis.

H. Gravity sewers must be installed in front (under driveway/roadway pavement) of new buildings and/or under roadway pavement in dedicated Right-of-Way, all accessible to maintenance equipment.

I. Gravity mains shall be installed a minimum of 10 feet from any existing or proposed structure (walls, trees, transformer pads, etc.).

J. All sanitary manholes shall have a rain guard installed. Rain guards shall be corrosion proof, and have a relief valve, lifting strap and insert gasket. The relief valve shall relieve at a pressure of 1 psi and have a water leak rate of not more than 5 gallons per 24 hours.

14.02 WASTEWATER PUMPING STATIONS

A. A Remote Telemetry Unit (RTU) shall be included in all pump stations that are to be dedicated to Indian River County.

B. Wastewater pumping stations shall be designed to peak ultimate development flow from all contributory areas, in accordance with the Indian River County Wastewater Master Plan. Design average daily flow and peak hour flow shall be as set forth in Section 14.01.

C. Design of private lift stations that may be dedicated to the County at a later date shall meet IRCDUS design standards and shall be approved by IRCDUS. Any private station that does not meet IRCDUS design standards will not be taken over by the IRCDUS. Owners of private stations shall sign a form acknowledging future upgrade requirements if Owner is to dedicate a private station to the IRCDUS at a later date.

D. The County allows owners of single commercial properties, who wish to manage their own sewage collection on-site and transfer to the County's regional distribution collection system, to install and maintain a private lift station. The County <u>does not</u> permit more than one property to connect to a private lift station or private gravity sewer system, regardless if all the properties involved are owned by the same entity or not. If a developer proposes to extend sewer laterals from a private sanitary sewage collection system to other properties, then the properties must be unified as one parcel. If the properties cannot be unified, then each property must have their own private lift station, or the developer may install and dedicate to the County, a regional lift station that is constructed in accordance to IRCDUS design standards.

E. At least 2 pumps shall be provided for stations handling flows of 700 gallons per minute (gpm) or less. A minimum of 3 pumps shall be provided in stations where peak design flow exceeds 700 gpm unless otherwise approved by IRCDUS. In

all cases, standby-pumping capability shall be provided such that if any one pump is out of service, an alternate unit is available at equal or greater capacity.

F. The sewage pump system shall be capable of pumping the design peak flow at the maximum computed system total dynamic head. Maximum residual head within existing force mains shall be obtained and coordinated through IRCDUS.

G. Pumps shall be capable of passing spheres of at least 3-inches in diameter, and pump suction and discharge piping shall be at least 4-inches in diameter. Grinder pumps shall be used when riser pipes in wet well are less than 3-inches. Minimum valve (all types) size is 4-inches.

H. Wet wells shall be a minimum of 6-feet in diameter (ID). All wet wells shall be sized to provide a minimum pump cycle of 15 minutes. Pumps shall be designed to provide a minimum pump run time equal to half the cycle time. Additionally, wet wells shall provide sufficient space for installed equipment and required suction pipe submergence and spacing. The wet well floor shall have a minimum slope of one-to-one to the hopper bottom.

I. A separate valve vault shall be provided to house the gate valves, check valves and the emergency pump connection. The vault shall be of sufficient size to allow for installation, removal and maintenance of the valves. The top of the valve vault shall be a minimum of 12-inches above the high water level of the associated development. The wet well top elevation and the valve vault top elevation shall be a minimum of 12-inches above the associated elevations shown on the FIRM (Flood Insurance Rate Map) or 12 inches above the 25-year – 24-hour storm event elevation, whichever is greater.

J. In IRCDUS maintained lift station, pumps shall be per the Approved Manufacturers' Product List. If a grinder pump is proposed, see Approved Manufacturers' Product List. Only grinder pumps under 5.0 hp are permitted unless approved by IRCDUS.

