WATER

Summary of Changes

Authorization #1 - Amendments Effective March 31, 2012

Chapter Four (4)	Section Name	Amendment Description
Section 411	Raw Water Main Design Standards Part 5 - Construction	Referenced raw water pipes and appurtenances color code established by FDOH, Section 411
	Raw Water Main Design Standards Part 7 - Execution	Noted olive green as the color established by FDOH for raw water pipe
Section 450-B Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Added Clow Series F-6100 for gate valves 12-inch and smaller (Resilient Seated Only)
		Added Clow Series F-6114 for tapping valves (Resilient Seated Only)
	Category 2 of 10: Service Materials	Corrected Y Branch size
		Listed approved meter box providers (plastic lids), Carson Polyplastic and DFW Alliance
	Category 4 of 10: Pipe Fittings	Added JCM Series 432 for Tapping Sleeves (MJ on cast iron, DIP, PVC-900, etc.)
Section 450-E:	Water System Hydrostatic Pressure Test Report (PVC and DIP)	Updated/corrected maximum allowable leakage equation
Standard Drawing	WA-06 Jumper Connection (Typical)	Clarified Installation responsibilities for Jumper Connection (Typical)

Authorization #2 - Amendments Effective December 15, 2012

Chapter Four (4)	Section Name	Amendment Description
Section 410:	Part 4 – Design, E. Velocity and Diameter	County may authorize water main size variations
	Part 4 – Design, J. Restrained Joints	Clarified Restrained Joint Requirements
	Part 5, E – System Connection and Service Connections	Specified Material Type(s) for Service Connections
	Part 11 – Products - 11.12. A., Hydraulically Operated Control Valves	Hydraulically Operated Control Valve new equipment addition
Part 12.07	Part 12 – Construction, 12.07 A., - F., Hydraulically Operated Control Valves	(New) Detailed construction process for Hydraulically Operated Control Valves
Section 450:	Standard Drawings TOC -	Inserted reference for WA-09-1, WA-09-2, WA-10
Section 450A:	Testing and Inspection for Acceptance B., 5. 2. Procedure for Leakage Test	Updated/corrected maximum allowable leakage equation

WATER

Summary of Changes

Section 450-B Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Listed approved manufacturers for Hydraulically Operated Control Valves (Cla-Val, OCV, Watts/Ames)
Standard Drawing	WA-09 - WA-09-1 - (Master Meter)	Updated Drawing for Master Meter Assembly 3" and Larger with new by-pass configuration
Standard Drawing	WA-10 (Hydraulically Operated Control Valve)	Inserted new Hydraulically Operated Control Valve detail drawing

Authorization #3 - Amendments Effective May 22, 2013

Chapter Four (4)	Section Name	Amendment Description
Standard Drawing	WA-09-2 (Master Meter)	Deleted the drawing for Master Meter Assembly (3" and Larger Double Cross Connection Control Assemblies). (WA-09-1 deemed sufficient)
Section 413	Water Production Facility SCADA Standards	Added NEW Section 413 Water Production Facilities SCADA Specifications and iFix schematics

Authorization #4 - Amendments Effective November 17, 2013

Chapter Four (4)	Section Name	Amendment Description
Section 450-B Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Clarified VM-38 and VM-45 for plant, facility use only. Added VM200C (combo valve) -- also for plant, facility use only.
	Butterfly Valves 16-in and Larger (Rubber Seated (AWWA))	Val-matic 2000 butterfly valves authorized for use (16" and larger)

Authorization #5 - Amendments Effective September 10, 2014

Chapter Four (4)	Section Name	Amendment Description
Section 412	Part 3 – Plant Layout - H.	Included reference to key switch and Approved Materials Checklist
Section 450-A	Testing and Inspection for Acceptance, Part 3 - Execution - 3.01 Tests	Strike out first section under 3.01 "TESTS" and following "Swabbing", re-number
Section 450-B Approved Materials Checklist	Categories 2 and 3 of 10: Service Materials, Pipe Materials	Change "Tracer" to "Locating"
	Category 2 of 10: Service Materials	Updated meter box specification to reference cast iron reader
		Added Apollo brand dual check for potable meters (3/4" and 1") (Cat 2)
Section 450-D	Approved Meters List	Updated and/or replaced Hersey compound meters with Ultra Sonic; strainer NOT optional

WATER

Summary of Changes

Standard Drawings	WA-01-1 - Blow Off Valve Standard	Updated various notes (Locating, Test Station Box)
	WA-01-2 Blow Off Valve (Above Ground) Automatic	Deleted RPZ reference and replaced with dual check; also prohibit blow off on reclaimed systems
	WA-03 - Fire Hydrant Assembly	Deleted galvanized and replaced with brass or poly on sample port

Authorization #6 - Amendments Effective October 3, 2015

Chapter Four (4)	Section Name	Amendment Description
Section 410	Part 2 - Location - 2. Polk County Utilities Easements, a.,f.	Clarified easement size variation(s) authorization guidelines; easements adjacent to RoW must be for existing, NOT future use
Section 450-B Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Corrected Water Plus ARV Part No. to 131632
		Included new part list for automatic blow-off (economical alternative compared to all-in-one assemblies.)
		Added Team Industrial Products for Insertion Valve MJ/Ductile Iron RWGV (New valve type)
	Category 2 of 10: Service Materials	Updated ADS service tubing specification (CTS PE4710)
	Category 3 of 10: Pipe Materials	Updated JM Manufacturing name to JM-Eagle
	Category 4 of 10: Pipe Fittings	Updated Tyler Union Part Numbers and Comments for Restrained Joints, DIP, HDPE, and PVC
		Added Total Piping Solutions' Triple Tap Tapping Sleeves, DIP, PVC
	Categories 6-10 of 10: - Plants and Remote Facilities	Added Approved Facility Equipment: Categories 6-10 (New), Manufacturers, Part Numbers, Comments
Section 450-I	Water System Schedule of Values - Page 4 of 4	Added Reviewer signature lines for Total Constructed Value $ Amount at the end of this section
	Figure WA-01-2	Added #57 stone/bedding rock to Blow off Valve (Above Ground) Automatic

WATER

Summary of Changes

Authorization #7 - Amendments Effective August 4, 2016

Chapter Four (4)	Section Name	Amendment Description
Section 410	Part 4 – H. Dead Ends	Clarified water system looping requirements to avoid dead ends in accordance with GR-19-1
Section 450-B Approved Materials Checklist	Category 1 of 10: Valves and Accessories	Deleted Water Plus automatic blow-off
	Category 4 of 10: Pipe Fittings	Added new vendor, SIP for fittings (C153 SSB/ C110 Flange, Restrained Joints (DIP, PVC)
Standard Drawing	WA-04-2 – Fire Service Master Meter Assembly	Corrected note reference

Potable Water Main Standards and Specifications

PART 1 – GENERAL

A. Potable water mains shall be designed for the estimated tributary population, as delineated in the approved PCU's MASTER PLAN (latest edition) for the subject RUSA. When the DEVELOPER's potable water MASTER PLANS are required, potable water mains shall be designed for the estimated ultimate build out, as approved by PCU. The DEVELOPER shall be required to satisfy the domestic water and fire protection design flow for their planned development (PD) or the development of regional impact (DRI).

PART 2 - LOCATION

A. Mains shall be located within dedicated public rights-of-way or Polk County Utilities Easements.

1. Public Rights-of-Way

   When installed in rights-of-way, mains shall maintain a consistent alignment with respect to the centerline of the road. In all cases, mains shall be installed along one side of the road with crossings kept to a minimum.

2. Polk County Utilities Easements

   If a main is to be constructed within an easement, the centerline of the pipe shall be located along the centerline of the easement.

   a. When not adjacent to County or State rights of way, a minimum width of 20 feet for mains with inverts up to 5 feet below finish grade. For mains with inverts deeper than 5 feet below finish grade, the minimum width shall be twice the invert depth of the main plus 10 feet. All widths shall be rounded up to the nearest even foot. Width of the easement shall be based on the deepest invert depth of each segment of the subject main. Variations in easement size may be authorized by the COUNTY only when deemed appropriate provided that the existing or proposed level of service is maintained and operational maintenance and responsibility is established to the benefit of the COUNTY.

   b. Where multiple parallel mains are to be placed within a single easement, the FDEP required horizontal separation distance between the mains shall be added to the above minimum single main easement width and rounded up to the nearest even foot.

   c. Have a maximum length of 150 linear feet if the easement terminates in a dead end or an obstruction. Longer easements may be authorized if adequate turnaround and work zone area is provided as based on an AASHTO single unit vehicle. All locations and lengths of easements shall take in consideration

the safety and accessibility of PCU vehicles and personnel.

d. Be free of any permanent structures, such as footers, foundations, walls, screen walls, buildings, air conditioner pads, transformer pads, sign supports, roof overhangs, stormwater structure, swimming pools, storage sheds, patios, etc.

e. Be accessible at all times and not subject to standing water nor under the side slope or bottom of a lake, pond or stormwater retention area, except that perpendicular crossings under swales, small ditches and canals may be authorized in writing by PCU.

f. As designated by PCU for existing use, a Polk County Utilities Easement of not less than 15 feet in width shall be provided parallel to and directly adjacent to all County, State, and Federal rights-of-way. Notwithstanding PCU's easement requirements stated above and herein, easements in typical subdivision construction including those adjacent to internal subdivision roads shall be sized and conveyed in accordance with the LAND DEVELOPMENT CODE. The ultimate width of easements may be based on the number, type, size and depth of the utility lines within the easement.

g. Landscape buffers may be allowed to co-exist with Polk County Utilities Easements as long as raised landscape berms are not utilized. Walls shall be allowed as long as there are no potential conflicts with future repair or replacement of a main. Should PCU disturb or damage any landscaping or other installed improvements within the easement, PCU shall initiate repairs or install replacements in a timely manner at no cost to the property owner.

h. A triangular corner clip type of Polk County Utilities Easement, that has 20 foot long sides, shall be provided at all intersections of County, State, and Federal rights-of-way.

B. Mains within easements shall not be placed under septic tanks or their drain fields, storm water management facilities, buildings, retention ponds, athletic courts, swimming pools, fountains, patios, or other structures. Privacy walls and foundations shall not be placed parallel over mains or within the structure's zone of influence as based on a soil angle of repose of 45 degrees. Mains shall not be located along interior side or rear lot lines, unless approved in writing by PCU. Placement of mains along storm water retention pond berms may be allowed by PCU on a case by case basis when placed in a casing and if such a configuration results in efficient placement and utilization of the system. Service laterals, valves, and other main related improvements shall not be placed along interior side or rear lot lines.

C. Mains may be accepted for ownership and maintenance by PCU if the private streets are designed with an urban design cross section in accordance with the LAND

DEVELOPMENT CODE. Polk County Utilities Easements shall be dedicated over the entire private street rights-of-way. In addition, sufficient area must be available outside of paved areas to maintain PCU mains.

D. Mains shall be designed with uniform positive or negative slopes to avoid undulations and minimize high points and low points in the profile.

E. Offsite mains for all developments shall be extended along the entire frontage of each development. The minimum size of the main to be extended by the DEVELOPER shall be the same size that is the minimum main size required to serve the development. In the event that PCU desires to upsize the main, PCU shall reimburse the DEVELOPER in accordance with the provisions of the Utilities Code.

