COLLIER COUNTY GOVERNMENT

PUBLIC UTILITIES DIVISION

RELIABILITY GUIDELINES

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Prepared by The Public Utilities Division

Collier County's utility systems are undergoing considerable expansion in response to the County's growth, which is expected to continue for the next several years. It is essential that the infrastructure systems be designed not only to meet the capacity demands, but also to continue to properly function during "down" times, i.e., during normal maintenance procedures and during component failure events.

This document is intended to provide guidance on minimum design requirements for the wastewater, irrigation quality water, water and solid waste systems of Collier County.

What is reliability? It is a measurement of the ability of a component of a facility to perform its designated function without failure. Reference is made to vital components, whose operations or functions are required to maintain permit conditions, or are required to protect other vital components from damage.

RELIABILITY FOR WASTEWATER SYSTEMS

In the State of Florida, wastewater facilities are governed by the FDEP Domestic Wastewater Facilities Regulations, Chapter 62-600, adopted in 1996 and by the FDEP Collection Systems and Transmission Facilities, Chapter 62-604, 1996. These regulations refer to three classes of reliability - Class I, II, and III (highest to lowest). Collier County's systems, which involve reclaimed, or irrigation quality, water, all require Class I reliability. The technical standards for reliability design cited in the regulations is a 1974 EPA Publication entitled "Design Criteria for Mechanical, Electrical and Fluid Systems, and Component Reliability." Reference is also made to the "Ten State Standards," or the Great Lakes/Upper Mississippi River Board of State Public Health & Environmental Managers' "Recommended Standards for Wastewater Facilities," 1997.

All new wastewater facilities, wastewater expansions and modifications must be on the basis of an engineering report prepared by a licensed professional engineer in the state of Florida.

The following reliability design requirements apply:

I General Design Requirements

A. Facility Location – protect from physical damage up to the 100-year flood/wave action. Remain operational during and up to the 25-year flood/wave action levels.

B. Piping Requirements – for pipes subject to clogging, design for flushing capability without causing effluent contamination. Alternatively provide for sufficient connections utilize mechanical cleaning. Provide for draining of pipes. Provide for repair of in -plant piping without having to drain tanks.

C. Component Repair – each vital component must be able to be serviced or replaced without violating effluent permit conditions. This can also be satisfied by providing flow equalization.

D. Access Space – sufficient work space shall be provided around components to allow maintenance/removal without interfering with surrounding equipment.

E. Equipment Removal – Removal equipment must be provided to allow removal of all components.

F. Essential Service water, compressed air, and electricity shall be made available throughout the facility for maintenance and cleaning.

II Wastewater Collection Systems

A. Wastewater pumping stations are considered to be Class 1 reliability given that failure would cause a permit violation. Therefore the liquid, electrical, and instrumentation requirements of Wastewater Treatment (below) will generally apply.

B. Smaller pump stations (6" force main or less) shall include provision for plug-in emergency power or portable pumping as backup (DEP 62.604)

C. Pumping stations shall be protected from lightning and transient voltage surges (DEP 62.604)

D. Branches of intersecting force mains shall be provided with isolation valves (DEP 62.604)

E. Adhere to Ten States Standards and DEP Collection Systems and Transmission Facilities Regulations 62-604 for wastewater collection system design.

III Class I Wastewater Treatment

A. Liquid Train

1. Bar Screens – provide mechanically cleaned screens with duplicate or manual screens as backup.

2. Pumps – the pumping system must be designed such that with the largest pump out of service, the remaining pumps can handle the peak hourly flow.

3. Aeration Basin – a backup basin is not required, but at least two equal volume basins are required.

4. Aeration Blowers – design such that the design oxygen transfer be maintained with the largest unit out of service. The backup unit may be uninstalled.

5. Air Diffusers – provide that the largest section of diffusers can be taken out of service without impairing the oxygen transfer.

6. Secondary Clarifiers, Filters – shall be a sufficient number of units such that with the largest capacity unit out of service, the remaining units shall have a design capacity of 75% of the design flow.

7. Disinfection – shall be a sufficient number of units that, with the largest unit out of service, the remaining units have capacity to treat 50% of the total design flows.

8. Isolate Components – components shall have provision isolation by slide gates.

9. Protection from Overload – employ devices to protect the components from overloading due to cloggage or blockage.

10. Protect Against Buoyancy – provide ballast, anchoring and/or ground water relief to protect against uplift.

B. Solids Train

1. Alternate Methods of Sludge Treatment and Disposal
Alternate methods of disposal shall be provided if no backup units are used.

2. Sludge Holding Tanks – Holding tanks may be used as an alternative to backup components. The tank must be sized based on the expected component repair time.

3. Sludge Dewatering Units – There shall be a sufficient number of units to enable the design sludge flow to be dewatered with the largest capacity unit out of service – flexibility on this requirement is possible for units normally run less than 24 hours per day.