K. Lift Station Calculation Checklist (all assumptions shall be listed in calculations and in an orderly fashion):

1. Design flow
2. Downstream force main size & down stream head pressure (in psi or feet of water)
3. Total Dynamic Head (TDH) of pumps shall exceed system head curve
4. Pump selection make, model, HP, impeller
5. a. Wet well dimensions
   b. Operating cycle and draw down time
6. Buoyant Computations Documentation:
   a. Buoyant force
   b. Downward force
   c. Safety factor
   d. Depth to water table
7. Designer name, date, design firm, Indian River County project number, project name, designer name of revisions

L. Only one influent gravity main is allowed into the lift station. The first upstream manhole from the lift station must be located within 20 feet +/- 1-foot of the lift station and as approved by IRCDUS.

M. The owner of a private lift station must have a maintenance agreement with a qualified firm (individual) to maintain the lift station. A label must be posted on the lift station stating the name and 24-hour phone number of the responsible firm before lift station may be placed into operation. A copy of a maintenance contract is to be submitted prior to issuance of the Utility Construction Permit. Maintenance contract must be renewed annually with copies of said contract submitted to IRCDUS

14.03 WATER DISTRIBUTION

A. All water mains shall be constructed in accordance with the Indian River County Water Master Plan, latest edition, or current AWWA Standard Specifications and current regulatory agencies requirements.

B. All distribution systems shall be properly looped, where feasible, and valved to provide maximum flexibility in providing service.

C. Design shall be based on an average daily consumption of 100-gallons per capita per day, a maximum day (MD) factor of 2.25 times average day and a peak hour factor of 4.5 times average day, per Indian River County Ordinance.

D. Distribution systems shall be sized to provide for 100 percent of the combined required fire flow and maximum day demand rate, while maintaining a 20-psi residual pressure in the distribution system.

E. All water mains shall be designed to provide a minimum pressure of 25-psi at ground level at all points in the distribution system under all conditions of flow (except as noted in D above).

F. Dead-end 4-inch water distribution system mains may be used to serve up to 10 ERU's, but shall not exceed 300 linear feet and down stream of last Fire Hydrant Assembly.

G. Fire flow requirements shall be as outlined within the Insurance Service Office (ISO) Fire Flow Requirements.

H. The minimum size main in diameter serving fire hydrants shall not be less than 6-inches in diameter for residential (single family) areas and 8-inches in diameter for commercial areas and multifamily residential areas.

I. Maximum fire hydrant spacing shall not exceed 1000-feet in single-family residential areas and 600-feet in commercial areas and multiple-family residential areas. No fire hydrant shall be over 500-feet from a single-family residence, multifamily residence, or commercial building.

J. All public fire hydrants shall be painted **"Federal Safety Red"**. Private fire hydrants shall have the body painted red with a white painted bonnet.

K. All fire mains shall be equipped with a double detector check valve assembly as shown in IRCDUS Standards Detail W-10.

L. A gate valve must be installed on the same water main as the fire hydrant. An additional gate valve is required if the distance between the first gate valve and the hydrant is greater than 18-feet as shown in IRCDUS Standards Detail W-2.

M. It shall be demonstrated that the water distribution system can supply the required demand rate and fire flow prior to acceptance by IRCDUS, and an on-site fire flow test shall be conducted by the Indian River County Fire Department or EMS. Prior to acceptance by IRCDUS, the fire hydrant shall be bagged as "OUT OF SERVICE".

N. Service connections and fittings shall be located outside of pavement, concrete curb, and/or concrete sidewalk areas unless otherwise approved by the IRCDUS.

O. Water mains and services shall be installed in front easements or in dedicated Rights-of-Way (not under pavement) accessible to maintenance equipment.

14.04 EARTHWORK AND BACKFILL

A. Excavation for all utilities and/or house connections shall be adequately guarded with barricades and lights, so as to protect the public from hazard. Streets, sidewalks, driveways, curbs, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the IRCDUS and/or Public Works.

B. Foundation material used for pipe bedding, from a minimum 6-inch distance below the pipe invert to the bottom 12-inches above the top of the pipe, shall be bank run sand and gravel.