F. Mains with inverts located up to 5 feet below finish grade shall not be located closer than 10 feet from any structure that requires a Certificate of Occupancy. For mains with inverts located deeper than 5 feet below finish grade, the minimum distance of 10 feet shall be increased by one foot for each one foot of increased depth of the main's invert. All horizontal distances shall be rounded up to the nearest whole foot.

G. Unless specifically determined by PCU to be of benefit to its overall system, potable water infrastructure installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

PART 3 – DESIGN BASIS

A. Average Daily Flow and Peak Flows:

Average daily water flow shall be calculated by referencing the equivalent residential connection (ERC) flow rates as established in the "Utilities Administration Manual". Water flow rates shall be in accordance with the Peaking Factors contained in the Section entitled "Water Hydraulic Modeling Standards".

B. Fire Flow Requirements:

Fire flow requirements shall be determined in accordance with applicable COUNTY fire codes and the LAND DEVELOPMENT CODE. Where fire flow requirements exceed the anticipated available fire flow from the central water system, on-site fire protection system or other COUNTY/city fire department approved mitigation measures shall be utilized.

C. Design Calculations:

The DEVELOPER's ENGINEER shall submit signed, sealed and dated design calculations along with a compact disc copy of the WaterCad or WaterGems based model with the PLANS for all water distribution projects. Calculations shall show that

the water mains will have sufficient hydraulic capacity to transport the greater of peak hourly flows or the combination of maximum daily flows and fire flows while meeting the requirements of this Section. Minor head losses shall be incorporated in calculations including losses through meters, detector checks and backflow prevention assemblies.

PART 4 - DESIGN

A. Pipe Cover:

A minimum cover of 36 inches shall be provided for all water mains.

B. Pressure:

Distribution systems shall be designed to maintain a minimum static pressure of 20 psi at all points in the system, including the supply side of each meter, under average daily flow conditions. Due to internal water demands, higher minimum pressures may be required at commercial, industrial, and high-density residential areas. A maximum pressure of 35 psi shall be used in calculating domestic water pressure for residential structures up to 2 stories in height and all fire suppression systems. For excessive pressures, pressure-reducing provisions may be required.

C. Design Friction Losses:

Friction losses through mains shall be based on the Hazen and Williams or Darcy-Wiesbach formulas. In the use of the Hazen and Williams formula, the value for “C” shall be 130 for all pipes.

D. Design Pressure and Restraint

1. The main and fittings, including all restrained joint pipe fittings shall be designed to withstand pump operating pressures and pressure surges, but not less than 150 psi.

2. The restrained joint lengths shall be calculated consistent with the table format shown in the STANDARD DRAWINGS.

3. In the event that it is necessary to locate proposed mains or leave existing mains longitudinally under any part of a proposed roadway subject to regular non-residential traffic or with speed limits above 30 miles per hour, such mains shall have restrained joints.

E. Velocity and Diameter:

Only 4, 6, 8, 10, 12, 16, 20, 24, 30, 36, 42, 48, and 54-inch in diameter water mains shall be permitted. Variations in main size may be authorized by the COUNTY when deemed appropriate provided that the existing or proposed level of service is maintained and operational maintenance and responsibility is established to the benefit of the

COUNTY. Water mains with a minimum of 6-inch diameter shall be required for use with fire hydrants. Looped systems shall be required in low-density residential developments. Where looping of mains is not practical, the diameter of dead end mains shall be increased by one pipe size as based on hydraulic modeling. In cul-de-sac situations, mains may be reduced to a minimum of 4 inches in diameter after the last fire hydrant assembly if the length of the reduced size main does not exceed 500 linear feet or will not serve more than 40 ERC's. Mains shall be sized so velocities do not exceed six feet per second under the fire flow plus max day flow condition. In no case shall connections be made to cause velocities to exceed six feet per second in existing mains.

F. Material:

1. Water mains shall be either PVC or ductile iron pipe. HDPE may be used in specific applications as specified in this MANUAL or as approved by PCU. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.

G. Fire Hydrant Assembly Location and Spacing:

1. At a minimum, specifications outlined in the latest version of LAND DEVELOPMENT CODE and applicable COUNTY fire codes shall apply. Specifically, minimum fire flow rates for individual uses shall be established by the Fire Marshall.

2. Hydrants assemblies shall be placed on the same side of the roadway as the water mains and shall be placed at 500-foot intervals in commercial, multifamily, and industrial areas. Hydrant spacing for single-family residential and other areas shall be 1,000-foot intervals.

3. Unless otherwise directed by the Fire Marshall, fire hydrant assemblies in non-residential developments shall have a minimum horizontal separation distance from a structure that is equal to the vertical distance from the finished ground elevation to the eaves of the structure.

4. If an existing fire hydrant assembly has to be relocated more than five feet longitudinally for any reason, the main shall be tapped and the existing fire hydrant assembly re-installed by the DEVELOPER. Should the existing assembly not be in good condition according to PCU or not in compliance with this MANUAL, it shall be replaced with a new fire hydrant assembly by the DEVELOPER. Relocations of five feet or less shall be accomplished by the DEVELOPER utilizing a section of pipe of the approximately length, diameter, material, and restrained joints.

H. Dead Ends:

1. In order to provide adequate system reliability, reduce head loss, and avoid water quality degradation, all water mains shall be designed to provide complete system looping with all portions of the system being fed from at least two directions. At the discretion of PCU, dead ends may be permitted in cul-de-sacs if the project does not have future phases or it is determined that no other practical looping alternative is available. Dead end water mains in cul-de-sacs shall be designed and constructed as shown in Figure GR-19-1.

2. Where permanent dead-end mains occur, they shall terminate with a fire hydrant, flushing hydrant, or blow-off assembly for flushing purposes. Automatic-metered flushing devices may be required to maintain water quality in water mains. No potable water flushing device shall be directly connected to any WASTEWATER or STORMWATER SYSTEM.

I. Valves:

Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Inline valves shall be located no more than 500 feet apart in commercial, industrial, and high-density residential areas and no more than 1000 feet in all other areas. In addition, inline valves shall be utilized to isolate a maximum of 40 ERC's in order to reduce inconveniences to other customers. A minimum of two valves per tee and three valves per cross shall be required to isolate and maintain adequate service. Valves shall be placed at phase lines and located at the end of all water main extensions except at cul-de-sacs.

J. Restrained Joints:

1. Pressure piping, fittings, and other items requiring restraint shall be restrained by assemblies or devices designed for the maximum pressure condition (test pressure) in accordance) in accordance with the STANDARD DRAWINGS.

2. In the event that it is necessary to locate proposed mains or leave existing mains longitudinally under any part of a proposed roadway subject to regular non-residential traffic or with speed limits above 30 miles per hour, such mains shall have restrained joints or be constructed within steel casing(s).

K. Separation of Water Mains and Sewers:

1. Separation of potable water, reclaimed water, wastewater, and stormwater systems shall comply with FDEP regulations as detailed in the STANDARD DRAWINGS.

2. Water pipes shall not pass through any part of a storm sewer or manhole. A

minimum separation from storm water structures in accordance with the STANDARD DRAWINGS shall be maintained to facilitate maintenance and operation.

L. Combination Air/Vacuum Release Valves:

Automatic air release valves of appropriate size and number shall be installed in accordance with the STANDARD DRAWINGS to prevent air locking formation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. All such valves are required at significant high points of the main or as specified by PCU. Valves shall be clearly delineated on the profile view for each main in the PLANS. The ENGINEER shall submit calculations to PCU justifying the valve sizes and numbers as specified by AWWA M-51 "Air Release, Air/Vacuum, and Combination Air Valves".

M. Permanent sample stations shall be required in accordance with the STANDARD DRAWINGS and as directed by PCU.

N. Provision for the installation of temporary access points into and egress points out of the piping system for pigging and cleaning purposes shall be incorporated into the design for pipe diameters. Permanent and temporary access and egress points shall conform to the STANDARD DRAWINGS.

O. All buildings over two stories in height shall be provided with individual domestic water service booster pumps which shall be located within each building. Master booster pumps for developments shall not be permitted.

P. All buildings over two stories in height shall be provided with individual fire suppression system booster pumps which shall be located within each building. Master booster pumps for developments shall not be permitted.

PART 5 – SYSTEM CONNECTION AND SERVICE CONNECTIONS

A. Water services and connections shall conform to the applicable provisions of this MANUAL. Only 1, 2, 4, 6, 8, 10, and 12-inch services will be permitted. Where water services greater than 12 inches are required, additional services shall be provided. It is recommended that hospitals install at least two services. PCU will install services and connections to existing water systems up to two-inch, after payment of applicable fees and charges. The CONTRACTOR shall furnish service connections for new water main extensions.

PART 6 - WATER METERING

A. General:

All water service connections shall be metered. In general, the method and location of metering shall follow the guidelines listed below and is subject to PCU's determination of appropriateness.

1. All meters shall be sized in accordance with Section 3 of the "Utilities Administration Manual" and this MANUAL's "Approved Meters List".

2. An above ground meter assembly or assemblies shall be required for all non-residential installations regardless of size.

3. Single family and duplex residential meters that are two inches or smaller shall be installed in PCU approved meter boxes installed by the DEVELOPER.

4. On-site water systems downstream of and served by a master meter assembly shall be maintained by the Homeowners Association, Owners Association, or the Property Owner.

5. The installation, operation, maintenance, and reading of sub-meters shall be the responsibility of the DEVELOPER.

6. The ENGINEER shall obtain approval from PCU before finalizing the metering system design.

7. Unless specifically approved by PCU, meter boxes shall not be installed in sidewalks, driveways, or areas subject to vehicular traffic.

8. Meters subject to vehicular traffic shall be installed in a traffic rated meter box.

B. Single Family, Duplex, and Town Homes Developments with Public Rights-of-Way:

1. Each unit shall be individually metered. Services shall be installed as indicated by the STANDARD DRAWINGS.

2. Multi-family subdivisions and town home developments shall have a minimum 4-inch stub out for each building, or groups of buildings for fire sprinkling systems when required by the Fire Marshall. A 4 inch gate valve and a mechanical joint end cap shall be placed at the end of each stub out.

3. An approved cross connection control assembly shall be provided if a separate fire suppression system is required. Both the cross connection control assembly and the fire suppression system shall be owned and maintained by a Homeowner's/Condominium's Association.

C. Single Family, Duplex, and Town Homes Developments with Private Rights-of-Way:

1. Individual meters may be permitted in accordance with this Section if the private streets are designed with an urban design cross section in accordance with the latest edition of the LAND DEVELOPMENT CODE. A Polk County Utilities Easement shall be dedicated over all private street rights-of-way in their entirety. In addition, sufficient area must be available outside of paved areas to locate water mains, services, and meters. If the above criteria cannot be met, the development shall be master metered.

2. Town Home Subdivisions shall have a minimum 4-inch stub out for each building, or groups of buildings for fire sprinkling systems when required by the Fire Marshall. A 4 inch gate valve and a mechanical joint end cap shall be placed at the end of each stub out.

3. An approved cross connection control assembly shall be provided if a fire suppression system is required. The fire suppression system shall be owned and maintained by the Homeowner's/Condominium's Association.