C. Electrical Systems

1. Electrical Power Source – two independent sources of power are required, either from two utility substations or a backup generator. Incoming lines shall be in separate conduits – sufficient fuel storage must be provided based on the expected outage.
2. Service to Motor Control Centers (MCC) - the internal power distribution shall be such that no single fault or loss of power source will result in disruption to more than one MCC.

3. Division of Loads at MCCs – vital components of the same type and function shall be divided equally as possible between two MCCs.

4. Power Transfer – Automatic transfer switching equipment shall be required when a time delay in power to manually transfer power would result in permit violations or equipment damage.

5. Breaker Settings – Shall be set so that the breaker nearest the fault will clear prior to activation of other breakers to the extent possible

6. Switchgear Location – Switchgear and MCCs shall be protected from sprays and moisture and from potential pipeline breaks. Ideally the equipment should be located in a separate room without process piping. Locate above the 100-year flood or wave height.

7. Motor Protection from Moisture – Waterproofed, totally enclosed or weather protected open motor enclosures shall be used for exposed outdoor motors. Motors for vital equipment shall be located above the 100-year flood or wave action or in a building protected to this level.

8. Provision for Equipment Testing - Provision for periodic testing and resetting shall be included while maintaining power to all vital components.

9. Electrical Room Conditions - All vital electrical components shall be installed in a controlled air-conditioned room, including items such as

motor control centers, electrical switchgear, main distribution panels, variable frequency drives and PLC equipment.

D. Instrumentation and Control Systems

1. Automatic Control – Automatic control systems shall have a manual override if loss would create a permit violation or other equipment damage. Backup PLCs and PLC logic shall be provided. Alarms and communications shall be provided.

2. Instrumentation – instrumentation whose failure would result in a permit violation shall be provided with a backup sensor and readout.

3. Alarms and Annunciators – Signals monitoring the condition of vital equipment must be localized and sent to a continuously manned location.

IV Wastewater Disposal

A. Effluent pumping stations and deep injection wells are considered to be Class 1 reliability given that failure would cause a permit violation. Therefore the liquid, electrical, and instrumentation requirements of Wastewater Treatment will generally apply.

B. Smaller pump stations (6" force main or less) shall include provision for plug-in emergency power or portable pumping as backup (DEP 62.604)

C. Pumping stations shall be protected from lightning and transient voltage surges (DEP 62.604)

D. Adhere to Ten States Standards and DEP Collection Systems and Transmission Facilities Regulations for wastewater disposal system design.

RELIABILITY FOR IRRIGATION QUALITY (IQ) SYSTEM

In the state of Florida, irrigation quality water facilities are regulated by the FDEP Reuse of Reclaimed Water and Land Application Regulations Chapter 62-610 adopted in 1999. Because a large percentage of wastewater is reclaimed, the reliability measures required for the irrigation quality water system is included herein and largely based on the wastewater requirements, Chapter 62-604 Collection Systems and Transmission Facilities.

All new irrigation quality water facilities, irrigation quality water expansions and modifications must be on the basis of an engineering report prepared by a licensed professional engineer in the State of Florida.

The following reliability design requirements apply:

I General Design Requirements

A. Facility Location – protect from physical damage up to the 100-year flood/wave action. Remain operational during and up to the 25-year flood/wave action levels.

B. Piping Requirements – for pipes subject to clogging, design for flushing capability without causing effluent contamination. Alternatively provide for sufficient connections utilize mechanical cleaning. Provide for draining of pipes. Provide for repair of in -plant piping without having to drain tanks.

C. Component Repair – each vital component must be able to be serviced or replaced without violating effluent permit conditions. This can also be satisfied by providing flow equalization.

D. Access Space – sufficient work space shall be provided around components to allow maintenance/removal without interfering with surrounding equipment.

E. Equipment Removal – Removal equipment must be provided to allow removal of all components.

F. Essential Service water, compressed air, and electricity shall be made available throughout the facility for maintenance and cleaning.

II Irrigation Quality Water Systems

A. Irrigation quality water pumping stations are considered to be Class 1 reliability given that failure would cause a permit violation. Therefore the liquid, electrical, and instrumentation requirements of Wastewater Treatment will generally apply.

B. Smaller pump stations (6" force main or less) shall include provision for plug-in emergency power or portable pumping as backup (DEP 62.604)

C. Pumping stations shall be protected from lightning and transient voltage surges (DEP 62.604)

D. Branches of intersecting force mains shall be provided with isolation valves (DEP 62.604)

E. Adhere to DEP's Collection Systems and Transmission Facilities (Chapter 62-604) and DEP's Reuse of Reclaimed Water and Land Application (Chapter 62-610) for irrigation quality water system design.