C. All gravity sewer installation procedures must be in accordance with pipe manufacturers' recommendations. All mains shall be installed to have a minimum depth of 36-inches to the top of the pipe. Installation of gravity sewers shall be controlled by use of a laser to maintain proper grade. A maximum tolerance of ½" dip will be accepted in gravity sewer construction.

1. Trench – Trench width shall be kept to a minimum necessary for pipe installation and shall comply with current OSHA requirements. The trench bottom shall be graded uniformly to match the slope of the pipe.

2. Backfill – Only good quality backfill, free of stones, hardpan materials, roots, rocks, broken cement or other debris that might be damaging to the pipe shall be used. Backfill shall be placed in the trench in uniform lifts of 12-inches (maximum).

3. Compaction – All pipe must be compacted by hand tamping to the centerline, under the pipe. Backfill shall be compacted in lifts up to the surface to achieve a minimum compaction of 98% of maximum density in

roadways and shoulders. Easements shall be 95% density, in accordance with AASHTO Specifications T-180 and ASTM D-2167.

4. Dewatering – Construction shall be accomplished in a dry trench. Well pointing may be required, as necessary. All water entering excavations or other parts of the work shall be contained, collected and pumped to suitable places for disposal as permitted by the Local, State or Water Management District.

5. Sheeting – Sheeting and shoring shall be installed as may be necessary for the protection of the work, preservation of adjacent property and structures and the safety of employees. Sheeting and bracing shall be uniform to OSHA requirements.

D. Installation of force mains (sewer or reused water) shall be in accordance with latest AWWA Standard Specifications C-600 and the installation specifications for water lines in the Water Distribution Section, irrespective of the type of pipe selected. Location tape shall be placed continuously in the trench over all pipes, 12-inches below grade. Trace wire shall be wrapped on all pipes, valves, fittings, and all appurtenances, per Detail M-14.

1. Trench – Trench width shall be kept to a minimum necessary for pipe installation and shall comply with current OSHA requirements. The trench bottom shall be graded and alignment shall be parallel with roadway, where possible.

2. Backfill – Only good quality backfill, free of stones, roots, rocks, broken cement or other material that might be damaging to the pipe shall be used. Backfill shall be placed in the trench in uniform lifts of 12-inches (maximum).

3. Compaction – All pipe must be compacted by hand tamping to the centerline, under the pipe. Backfill shall be compacted in lifts up to the surface to achieve a minimum compaction of 98% of maximum density in roadways and shoulders. Easements shall be 95% density, in accordance with AASHTO Specifications T-180 and ASTM D-2167.

4. Dewatering – Construction shall be accomplished in a dry trench. Well pointing may be required, as necessary. All water entering excavations or other parts of the work shall be contained, collected and pumped to suitable places for disposal as permitted by the Local, State or Water Management District.

5. Sheeting – Sheeting and shoring shall be installed as may be necessary for the protection of the work, preservation of adjacent property and structures and the safety of employees. Sheeting and bracing shall be uniform to OSHA requirements.

E. Installation of water mains and brine mains must be in accordance with latest AWWA Standard Specifications C-600 Series, irrespective of the type of pipe selected. All installation procedures must also be in conformance with pipe

manufacturers' recommendations. Minimum depth of cover shall be 36-inches over the top of the pipe. Location tape shall be placed continuously in the trench over all pipes, 12-inches below grade. Trace wire shall be wrapped on all pipes, valves, fittings, and all appurtenances, per Detail M-14. Allowable deflection of the pipe joints and curvature of PVC pipe shall not exceed the manufacturers' specifications.

1. Trench – Trench width shall be kept to a minimum necessary for pipe installation and shall comply with current OSHA requirements. The trench bottom shall be graded and alignment shall be parallel with roadway, where possible.

2. Backfill – Only good quality backfill, free of stones, roots, rocks, broken cement or other material that might be damaging to the pipe shall be used. Backfill shall be placed in the trench in uniform lifts of 12-inches (maximum).