D. Commercial, Industrial, Institutional, and Multi-Family Developments with Buildings adjacent to Public Rights-of-Way and without Private Fire Suppression Mains:

1. Each building shall be individually metered with the appropriate cross connection control assembly installed. All meters and cross connection control assemblies shall be located adjacent to public rights-of-way at the property line in a Polk County Utilities Easement.

E. Commercial, Industrial, Institutional, and Multi-Family Developments with Buildings adjacent to Private Streets and Private Fire Suppression Mains (including timeshares, condo hotels, apartments, and condominiums developments):

1. Apartments, Condominiums, and Multi-Family Developments shall have one of the following:

   a. A fire service type master meter to provide both domestic and fire suppression supply water. All projects shall be designed so that private sub-metering of individual units with the appropriate cross connection control assemblies shall be accommodated, or

   b. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

2. Commercial, Industrial, and Institutional Developments shall have one of the following:

    a. A fire service type master meter to provide both domestic and fire suppression supply water. All projects shall be designed so that private sub-metering of individual units with the appropriate cross connection control assemblies shall be accommodated, or

    b. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

3. Retail Centers and Malls shall have one of the following:

    a. A master domestic meter where fire suppression is provided by public fire hydrants. All developments shall be designed so that private sub-metering of individual units with the appropriate approved cross connection control assembly shall be accommodated in order to facilitate water conservation. The master meter shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

    b. A fire service type master meter assembly where fire suppression is provided by private fire hydrants and/or fire suppression systems. All developments shall be designed so that private sub-metering of individual units with the appropriate cross connection control assembly shall be accomplished in order to facilitate water conservation. The master meter shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

    c. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

    d. Individual domestic meters to each building or unit where fire suppression is provided by public hydrants. All meters shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

F. Meter Installation:

Meters will be installed after payment of applicable fees and charges to PCU. PCU approved meters that are larger than two inches shall be purchased and installed by the DEVELOPER. Installation of meters two inches and smaller shall be provided

and installed by PCU. Single family residential meters that are smaller than two inches in size shall be installed underground in an approved meter box. All other meters shall be installed above ground and located in a Polk County Utilities Easement located adjacent to but outside of public rights-of-way per the STANDARD DRAWINGS.

G. Meter Sizing:

PCU shall approve the size and quantity of all meters in accordance with Part 6 (A) (1) above. The DEVELOPER's ENGINEER shall provide sufficient information on estimated average, peak, and minimum flows so that meter size can be determined.

PART 7 - MATERIALS, INSTALLATION, AND TESTING

A. Applicable provisions of this MANUAL shall apply.

PART 8 - LOCATION AND IDENTIFICATION

A. A means for locating and identifying all water mains and valves shall be provided in accordance with this MANUAL and the STANDARD DRAWINGS.

PART 9 - CROSS CONNECTION CONTROL

A. General:

1. In order to protect the potable water supply system from contamination due to cross-connections, PCU approved cross connection control assemblies shall be installed on the potable water system as outlined in the "Cross Connection Control Policy Manual".

PART 10 – CONSTRUCTION

10.01 SCOPE OF WORK

A. These specifications cover the pipes, fittings, and appurtenances used for potable water systems. All materials shall be utilized in accordance with the appropriate "Approved Materials Checklist".

B. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, or samples for analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

C. Pipe and fitting interior linings shall conform to ANSI/NSF 61 list of approved materials standard.

D. Potable water mains, service piping, and connections shall be installed as indicated in the STANDARD DRAWINGS.

E. Pigging of mains shall be used to remove foreign materials in lieu of flushing.

PART 11 – PRODUCTS

11.01 PIPE MATERIALS

A. PVC Pipe:

PVC water distribution mains shall be manufactured in accordance with AWWA standard C900, C905, or C909, latest edition. Pipe that is 4 to 12 inches in diameter shall be C900 and have a dimension ratio of 18. Pipe larger than 12 inches in diameter shall be C905 or C909 and have a dimension ratio of 25. Pipe shall be blue in color.

B. Ductile Iron Pipe:

Ductile iron pipe shall conform to ANSI/AWWA A21.51/C151. Pipe shall be pressure class 350 for 3-inch to 12-inch, pressure class 250 for 16-inch to 20-inch, pressure class 200 for 24-inch, and pressure class 150 for 30-inch to 64-inch.

C. HDPE Pipe:

HDPE pipe shall be in accordance with AWWA C906 and shall have an outside diameter equal to ductile iron pipe for the same size. Pipe shall have a minimum dimension ratio of 11 for use with ductile iron pipe fittings and have a minimum working pressure of 150 psi. In the event that HDPE pipe with 42 inch and larger diameters are not available due to general industry limitations, PCU may consider the use of outside diameters based on iron pipe sizes.

11.02 JOINT MATERIALS

A. PVC Pipe Joints:

1. PVC pipe shall have integral bell push on type joints conforming to ASTM D3139.

2. Fusible PVC pipe lengths, as used in horizontal directional drill applications only, shall be assembled in the field with butt fused joints. The CONTRACTOR shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as specified by the pipe supplier and this MANUAL.

B. Ductile Iron Pipe Joints:

Joints for ductile iron pipe shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C111., Restrained or flanged joints shall be provided where called for in the PLANS. Flanged points shall conform to AWWA C115.

C. HDPE Pipe Joints:

HDPE joints shall conform to AWWA C906.

11.03 FITTINGS

A. Ductile Iron and PVC Pipe:

Fittings shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153.

B. HDPE Pipe:

1. Fittings used with HDPE pipe shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153 unless otherwise specifically approved by PCU.

11.04 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

A. Pipe and Fittings

Ductile iron pipe and fittings shall have an interior protective lining of cement-mortar with a seal coat of asphaltic material in accordance with ANSI/AWWA A21.4/C104. Exterior ductile iron pipe shall be coated with asphaltic material in accordance with a minimum one mil thick in accordance with ANSI/AWWA A21.51/C151.

B. Additional Applied Exterior Coatings for Above Ground Pipe and Fittings

Pipe, fittings, and valves shall be thoroughly cleaned and given one field coat (minimum 1.5 mils dry thickness) of rust inhibitor primer in addition to the existing factory applied coat of rust inhibitor primer. Intermediate and finished field coats of Alkyd shall also be applied by the CONTRACTOR with a minimum 1.5 mil dry thickness for each coat. Primer and field coats shall be compatible and applied in accordance with the manufacturer's recommendations. Refer to the appropriate "Approved Materials Checklists". Final field coat shall be blue for potable water.

11.05 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement of ductile iron pipe shall be in accordance with ANSI/AWWA A21.51/C105 and blue in color. Polyethylene encasements shall be

required in accordance with AWWA C105 and when crossing or within a power transmission and gas transmission easements.

11.06 SERVICE PIPE, STOPS, FITTINGS, AND SERVICE SADDLES

A. Service Connections at Main:

1. Service connections of one and two inches shall be brass body reduced port type corporation stops, equipped with connections compatible with the polyethylene tubing and threaded in accordance with specifications in AWWA C800, AWWA C901 and shall comply with NSF-61. One and two-inch services at the water main shall have connections for female iron pipe by female iron pipe thread, conforming to AWWA C509.

2. Service connections, 4-inch through 12-inch, shall have iron body resilient seat gate valves.

3. Service taps for air release valve installations shall utilize a 2-inch brass ball type corporation stop.

B. Service Pipe:

1. One-inch and two-inch service lines shall be PE4710 polyethylene tubing with SDR 9 dimensions, conforming to specifications in AWWA C800, AWWA C901, ASTM D-1248, ASTM D-3035, and ASTM D-2239.

2. Service lines, that are 4, 6, 8, 10, and 12 inches in size, shall be the same as water main pipe.

C. Service Control Valves at Property Line:

1. One-inch and two-inch size service curb stops shall be reduced port ball valves, made of brass, cast and machined in accordance with specifications in AWWA C800, AWWA C901, compliant with NSF-61 and compatible with polyethylene tubing connections.

2. For connections larger than two inches, the CONTRACTOR shall provide resilient seat gate valves.

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D. Service Fittings:

1. One-inch and two-inch fittings shall be brass, cast and machined in accordance with specifications in AWWA C800, AWWA C901, complaint with NSF-61, and compatible with polyethylene tubing connections.

2. Fittings, that are 4, 6, 8, 10, and 12 inches in size, shall be the same as water main fittings.

E. Service Tapping Saddles:

1. Stainless Steel Service Saddles:

   Saddles shall have epoxy or nylon coated stainless steel 18-8 type 304 straps, and iron pipe threads. Double straps shall be a minimum of 2-inches in width each, Single straps shall be a minimum of three inches wide. Saddles used to connect to HDPE pipe shall allow for the normal expansion and contraction of such pipe.

2. Service Connections:

   a. PVC and HDPE Pipe Service Saddle:

      i. One-inch and two-inch services shall utilize with controlled OD.

      ii. Four-inch or larger services shall use mechanical tapping sleeves, stainless steel sleeve for size on size taps, or epoxy coated sleeves with stainless steel hardware for all other sizes.

   b. Ductile Iron Pipe Service Saddle:

      i. One-inch and two-inch services shall use a controlled OD service tapping saddle with stainless steel straps and a ductile iron body that is either nylon or epoxy coated.

      ii. Four-inch or larger services shall be mechanical tapping sleeves, stainless steel sleeve for size on size taps, or epoxy coated sleeve with stainless steel hardware for all other sizes.

11.07 RESILIENT SEAT GATE VALVES

A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C515, latest revision, and in accordance with these specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve. Valves shall have a minimum pressure rating of 150 psi.

B. Valves that are 16 inches and larger shall have side actuators. The valve body, bonnet and bonnet cover shall be ductile iron ASTM A126, Class B. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550. A two-inch wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C515.

C. Directional Opening:

All valves shall open left or counter clockwise.

D. The valves shall be non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C515. Two stem seals shall be provided and shall be of the o-ring type. The stem nut must be independent of the gate.

E. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the line flow from either direction.

11.08 BUTTERFLY VALVES

A. Typically, butterfly valves shall not be installed within any PCU system, except directly adjacent to storage tanks for isolation purposes.

B. Butterfly valves and operators shall conform to the "AWWA Standard Specifications for Rubber Seated Butterfly Valves", Designation C504, latest version, except as hereinafter specified, shall be Class 150A or B.

C. The valve body materials shall be epoxy coated inside and out as per AWWA C550. The valve body shall be constructed of close grain cast iron per ASTM A126, Class B or equivalent material. All retaining segments and adjusting devices shall be of corrosion resistant material.

D. Valve seats shall be a natural rubber or synthetic rubber compound. Valve seats shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material.

E. The face-to-face dimensions of valves shall be in accordance with above-mentioned AWWA specification for short-body valve.

F. Should PCU find it necessary to install butterfly valves along mains that are 16 inches in diameter or larger, a 6-inch minimum bypass with one gate valve shall be installed around each valve.

G. The valve shaft shall be turned, ground, and polished constructed of Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one-piece unit extending full size through the value disc and valve bearing or it may be of a stub shaft design.