RELIABILITY FOR WATER SUPPLY SYSTEMS

In the state of Florida, water supply facilities are regulated by the FDEP Water Supply Facility Regulations Chapter 62-555, adopted in 1999, and the FDEP Drinking Water Standards, Monitoring, and Reporting Chapter 62-550, 2001. These regulations refer to the "Ten States Standards," or the Great Lakes/Upper Mississippi River Board of State Public Health and Environmental Managers "Recommended Standards For Water Works," 1997.

All new water supply facilities, water supply expansions and modifications must be on the basis of an engineering report prepared by a licensed professional engineer in the State of Florida.

FDEP regulations exist for both surface water supply and treatment systems as well as for subsurface water supply and treatment. In as much as Collier County relies exclusively on the Tamiami and Hawthorn Aquifers, only the reliability requirements for subsurface systems will be addressed.

I General Design Requirements

A. Facility Location – protect from physical damage up to the 100-year flood/wave action elevation. Remain operational up to the 25-year flood/wave action elevation.

B. Piping Requirements – for pipes subject to clogging, design for flushing. Alternatively provide for mechanical cleaning or ready disassembly for cleaning. Provide for repair of in-plant piping without having to drain tanks.

C. Component Repair – each vital component must be able to be serviced without violating permit requirements. This can also be satisfied by flow storage.

D. Access Space – sufficient work space shall be provided around components to allow maintenance/removal without interfering with surrounding equipment.

E. Equipment Removal – Removal equipment must be provided to allow removal of all components.

F. Essential Service – water, compressed air, and electricity shall be made available throughout the facility for maintenance and cleaning.

II Subsurface Raw Water Supply

A. Generally a level of reliability of 20% of the supply requirement is utilized for Tamiami wellfields and 33% is utilized for Hawthorn wellfields.

III Water Treatment

A. The treatment system must be capable of delivering the demand requirement to the distribution system with the largest unit (pump, tank, treatment component) out of service.

B. Backup units are required for all vital system components. In some cases they may be uninstalled if they can be quickly placed in service.

C. For membrane plants, the plant capacity is based on the sum of the numerical capacity of the membrane components or "skids" with the largest single unit out of service.

D. Pumps – The pumping systems must be designed such that with the largest pump out of service the remaining pumps can handle the peak flow.

E. Protect Against Buoyancy – Ballast or anchoring shall be provided to protect against uplift.

F. Electrical Systems

1. Electrical Power Source – two independent sources of power are required, either from two utility substations or a backup generator. Incoming lines shall be in separate conduits – sufficient fuel storage must be provided based on the expected outage.

2. Service to Motor Control Centers (MCC) - the internal power distribution shall be such that no single fault or loss of power source will result in disruption to more than one MCC.

3. Division of Loads at MCCs – vital components of the same type and function shall be divided equally as possible between two MCCs.

4. Power Transfer – Automatic transfer switching equipment shall be required when a time delay in power to manually transfer power would result in permit violations or equipment damage.

5. Breaker Settings – Shall be set so that the breaker nearest the fault will clear prior to activation of other breakers to the extent possible

6. Switchgear Location – Switchgear and MCCs shall be protected from sprays and moisture and from potential pipeline breaks. Ideally the equipment should be located in a separate room without process piping. Locate above the 100-year flood or wave height.

7. Motor Protection from Moisture – Waterproofed, totally enclosed or weather protected open motor enclosures shall be used for exposed outdoor motors. Motors for vital equipment shall be located above the 100-year flood or wave action or in a building protected to this level.

8. Provision for Equipment Testing - Provision for periodic testing and resetting shall be included while maintaining power to all vital components.

9. Electrical Room Conditions - All vital electrical components shall be installed in a controlled air-conditioned room, including items such as motor control centers, electrical switchgear, main distribution panels, variable frequency drives and PLC equipment.

G. Instrumentation and Control

1. Automatic Control – Automatic control systems shall have a manual override if loss would create a permit violation or other equipment damage. Backup PLCs and PLC logic shall be provided. Alarms and communications shall be provided.

2. Instrumentation – instrumentation whose failure would result in a permit violation shall be provided with a backup sensor and readout.

3. Alarms and Annunciators – Signals monitoring the condition of vital equipment must be localized and sent to a continuously manned location.

IV Distribution Facilities

A. The liquid, electrical, and instrumentation requirements of Wastewater Treatment will generally apply.

B. Remote pump stations shall include provision for plug-in emergency power or portable pumping as backup so as to maintain greater than 20 psi pressure (DEP 62.555.320 (6) & (7)).

C. Pumping stations shall be protected from lightning and transient voltage surges (Ten States' Recommended Standards for Water Works 6.1).

D. Branches of intersecting water mains shall be provided with isolation valves (Ten States' Recommended Standards for Water Works 6.1).

E. Adhere to Ten States Standards and DEP Water Supply Regulations for water distribution system design.