3. Compaction – All pipe must be compacted by hand tamping to the centerline, under the pipe. Backfill shall be compacted in lifts up to the surface to achieve a minimum compaction of 98% of maximum density in roadways and shoulders. Easements shall be 95% density, in accordance with AASHTO Specifications T-180 and ASTM D-2167.

4. Dewatering – Construction shall be accomplished in a dry trench. Well pointing may be required, as necessary. All water entering excavations or other parts of the work shall be contained, collected and pumped to suitable places for disposal as permitted by the Local, State or Water Management District.

5. Sheeting – Sheeting and shoring shall be installed as may be necessary for the protection of the work, preservation of adjacent property and structures and the safety of employees. Sheeting and bracing shall be uniform to OSHA requirements.

14.05 RESTRAINED JOINTS

A. Restrained joints shall be used on lines per the Table of the IRCDUS Standards Drawing M-3. Section of piping having restrained joints or those requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures up to 150 pounds per square inch (psi). The pipe fittings shall be as shown for restrained push-on joints or restrained mechanical joints on Page 416 in Section VI, in the Handbook of Cast Iron Pipe, 4th Edition. In all cases, restrained joints must be used per Section C below, with thrust blocks, per contract drawings.

B. Restrained pipe joints that achieve restraint by incorporating cutout sections installed in the bell of the pipe shall have a minimum wall thickness at the point of cutout that corresponds with the minimum specified wall thickness for the rest of the pipe.

C. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Drawing and formula below are provided for the Contractor as a guideline.

Where:

$$L = \frac{1.5PA(1-\cos X)}{Fw}$$

L = Length of pipe on each side of fittings or change in direction

P = 150 psi, unless otherwise noted

A = Cross-sectional area in square inches based on outside diameter (O.D.) of pipe

X = Angle of bend or change in direction in degrees

f = Coefficient of friction = 0.4 (maximum)

W = W (earth) + W (pipe) + W (water in pipe) W (earth) = unit weight of soil in pounds = (density of soil*) (depth of cover in feet) (O.D. in feet)
W (pipe) = unit weight of pipe in pounds
W (water in pipe) = unit weight of water in pipe

* Maximum 12-lbs/cubic ft above maximum water table elevation and 60-lbs/cubic ft below maximum water table

D. Bolts and nuts for restrained joints shall be 304 stainless steel.

E. The Contractor shall also provide restrained joints in accordance with the above criteria wherever below ground fittings <u>are</u> on lines 12-inches in diameter or less.

14.06 HORIZONTAL SEPARATION

A. All water, reclaimed water and/or sewer utilities shall be located a minimum horizontal separation equal to the depth of the pipe plus the diameter of the pipe from any permanent above ground structures (i.e., walls, trees, transformer pads, etc.).

B. A minimum 4-feet separation is required between water/sewer utilities and other underground utilities such as telephone, gas, cable, irrigation, etc.

C. All water and/or sewer utilities shall be located a minimum horizontal separation equal to 2 times the depth of the pipe plus the diameter of the pipe from the top of bank of any bodies of water (I.e., storm water ponds, canals, etc.).

D. All water mains shall be located a minimum horizontal separation of 3 ft. from storm sewer, stormwater force main or reclaimed water main.

E. All water mains shall be located a minimum horizontal separation of 3 ft., with 10 ft. preferred, from vacuum sanitary sewer mains.

F. All water mains shall be located a minimum horizontal separation of 6 ft., with 10 ft. preferred, from gravity or pressure sanitary sewer, sanitary sewer force main or reclaimed water main.

14.07 VERTICAL SEPARATION

A. Maintain 18” vertical clearance between any water/sewer utility and any other underground utilities such as telephone, gas, cable, irrigation, etc.

B. All water mains shall maintain a minimum 6” vertical clearance between storm sewer, vacuum sewer system and gravity sewer with 12” vertical clearance preferred. A 12” vertical clearance shall be maintained between all water mains and pressure sewer systems, stormwater force mains and reclaimed water mains.

END OF SECTION