H. Valve Actuator:

The butterfly valve actuators shall conform to the requirements of AWWA standard

specifications for "Rubber Seated Butterfly Valves, Designation C504", insofar as applicable.

I. Directional opening:

All valves shall open left or counter clockwise.

11.09 VALVE BOXES

A. Standard Three-Piece Cast Iron Valve Box:

Three-piece valve boxes are required for mains less than six feet below finished grade as indicated in the STANDARD DRAWINGS. Valve boxes shall comply with AWWA standards and be provided with suitable heavy duty ductile or cast iron bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by PCU. The barrel shall be screw type only and have a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with ductile or cast iron covers. Ductile or cast iron covers shall have "WATER" cast into the top for all water mains.

B. Valve Box Assembly:

Valve box assemblies, as indicated in the STANDARD DRAWINGS, are required for any size main whenever the top of the valve nut is six feet or deeper below the finished surface elevation that is directly above the valve location. Valve boxes shall comply with AWWA standards and be one complete assembled unit composed of the ductile or cast iron valve box with a 5-1/4 inch barrel shaft, and steel extension stem that attaches to the valve body. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable depths.

C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 ft-lb without failure.

D. Valve boxes, located in roadways with speed limits above 30 miles per hour or on mains that are 16 inches in diameter or larger, shall have locking lids utilizing a five sided nut with a special wrench needed to open. Valve lids to be made as shown in the STANDARD DRAWINGS.

E. A test station box shall be installed into the valve pad for placement of the locating wire. The test station box shall be as specified in the appropriate "Approved Materials Checklist".

F. Locating wire shall be 14-gauge single strand solid core copper wire with insulation. The color of the insulation shall be the same color as the color code for the pipe being installed.

G. Each valve marker shall be made of bronze with each specific valve's information clearly imprinted on its top surface, provided with a hanger pin, and installed in each valve collar as shown in the STANDARD DRAWINGS.

11.10 AIR RELEASE VALVES

A. Valves for use in water mains shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be in stalled in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass.

11.11 FIRE HYDRANT ASSEMBLIES

A. General:

Fire hydrant assemblies shall consist of a fire hydrant, isolation gate valve, and associated piping that are attached to each other and the main by restrained joints. Fire hydrants shall have a minimum of 5-1/4-inch valve opening and shall comply with AWWA Standard C502 for fire hydrants for water works service, unless in conflict with this MANUAL, in which case this MANUAL shall apply. Each hydrant shall have 6-inch mechanical joint ends and shall open by turning to the left (counter-clockwise). The barrel of fire hydrants shall be 36 inches in length below final grade elevation to match main depth installation. Hydrants shall be provided with two 2-1/2-inch hose nozzles and one, 4-1/2-inch pumper nozzle, all having National Standard hose threads. Nozzles shall have caps attached by chains. Operating nuts shall be AWWA Standard pentagonal, measuring 1-1/2-inch point to flat. Fire hydrants shall be equipped with o-ring packing. Fire hydrants shall be supplied without drain holes or with permanently plugged drain holes.

B. Coating and painting:

1. All non-brass parts of the hydrant both inside and outside shall be painted, in accordance with AWWA C-502.

2. The shoe of the hydrant below the ground line shall have a fusion bonded epoxy coating and the barrel of the hydrant below ground shall be coated with a mastic

material.

3. The outside of the hydrant, above the finished ground line, shall be thoroughly cleaned and thereafter painted with one coat of paint of a durable composition, a minimum one additional coat of paint on the body of the hydrant and on the bonnet. The first coat must dry thoroughly before the second coat is applied.

4. The above ground portion of hydrants to be owned and maintained by PCU shall receive with two coats of ultra-violet stabilized International Orange colored paint.

5. The above ground portion of privately owned and maintained hydrants shall receive two coats of ultra-violet stabilized paint in a color that does not replicate the color used by PCU or any other water utility within Polk County.

6. The paint used shall be in accordance with the appropriate "Approved Materials Checklist".

C. Hydrant Reflective Pavement Markers:

Where fire hydrants are located adjacent to paved roadways, each fire hydrant shall have a blue reflective pavement marker located as follows:

1. On undivided paved roadways, 6 inches to the hydrant side of the centerline stripe.

2. On divided paved roadways, 6 inches to the side of the lane stripe which is closest to the hydrant in line with the largest port.

3. On un-striped paved roadways, the center of the roadway (not the driving lane).

Typically, the high impact acrylic markers shall measure 4 inches by 4 inches by 0.68 inches, have a minimum compression rating of 6000 pounds (ASTM D4280-04), and have a maximum acceptable deflection rating of 0.130 inch at 2000 pounds.

The marker shall be securely installed on the pavement using a conventional epoxy adhesive. The blue reflective faces of each marker shall face in both directions of traffic flow.

D. All fire hydrant assemblies shall be covered with black plastic bags until such time that the potable water system has been cleared for service by the FDOH.

All fire hydrant assemblies shall be covered with black plastic bags until such time that the potable water system has been cleared for service by the FDOH.

11.12 HYDRAULICALLY OPERATED CONTROL VALVES

A. Hydraulically operated control valves may be installed in distribution systems that

require automatic or remote control, pressure regulation, solenoid operation, rate of flow control, liquid level control, or check valve operation. Each valve shall consist of a main valve and pilot control system designed and installed in accordance with the STANDARD DRAWINGS and Approved Materials Checklist. The main valve shall be hydraulically actuated, line pressure operated, diaphragm actuated, globe pattern valve. The main valve shall contain an EPDM seat disc contained by a disc retainer and forming a tight seal against removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface.

PART 12 -CONSTRUCTION

12.01 MATERIAL IDENTIFICATION AND TESTING

A. Pipe Identification and Location:

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe, which is not clearly marked, is subject to rejection. The CONTRACTOR shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

2. All PVC pipe and other pipe that is factory color-coded on the outside surface of the pipe shall be identified and locatable as specified in the STANDARD DRAWINGS. All DI pipe, and other pipe not factory color-coded on the outside surface of the pipe, shall be identified and locatable as specified in Appendix A, “STANDARD DRAWINGS”. Where the above type of identification method is not considered to be practical by PCU, the pipe shall have a field applied three inch wide permanent blue paint stripe down the top outside center of the pipe along its entire length.

B. Material Testing Requirements:

1. If requested by PCU, a sample of pipe to be tested shall be selected at random by PCU or the testing laboratory hired by PCU.

2. When the samples tested conform to applicable standards, all pipe represented by such samples shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed on the project.

3. In the event that any of the test samples fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test samples from the same shipment or delivery, for each sample that failed and the pipe will be considered acceptable if all of these additional samples meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR’s expense.

4. Pipe that has been rejected by PCU shall be removed from the site of the work by the CONTRACTOR and replaced with pipe that meets these specifications.

12.02 SEPARATION OF MAINS

Separation shall be in accordance with the "STANDARD DRAWINGS".

12.03 INSTALLATION OF VALVES

A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of PCU before they are installed.

12.04 NOTIFICATION OF CONNECTION TO EXISTING MAINS

A. PCU shall be notified at least five NORMAL WORKING DAYS in advance to schedule main connections and valve operations. All existing valves are to be operated only by PCU. All valves installed are to remain closed during construction.

The CONTRACTOR shall exercise extreme caution when excavating in proximity of PCU mains. PCU main locations shown on plans are not exact or guaranteed. The CONTRACTOR is responsible for field verifying existing utility locations. PCU dispatch operator shall be notified immediately in the event of a force main, water main, or reclaimed water main break or damage. The CONTRACTOR shall immediately repair all damage to PCU mains, at the CONTRACTOR's expense. If the repair is not made in a timely manner, as determined by the PCU Inspector, PCU may perform repairs and the CONTRACTOR will be charged for repairs.

12.05 WATER SERVICE LOCATION AND IDENTIFICATION

A. The location of all service lines shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact location of each service shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Service" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each service shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Service" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the pavement in accordance with the manufacturer's guidelines approximately 6 inches

from the edge of pavement.

12.06 WATER VALVE LOCATION AND IDENTIFICATION

A. On curbed streets, the exact location of each valve shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Valve" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each valve shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Valve" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the pavement in accordance with the manufacturer's guidelines approximately 6 inches from the edge of pavement.

12.07 HYDRAULICALLY OPERATED CONTROL VALVES

A. The CONTRACTOR shall furnish and install the valve as specified by the PLANS and in accordance with the STANDARD DRAWINGS.

B. The main valve and the pilot control system shall be factory assembled and tested to determine conformance with the requirements of this Specification section.

C. All settings shall be factory pre-set and verified in the field. Hydraulic pilots shall be tagged with model #, adjustment range, and factory setting.

D. All valves shall be installed according to the valve manufacturer's instructions at the location shown in the PLANS.

E. After installation is complete, operational performance tests shall be conducted in the presence of the manufacturer's representative, CONTRACTOR, and ENGINEER. The manufacturer's representative shall provide training and oversee start-up, testing, and adjustment of the valve to ensure zero leakage, correct installation, and function. Any deficiencies revealed during testing shall be corrected and tests repeated at CONTRACTOR's expense until all tests are passed to the satisfaction of the ENGINEER.

F. Operation and Maintenance Manuals shall be provided by CONTRACTOR.

Raw Water Main Design Standards and Specifications

PART 1 - GENERAL

A. Raw water mains shall be utilized to transport untreated water from a source or sources to a potable water production facility.

PART 2 – LOCATION

A. Refer to “Potable Water Main Design Standards and Specifications”.

PART 3- DESIGN CALCULATIONS

A. Refer to “Potable Water Main Design Standards and Specifications”.

PART 4 - DESIGN

A. Pipe Cover:

A minimum cover of 36 inches shall be provided.

B. Pressure:

Refer to “Potable Water Main Design Standards and Specifications”.

C. Diameter:

Refer to “Potable Water Main Design Standards and Specifications”.

D. Velocity:

E. Refer to “Potable Water Main Design Standards and Specifications”.Design Friction Losses:

Refer to “Potable Water Main Design Standards and Specifications”.

F. Design Pressure and Restraint

Refer to “Potable Water Main Design Standards and Specifications”.

G. Valves:

Refer to “Potable Water Main Design Standards and Specifications”.

H. Air Release Valves:

Refer to “Potable Water Main Design Standards and Specifications”.

I. Control Valves:

Refer to "Potable Water Main Design Standards and Specifications".

J. Restrained Joints:

Refer to "Potable Water Main Design Standards and Specifications". Rev March 2012

K. Separation of Raw Water Mains from other Mains:

Separation of raw water, reclaimed water, potable water, and wastewater system shall comply with FDEP regulations and PCU standards per the STANDARD DRAWINGS.

L. Air Release Valves:

Refer to "Potable Water Main Design Standards and Specifications".

M. Permanent sample stations shall not be required on raw water mains.

N. Pigging (Swabbing) Stations:

Refer to "Potable Water Main Design Standards and Specifications".

PART 5 - CONSTRUCTION

5.01 SCOPE OF WORK

A. These specifications cover the pipes, fittings, and appurtenances used for raw water mains. All materials shall be utilized in accordance with the appropriate "Approved Materials Checklists".

B. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, or samples for analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

C. Pipe and fitting interior linings shall conform to ANSI/NSF 61 list of approved materials standard.

D. Raw water mains, service piping, and connections shall be installed as indicated in the STANDARD DRAWINGS.

E. The color for raw water pipes and appurtenances shall be as directed by FDOH and in accordance with Section 411, 7.01.A.2 below.

F. Fire hydrant assemblies shall not be installed on any part of a raw water main.

G. Pigging of pipe shall be used to remove foreign materials in lieu of flushing.

PART 6 - PRODUCTS

6.01 PIPE MATERIALS

A. PVC Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

B. Ductile Iron Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

C. HDPE Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

6.02 JOINT MATERIALS

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.03 FITTINGS

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.04 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

A. Fittings:

Refer to “Potable Water Main Design Standards and Specifications”.

B. Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

C. Additional Applied Exterior Coatings for Above Ground Pipe and Fittings:

Refer to “Potable Water Main Design Standards and Specifications”.

6.05 POLYETHYLENE ENCASEMENT

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.06 CONNECTIONS TO MAIN

A. Refer to "Potable Water Main Design Standards and Specifications".

6.07 RESILIENT SEAT GATE VALVES

A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C509, latest revision, and in accordance with these specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve. Valves shall have a minimum pressure rating of 150 psi.

B. Valves that are 16 inches and larger shall have side actuators. The valve body, bonnet and bonnet cover shall be cast iron ASTM A126, Class B. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550. A two-inch wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C509.

C. Directional Opening:

All valves shall open left or counter clockwise.

D. The valves shall be non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C509. Two stem seals shall be provided and shall be of the o-ring type. The stem nut must be independent of the gate.

E. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the line flow from either direction.

6.08 BUTTERFLY VALVES

A. Typically, butterfly valves shall not be installed within any PCU system, except directly adjacent to storage tanks for isolation purposes.

B. Butterfly valves and operators shall conform to the "AWWA Standard Specifications for Rubber Seated Butterfly Valves", Designation C504, latest version, except as hereinafter specified, shall be Class 150A or B.

C. The valve body materials shall be epoxy coated inside and out as per AWWA C550. The valve body shall be constructed of close grain cast iron per ASTM A126, Class B or equivalent material. All retaining segments and adjusting devices shall be of corrosion resistant material.

D. Valve seats shall be a natural rubber or synthetic rubber compound. Valve seats shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material.

E. The face-to-face dimensions of valves shall be in accordance with above-mentioned AWWA specification for short-body valve.

F. Should PCU find it necessary to install butterfly valves along mains that are 16 inches in diameter or larger, a 6-inch minimum bypass with one gate valve shall be installed around each valve.

G. The valve shaft shall be turned, ground, and polished constructed of Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one-piece unit extending full size through the value disc and valve bearing or it may be of a stub shaft design.

H. Valve Actuator:

The butterfly valve actuators shall conform to the requirements of AWWA standard specifications for "Rubber Seated Butterfly Valves, Designation C504", insofar as applicable.

I. Directional opening:

All valves shall open left or counter clockwise.

6.09 VALVE BOXES

A. Standard Three-Piece Cast Iron Valve Box:

Three-piece valve boxes are required for mains less than six feet below finished grade as indicated in the STANDARD DRAWINGS. Valve boxes shall comply with AWWA standards and be provided with suitable heavy duty ductile or cast iron bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by PCU. The barrel shall be screw type only and have a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with ductile or cast iron covers. Ductile or cast iron covers shall have "RAW" cast into the top for all water mains.

B. Valve Box Assembly:

Valve box assemblies, as indicated in the STANDARD DRAWINGS, are required for any size main whenever the top of the valve nut is six feet or deeper below the finished surface elevation that is directly above the valve location. Valve boxes shall comply with AWWA standards and be one complete assembled unit composed of the ductile or cast iron valve box with a 5-1/4 inch barrel shaft, and steel extension stem that attaches to the valve body. All moving parts of the extension stem shall be enclosed in a

housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable depths.

C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 ft-lb without failure.

D. Valve boxes, located in roadways with speed limits above 30 miles per hour or on mains that are 16 inches in diameter or larger, shall have locking lids utilizing a five sided nut with a special wrench needed to open. Valve lids to be made as shown in the STANDARD DRAWINGS.

E. A test station box shall be installed into the valve pad for placement of the locating wire. The test station box shall be as specified in the appropriate "Approved Materials Checklist".

F. Locating wire shall be 14-gauge single strand solid core copper wire with insulation. The color of the insulation shall be the same color as the color code for the pipe being installed.

G. Each valve markers shall be made of brass with each specific valve's information clearly imprinted on its top surface, provided with a hanger pin, and installed in each valve collar as shown in the STANDARD DRAWINGS. Rev March 2012

6.10 AIR RELEASE VALVES

A. Valves for use in water mains shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be installed in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass.

PART 7 - EXECUTION

7.01 MATERIAL IDENTIFICATION AND TESTING

A. Pipe Identification and Location:

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. DI pipe shall meet all applicable requirements of AWWA C151. Pipe, which is not clearly marked, is subject to rejection. The CONTRACTOR shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

2. All PVC pipe and other pipe that is factory color-coded on the outside surface of the pipe shall be identified and locatable as specified in the STANDARD DRAWINGS. Olive green is the material identification color established by FDOH for raw water pipe. All DI pipe, and other pipe not factory color-coded on the outside surface of the pipe, shall be identified and locatable as specified by the "STANDARD DRAWINGS. Where the above type of identification method is not considered to be practical by PCU, the pipe shall have a field applied three inch wide permanent paint stripe down the top outside center of the pipe along its entire length. Identification color shall be olive green in accordance with the requirements established by the FDOH.

B. Material Testing Requirements:

1. If requested by PCU, a sample of pipe to be tested shall be selected at random by PCU or the testing laboratory hired by PCU.

2. When the samples tested conform to applicable standards, all pipe represented by such samples shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed on the project.

3. In the event that any of the test samples fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test samples from the same shipment or delivery, for each sample that failed and the pipe will be considered acceptable if all of these additional samples meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR's expense.

4. Pipe that has been rejected by PCU shall be removed from the site of the work by the CONTRACTOR and replaced with pipe that meets these specifications.

7.02 SEPARATION OF MAINS

A. Separation shall be in accordance with the "STANDARD DRAWINGS".

7.03 INSTALLATION OF VALVES

A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in

the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of PCU before they are installed.

7.04 NOTIFICATION OF CONNECTION TO EXISTING MAINS

A. PCU shall be notified at least five NORMAL WORKING DAYS in advance to schedule main connections and valve operations. All existing valves are to be operated only by PCU. All valves installed are to remain closed during construction.

The CONTRACTOR shall exercise extreme caution when excavating in proximity of PCU mains. PCU main locations shown on plans are not exact or guaranteed. The CONTRACTOR is responsible for field verifying existing utility locations. PCU dispatch operator shall be notified immediately in the event of a force main, water main, or reclaimed water main break or damage. The CONTRACTOR shall immediately repair all damage to PCU mains, at the CONTRACTOR's expense. If the repair is not made in a timely manner, as determined by the PCU Inspector, PCU may perform repairs and the CONTRACTOR will be charged for repairs.

7.05 VALVE LOCATION AND IDENTIFICATION

A. The location of all valves shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact longitudinal location of each valve shall be adequately and permanently identified using durable blue colored A-TAG style pavement markers that states "Raw Water Valve" and "Call Before You Dig" that are securely installed into the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact longitudinal location of each valve shall be adequately and permanently identified using durable blue colored A-TAG style pavement markers that states "Raw Water Valve" and "Call Before You Dig" that are securely installed into the pavement in accordance with the manufacturer's guidelines approximately 3 inches from the edge of pavement.

Potable Water Production Facilities Design Standards

PART 1 - GENERAL

A. This Section shall be applicable to the design of potable water production facilities proposed as part of any development to be constructed in compliance with the LAND DEVELOPMENT CODE, as amended, or as part of the PCU Community Investment Program.

B. Design, Construction, and Plan Review:

The design and construction of potable water production facilities associated with COUNTY approved developments shall be in compliance with this MANUAL. PLANS will be reviewed and approved by PCU as part of the subdivision or commercial site plan review process as specified by the LAND DEVELOPMENT CODE.

C. Compliance with Other Regulatory Requirements:

It shall be the responsibility of the DEVELOPER/CONTRACTOR to obtain and comply with all applicable federal, state, and local regulatory permits.

D. The DEVELOPER shall be financially responsible for any proposed designs that require modification to or may adversely affect any portion of PCU's potable water infrastructure.

PART 2 - DESIGN

A. The design of the potable water production facility, including the water source and treatment facilities shall be designed for the maximum day demand of the design year, as a minimum. Requirements of the FDEP, LAND DEVELOPMENT CODE, and COMPREHENSIVE PLAN, whichever is more restrictive, shall govern. Consideration shall be given to the design requirements of other federal and state regulatory agencies regarding safety requirements, special designs for the handicapped, plumbing, and electrical codes. No part of the facility shall be constructed below the 100 year flood prone elevation as established by FEMA.

B. The potable water production facility shall be sited on a square shaped fee simple parcel of land that measures not less than one acre in size and centered around the onsite well(s). Offsite wells shall be placed in the center of a square shaped fee simple parcel of land that measures not less than one acre in size.

PART 3 - PLANT LAYOUT

A. The ENGINEER shall consider the functional aspects of the plant layout, provisions for future plant expansion, provisions for expansion of the plant waste treatment and disposal facilities, access roadways, site grading, site drainage, walkways, driveways, and delivery of chemicals.

B. Onsite buildings shall be provided with adequate ventilation, adequate lighting, lightning protection system, adequate heating, adequate drainage, accessibility of equipment for operation, serving, and removal, flexibility of operation, operator safety, convenience of operation, and the placement of chemical storage and feed equipment in a separate room to reduce hazards and dust problems. Main electrical control equipment shall be located above grade and above the 100 year flood prone elevation. Adequate facilities shall be included for shop space and storage consistent with the needs of the designed facilities.

C. All buildings shall be of concrete masonry unit construction with engineered trusses and coated metal roof systems **or** hollow core reinforced concrete slab based roofs. All structures shall be painted with colors in accordance with PCU standards, unless otherwise approved by PCU. All exterior doors shall be of steel construction and interior doors shall be of wood or steel construction.

D. A permanently mounted standby power generator system of sufficient size shall be required so that potable water may be treated and/or pumped to the most distance portion of the distribution system during power outages to meet the average day demand while maintaining a minimum residual pressure of 20 psi.

E. Adequate monitoring equipment, sample taps, flow meters, and pipe color coding shall be provided.

F. An operation and maintenance manual including a parts list and parts order form, operator safety procedures, and operational trouble shooting section shall be supplied for any proprietary unit installed in the facility.

G. Consideration shall be given to the safety of plant personnel and visitors. The design must comply with all applicable safety codes and regulations that may include the Florida Building Code. Uniform Fire Code, National Fire Protection Association Standards, and OSHA standards.

H. Security measures shall be installed and instituted in accordance with this MANUAL. Appropriate design measures to help ensure the security of water system facilities shall be incorporated. Such measures, as a minimum, shall include heavy duty type locks for exterior doorways, windows, gates, and other entrances to sources, treatment, and water storage facilities, signage, intrusion alarms, motion sensitive flood lighting, and 6 foot high security type fencing topped with 3 strands of barb wire. Facilities secured with electrically operated gates shall include key switches in accordance with the appropriate “Approved Materials Checklist” (See Wastewater Checklist). Other measures may include close circuit monitoring and real time water quality monitoring.

I. Electrical supply to the facility shall be placed underground onsite of the plant property.

J. Other than pipes, conduits, foundations, and footings, the potable water production facility shall be constructed above ground.

K. Hydropneumatic tanks shall be made of steel, ASME certified, and no smaller than 15,000 gallons in size.

L. Lightning protection systems shall be installed and certified in accordance with all applicable sections of UL 96A, "Installation Requirements for Lightning Protection Systems" as published by the Underwriters Laboratories, Inc. A Master Label Certificate of Inspection for Lightning Protection Systems shall be provided to the COUNTY for each such installation.

PART 4 - MATERIALS

A. All materials used in the construction of a potable water production facility shall be in accordance with this MANUAL.

Water Production Facility SCADA Specifications

PART 1 – GENERAL WATER PRODUCTION FACILITY SCADA STANDARDS

1.01 SUMMARY OF SYSTEM

A. These standards represent minimum requirements for County projects at the time the standards were adopted. The County reserves the right to approve changes based on site specific design requirements

B. Water treatment facilities shall be able to be monitored and controlled remotely. The CONTRACTOR shall provide a Human Machine Interface (HMI) / Supervisory Control and Data Acquisition (SCADA) system, Programmable Logic Controller (PLC), and decentralized Historian for water treatment facility control as identified in this Section.

C. The SCADA process data shall be organized by unit process (UP) as identified below:

Unit Process Number	Process Name
10	Raw Pump Station/Wells
20	Preliminary Treatment
30	Primary Filtration
40	Ground Storage
50	Distribution High Service Pumping
60	Secondary Filtration
70	Pressure Control
80	Chemical Storage and Feed
90	Electrical Power

D. SCADA tag numbering shall be as follows:
   1. Facility = SW
   2. Unit Process = 10
   3. Function of Device = Level Indicating Transmitter
   4. Quantity/Discrete Identifier = 1
      i. E.g. SW_010_LIT_001

1.02 EQUIPMENT TO BE MONITORED AND CONTROLLED

A. The following typical elements at standard unit processes must be monitored and controlled at the various unit processes with alarms as defined:

   a. UP 10 Raw Pump Station/Wells
      i. Influent Flow Meter
         Monitored Data
         1. Instantaneous Flow

2. Totalized Daily Flow, Current and Previous Day

Alarms

1. Out of Range
2. No Signal

ii. Pumps

Monitored Data

1. Pump Motor Status
2. Level in Pump Station

Alarms

1. Pump Over-Torque
2. Pump Fail
3. High Level Alarm
4. High-High Level Alarm
5. Low Level Alarm

b. UP 20 Preliminary Treatment

i. Mechanical Bar Screen/Level Operated (Surface Water)

Monitored Data

1. Motor Status
2. Level in Channel
3. Screw Conveyor Motor Status

Alarms

1. Screen Over-Torque
2. Screen Fail
3. Channel Level High
4. Screw Wash/Press Over-Torque
5. Screw Wash/Press Fail

c. UP 30 Primary Filtration

i. Multimedia/Greensand Filters

Monitored Data

1. Valve Status
2. Pressure Differential

Alarms

1. Valve
2. High Pressure Differential

d. UP 40 Ground Storage

i. Levels/Valves

Monitored Data

1. Ground Storage Tank Levels
2. Calculated Ground Storage Tank Volumes
3. Calculated Rate of Change (gpm) in Storage
4. Raw Storage Tank Levels
5. Calculated Raw Storage Tank Volumes

6. Calculated Rate of Change (gpm) in Raw Water
7. Transfer Pump Wet Well Level
8. Fill Valve Status
9. In/Eff Valves for Tanks Status

Alarms

1. High Ground Storage Level
2. Low Ground Storage Level
3. High Raw Water Storage Level
4. Low Raw Water Storage Level
5. High Wet Well Level
6. Low Wet Well Level
7. Valve Failure

ii. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed

Alarms

1. Pump Over-Torque
2. Pump Fail

e. UP 50 Distribution High Service Pumping

i. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed
3. Pressure
4. Flow Rate

Alarms

1. Pump Over-Torque
2. Pump Fail
3. Flow Out of Range
4. High Pressure
5. Low Pressure

f. UP 60 Secondary Filtration

i. Slow Sand Filters/Green Sand Filters/Rapid Rate Filters

Monitored Data

1. Backwash Pump and Wash Unit Motor Status
2. Level in Filter
3. Valve Status
4. Total Suspended Solids and/or Nephelometric Turbidity Units
5. Flow Rate

Alarms

1. Pump/Wash Unit Motor Fail

2. Valve Fail
3. High Level
4. Low Level
5. Flow Rate Out of Range

g. UP 70 Pressure Control

i. Instrumentation

Monitored Data

1. Hydopheumatic Tank Liquid Level
2. Pressure
3. Compressor Status

Alarms

1. Low Pressure
2. High Pressure
3. Compressor Fail
4. Low Tank Level
5. High Tank Level

h. UP 80 Chemical Storage and Feed

i. Chemical Feed and Monitoring

Monitored Data

1. pH
2. Effluent Chlorine Residual
3. Sodium Hypochlorite Level/Volume
4. Alum Level/Volume
5. Ferric Chloride Level/Volume
6. Anti-Scalant Level/Volume
7. Potassium Permanganate Level/Volume
8. Sodium Hydroxide Level/Volume
9. Sulfuric Acid Level/Volume
10. Carbon Dioxide Mass
11. Chemical Metering Pump Status
12. Exhaust Fan Status
13. Eye Wash Status

Alarms

1. Effluent pH Out of Range
2. High Chlorine Residual
3. Low Chlorine Residual
4. Chemical Metering Pump Failures
5. Exhaust Fan Failure
6. Eyewash In Use or Failure
7. High Chemical Level
8. Low Chemical Level

i. UP 90 Electrical Power
   i. Electrical Line Power
      Monitored Data
         1. Phase Voltage Difference
         2. Phase Amperage
         3. Tie-Breaker Status
         4. Main Breaker Status
      Alarms
         1. Low Voltage
         2. High Voltage
         3. Loss of Power
   ii. Generator Power
      Monitored Data
         1. Generator Status
         2. Phase Voltage Difference
         3. Phase Amperage
         4. Transfer Switch Status
      Alarms
         1. Low Voltage
         2. High Voltage
         3. Generator Failure
         4. Transfer Switch Failure

1.03 DATA TO BE STORED IN HISTORIAN

A. The following typical data at standard and alarm at unit processes. Historical data shall be stored at a minimum rate of one point every ten seconds, or a change greater than a set dead-band, and shall be stored as defined:

a. UP 10 Raw Pump Station/Wells
   i. Influent Flow Meter
      Monitored Data
         1. Instantaneous Flow
         2. Totalized Daily Flow, Current and Previous Day
   ii. Pumps
      Monitored Data
         1. Pump Motor Status
         2. Level in Pump Station
      Alarms
         1. Pump Fail

b. UP 20 Preliminary Treatment
   i. Mechanical Bar Screen/Level Operated (Surface Water)
      Monitored Data
         1. Motor Status

2. Level in Channel
3. Screw Conveyor Motor Status

Alarms

1. Screen Fail
2. Screw Wash/Press Fail

c. UP 30 Primary Filtration

i. Multimedia/Greensand Filters

Monitored Data

1. Valve Status
2. Pressure Differential

Alarms

1. Valve Fail

d. UP 40 Ground Storage

i. Levels/Valves

Monitored Data

1. Ground Storage Tank Levels
2. Calculated Ground Storage Tank Volumes
3. Raw Storage Tank Levels
4. Calculated Rate of Change (gpm) in Raw Water
5. Transfer Pump Wet Well Level
6. Fill Valve Status
7. In/Eff Valves for Tanks Status

Alarms

1. Valve Failure

ii. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed

Alarms

1. Pump Fail

e. UP 50 Distribution High Service Pumping

i. Pumps

Monitored Data

1. Pump Motor Status
2. VFD Speed
3. Pressure
4. Flow Rate

Alarms

1. Pump Fail

f. UP 60 Secondary Filtration

i. Slow Sand Filters/Green Sand Filters/Rapid Rate Filters

Monitored Data
1. Backwash Pump and Wash Unit Motor Status
2. Level in Filter
3. Valve Status
4. Total Suspended Solids and/or Nephelometric Turbidity Units
5. Flow Rate

Alarms
1. Pump/Wash Unit Motor Fail
2. Valve Fail

g. UP 70 Pressure Control
   i. Instrumentation

Monitored Data
1. Hydopheumatic Tank Liquid Level
2. Pressure
3. Compressor Status

Alarms
1. Compressor Fail

h. UP 80 Chemical Storage and Feed
   i. Chemical Feed and Monitoring

Monitored Data
1. pH
2. Chlorine Residual
3. Sodium Hypochlorite Level/Volume
4. Alum Level/Volume
5. Ferric Chloride Level/Volume
6. Anti-Scalant Level/Volume
7. Potassium Permanganate Level/Volume
8. Sodium Hydroxide Level/Volume
9. Sulfuric Acid Level/Volume
10. Carbon Dioxide Mass
11. Chemical Metering Pump Status
12. Exhaust Fan Status
13. Eye Wash Status

Alarms
1. Chemical Metering Pump Failures
2. Exhaust Fan Failure
3. Eyewash In Use or Failure

i. UP 90 Electrical Power
   i. Electrical Line Power

Monitored Data
1. Phase Voltage Difference

2. Phase Amperage
3. Tie-Breaker Status
4. Main Breaker Status

Alarms

1. Loss of Power

ii. Generator Power

Monitored Data

1. Generator Status
2. Phase Voltage Difference
3. Phase Amperage
4. Transfer Switch Status

Alarms

1. Generator Failure
2. Transfer Switch Failure

PART 2 – COMPONENTS AND INTEGRATION

2.01 SOFTWARE, PLC, COMPUTERS, and NETWORK COMPONENTS

A. The CONTRACTOR shall purchase and install equipment compatible with the PCU existing SCADA central station equipment.

1. Water treatment facility control systems must utilize GE PAC RX3i PLC components.

2. Water treatment facility SCADA controls must be integrated utilizing iFix with the licenses for the latest version supplied as part of the construction effort. CONTRACTOR must verify and utilize the iFix version currently in use by PCU prior to integrating PLC/SCADA.

3. CONTRACTOR shall provide local servers and historian, including a license for GE Historian, latest version, as part of the construction effort.

4. iFix and Historian licenses must be provided with sufficient tags for at least 30% spare tags.

5. Servers provided will be mapped to PCU network by Owner. Hardware to be provided to Owner at a time scheduled at least two (2) weeks in advance for mapping purposes.

B. SCADA Computer Server equipment shall be as follows:

1. Primary SCADA server
   i. Dell server or approved equivalent with minimum criteria
   ii. Two Pentium Xeon Hex-Core Processors, 3.0 Ghz min, 12 Mb L3

Cache
iii. 24 Gb of DDR3 RAM, 1333 MHz, expandable to 128 Mb
iv. Hard Drives: (2) RAID 1 configuration HD, SAS, SCSI, 15,000 rpm, Hot-Swappable. Size of each drive shall be at least 200% of capacity required for current system implementation.
v. Multi-use optical drive, 24x, CD-RW/DVD-RW
vi. Multimedia cards: manufacturer's standard
vii. Dual Hot-Swappable Power Supplies
viii. Two IEEE 802.3 network card, dual redundant, 1 GbE
ix. External 56k modem, V.90 PCI, USB interface, voice and data modem, as manufactured by US Robotics.
x. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
xi. Keyboard, Video, Mouse module
xii. Proficy iFix Software Run License, Latest Version
xiii. 3-Years Onsite Warranty

2. Backup SCADA server
   i. Dell or approved equivalent
   ii. Pentium Quad-Core Processor, 3.6 Ghz min, 12 Mb L2 Cache
   iii. 16 Gb of DDR3 RAM, 1333 MHz
   iv. Hard Drives: (2) RAID 1 configuration HD, SATA, 7,200 rpm. Size of each drive shall be at least 200% of capacity required for current system implementation.
   v. Multi-use optical drive, 24x, CD-RW/DVD-RW
   vi. Audio Card: manufacturer's standard
   vii. Video Card: capable of running two monitors and software noted
      1. Dual Channel VGA color graphics, 16X transfer rate
      2. 512 Mb DDR3, min
      3. NVIDIA Quadro NVS 300
   viii. Single Power Supply, 500 kW min
   ix. 101-key Enhanced Keyboard
   x. Mouse: two button with thumb wheel, min
   xi. IEEE 802.3 network card, dual redundant, 1 GbE
   xii. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
   xiii. Proficy iFix Development License, Latest Version
   xiv. (2)-47-inch Flat Panel Displays
   xv. 3-Years Onsite Warranty

3. Historian SCADA server
   i. Link with all Historian tags sent to Base One Master Historian
   ii. Dell R710 or approved equivalent
   iii. Dual Pentium Xeon Hex-Core Processor, 3.0 Ghz min, 12 Mb L3 Cache

iv. 24 Gb of DDR3 RAM, 1333 MHz, expandable to 128 Mb
v. Hard Drives: (4) RAID 5 configuration HD, SAS, SCSI, 15,000 rpm, Hot-Swappable. Size of drive array shall be at least 200% of capacity required for current system implementation with 5 years of data stored.
vi. Multi-use optical drive, 24x, CD-RW/DVD-RW
vii. Multimedia cards: manufacturer's standard
viii. Dual Hot-Swappable Power Supplies
ix. IEEE 802.3 network card, dual redundant, 1 GbE
x. External 56k modem, V.90 PCI, USB interface, voice and data modem, as manufactured by US Robotics.
xi. Windows Server 2008 R2 Standard Operating System, 5 Client Access Licenses
xii. Keyboard, Video, Mouse module
xiii. Proficy iFix Historian, Latest Version
xiv. Proficy Web Server, Latest Version
xv. 3-Years Onsite Warranty

4. Additional Equipment
   i. Cisco 1 GbE Network Switch
      1. 24 ports, 4 Dual Ports
      2. 4 Dual Port Uplinks Support 1 GbE Upload and Download
      3. Catalyst 2960S series
   ii. 1 KVM Module, Tripplite B040-008-19
   iii. Tripplite 6 kVA UPS
   iv. Network Rack, 42 RU min
   v. Cable Management Unit for Network Rack
   vi. 24" Monitor, ViewSonic VG2436wm or Equal

C. New plants shall have integrated WiFi throughout the facility in accordance with IEEE 802.11. WiFi shall be able to be utilized for remote SCADA access at any unit process in the plant.
   1. Radio propagation studies shall be performed during design and construction of WiFi networks to ensure WiFi is functional at all unit processes.

D. New unit processes shall have decentralized I/O to limit long runs of buried copper communication. Localized OLMs shall be designed and installed with a fiber connection to carry the information to a point local to the PLC. There the data can be converted back into a readable signal for the PLC.

E. CONTRACTOR to perform testing on integrated systems at key stages in the process. At a minimum, Operational Readiness Testing (ORT) and Performance Acceptance Testing (PAT) shall be performed. Factory Testing and Staging Testing may be added at COUNTY or ENGINEER discretion. Minimum testing requirements shall be as follows:

1. Operational Readiness Test (ORT): Prior to startup test period and PAT, inspect, test, and document that entire Process Instrumentation and Control System (PICS) is ready for operation.

    i. Loop/Component Inspections and Tests:
        1. Check PICS for proper installation, calibration, and adjustment on a loop-by-loop and component-by-component basis.
        2. Provide space on forms for signoff by PICS subcontractor.
        3. Use loop status report to organize and track inspection, adjustment, and calibration of each loop and include the following:
            a. Project name.
            b. Loop number.
            c. Tag number for each component.
            d. Checkoffs/Signoffs for Each Component:
                i. Tag/identification.
                ii. Installation.
                iii. Termination wiring.
                iv. Calibration/adjustment
            e. Checkoffs/Signoffs for the Loop
                i. Field Device Signals Transmitted to the PLCs are Operational: Received/sent, processed, adjusted.
        4. Component calibration sheet for each active field component (except simple hand switches, lights, gauges, and similar items) include the following:
            a. Project name.
            b. Loop number.
            c. Component tag number or PLC register address.
            d. Component code number for field device elements.
            e. Manufacturer for field device elements.
            f. Model number/serial number for field device elements.
            g. Summary of Functional Requirements, for Example:
                i. Indicators and recorders, scale and chart ranges.
                ii. Transmitters/converters, input and output ranges.
                iii. Computing elements' function.
                iv. Controllers, action(direct/reverse) and control modes (P&ID).
                v. Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual).
            h. Calibrations, for Example, but not Limited to:
                i. Analog Devices: Actual inputs and outputs at 0,10, 50, and 100 percent of span, rising and falling.
                ii. Other Field Devices: Actual trip points and reset

points.

iii. Controllers: Mode settings (P&ID).

iv. Actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling.

v. Space for comments.

i. Maintain loop status reports, valve adjustment sheets, and component calibration sheets at site and make them available to Engineer at all times.

j. Test and calibrate all fiber optic data links. Document that the dB links are within specified limits and the data communication is error free at specified baud rates.

k. These inspections and tests will be spot checked by Engineer.

l. Engineer reviews loop status sheets and component calibration sheets and spot-check their entries periodically, and upon completion of ORT. Correct deficiencies found.

2. Performance Acceptance Tests (PAT):

i. Once ORT has been completed and facility has been started up, perform a witnessed PAT on complete PICS to demonstrate that it is operating as required by the Contract Documents. Demonstrate each required function on a paragraph-by-paragraph, loop-by-loop, and site-by-site basis.

ii. Loop-specific and non-loop-specific tests same as required for Factory Testing except that entire installed PICS tested using actual process variables and all functions demonstrated.

iii. Perform local and manual tests for each loop before proceeding to remote and automatic modes.

iv. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.

v. Provide updated versions of the following documentation available to Engineer at site, both before and during tests.

1. One copy of submittals applicable to the equipment to be tested.
2. One copy of the Drawings and Specifications together with

addenda and applicable change orders.

3. Make one copy of all O&M manuals.

vi. Specialty Equipment: For certain components or systems provided under this section but not manufactured by PICS Subcontractor, provide services of qualified manufacturer's representative during installation, startup, demonstration testing, and County training. Refer to Article Onsite Services in PICS Subsystems for specific requirements.

vii. Instruments shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of scale through wired and wireless communications to the PLC and to the HMI insofar as is practical and not to put effluent quality at risk.

2.02 INSTRUMENTATION

A. The CONTRACTOR shall purchase and install instrumentation equipment as standardized below. The equipment aligns with what Polk County Utilities currently utilizes. Exact models shall be determined during design:

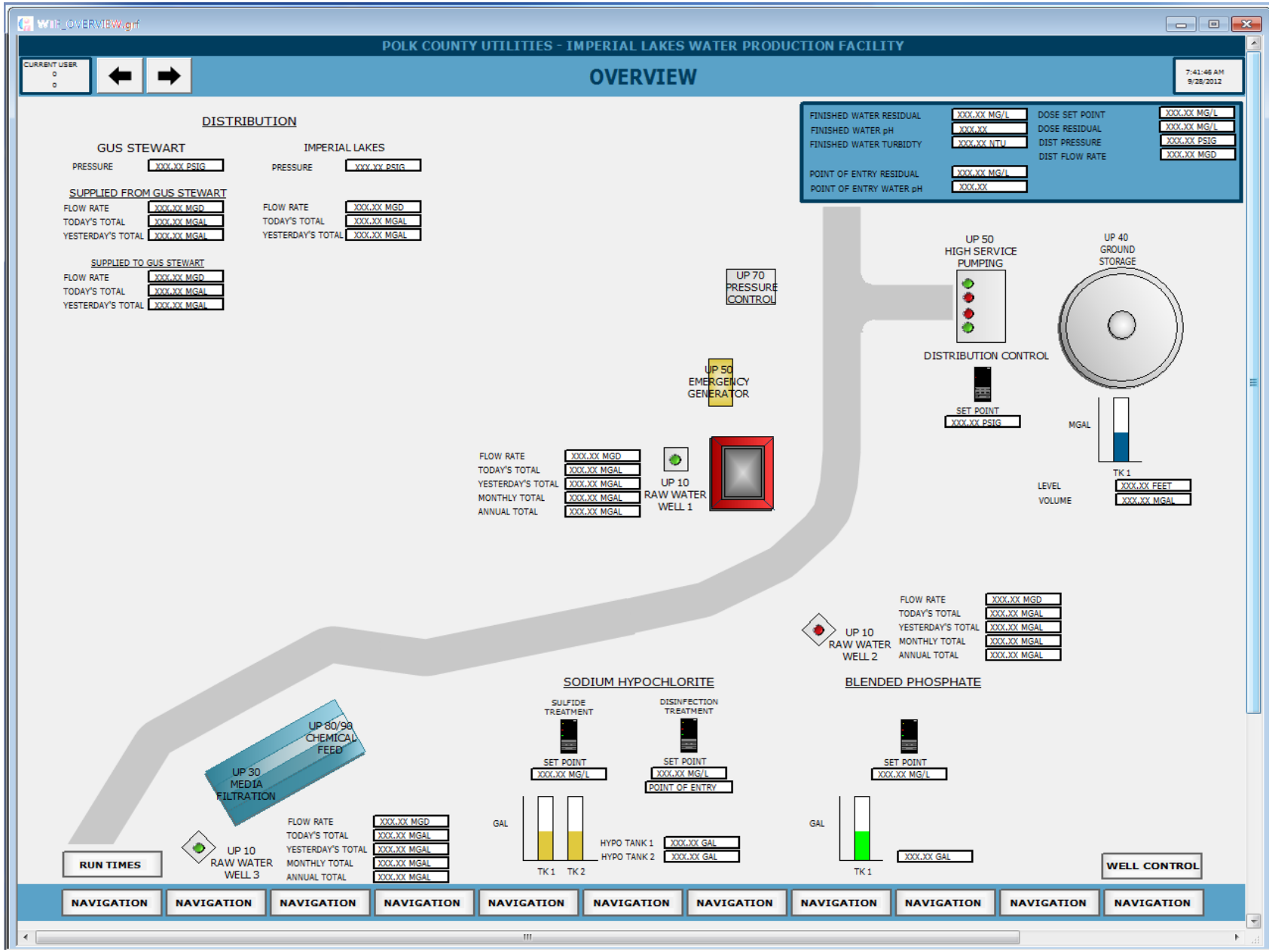
1. Liquid Level
   i. Pressure – Rosemount 3051
   ii. Ultrasonic – Endress Hauser FMU95 or Siemens SITRAN LU
   iii. Approved Equal
2. Pressure Indicating and Differential Transmitters
   i. Rosemount 3051
   ii. Approved Equal
3. Pressure Switches
   i. Ashcroft B-Series
   ii. Approved Equal
4. Pressure Gauges
   i. Ashcroft
   ii. Approved Equal
5. Flow Meters
   i. Electromagnetic – Foxboro
   ii. Vortex – Foxboro
6. Chemical Metering Pumps
   i. Prominent
7. Chlorine Analyzers
   i. Prominent
8. Hach Transmitters
   i. Hach SC200 or SC1000 depending on number of elements
   ii. Approved Equal
9. pH Element

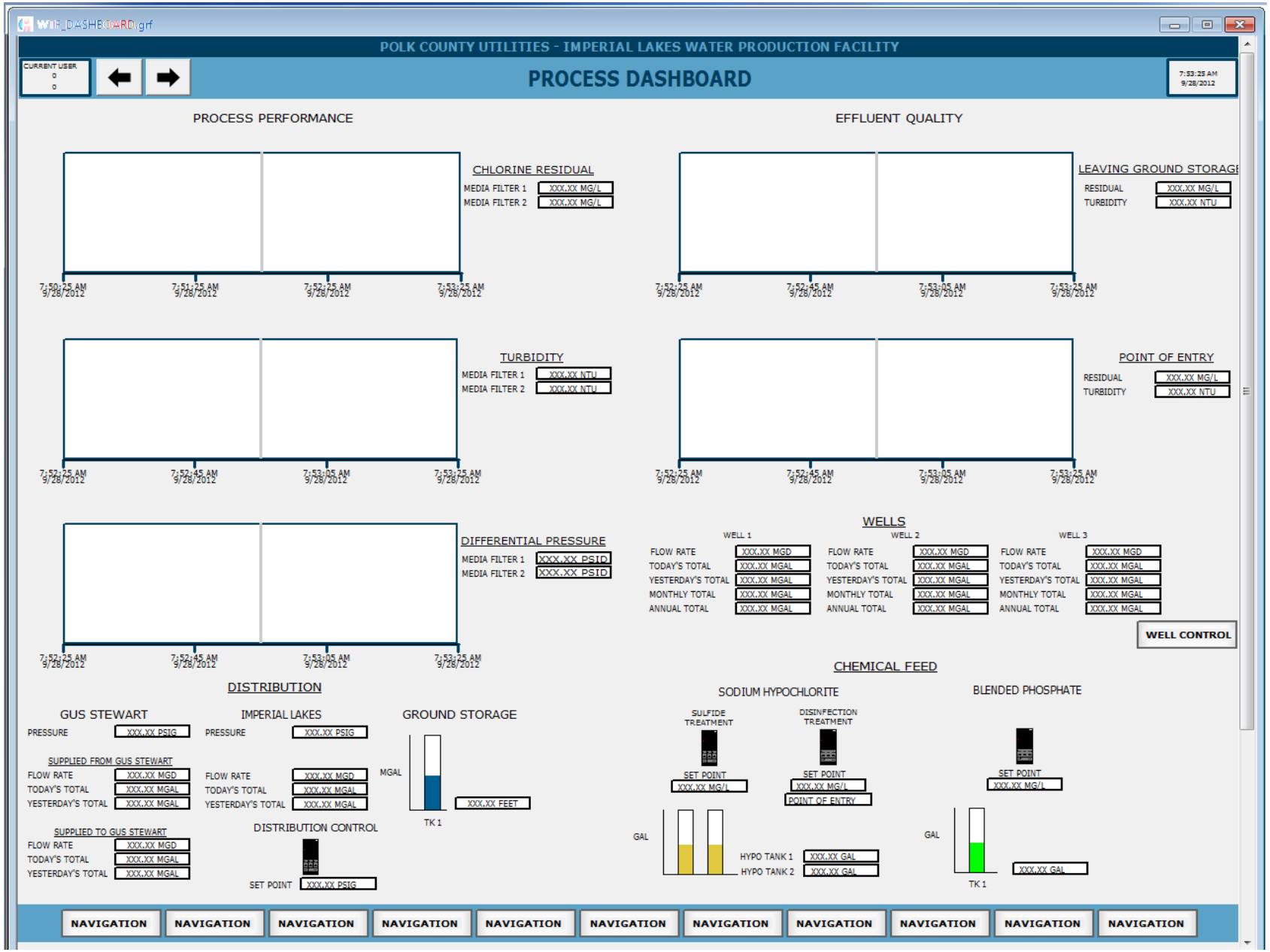
i. Prominent – pH sensor

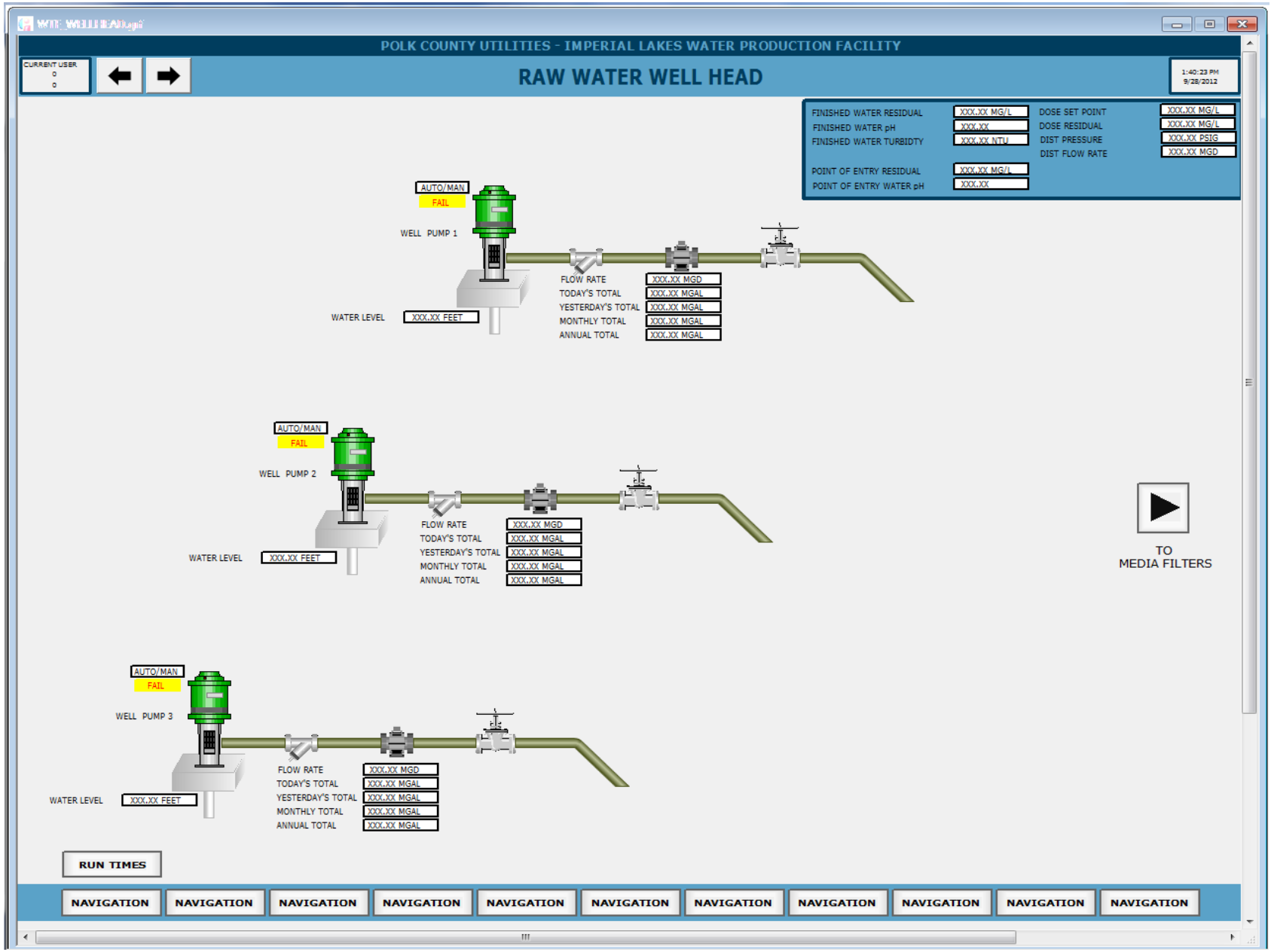
10. Conductivity
    i. Hach
    ii. Approved Equal
11. Motor Operated Valves
    i. Limitorque or Auma Actuators, Valve per Polk County Standards
    ii. Approved Equal

2.03 STANDARD SCREENS

A. The following pages are intended to be standard screens as a basis for creating water treatment facility SCADA pages. The screens shall be used as a basis by both designers and integrators.


POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
OVERVIEW
DISTRIBUTION
GUS STEWART
IMPERIAL LAKES
PRESSURE
SUPPLIED FROM GUS STEWART
FLOW RATE
TODAY'S TOTAL
YESTERDAY'S TOTAL
SUPPLIED TO GUS STEWART
FINISHED WATER RESIDUAL
FINISHED WATER pH
FINISHED WATER TURBIDTY
POINT OF ENTRY RESIDUAL
POINT OF ENTRY WATER pH
DOSE SET POINT
DOSE RESIDUAL
DIST PRESSURE
DIST FLOW RATE
UP 70 PRESSURE CONTROL
UP 50 HIGH SERVICE PUMPING
UP 40 GROUND STORAGE
DISTRIBUTION CONTROL
SET POINT
MGAL
TK 1
LEVEL
VOLUME
UP 50 EMERGENCY GENERATOR
UP 10 RAW WATER WELL 1
MONTHLY TOTAL
ANNUAL TOTAL
UP 10 RAW WATER WELL 2
SODIUM HYPOCHLORITE
BLENDED PHOSPHATE
SULFIDE TREATMENT
DISINFECTION TREATMENT
POINT OF ENTRY
GAL
HYPO TANK 1
HYPO TANK 2
TK 2
UP 80/90 CHEMICAL FEED
UP 30 MEDIA FILTRATION
UP 10 RAW WATER WELL 3
RUN TIMES
WELL CONTROL
NAVIGATION


WTP_DASHBOARD.grf
POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
PROCESS DASHBOARD
7:53:25 AM 9/28/2012
PROCESS PERFORMANCE
CHLORINE RESIDUAL
MEDIA FILTER 1 XXX.XX MG/L
MEDIA FILTER 2 XXX.XX MG/L
7:50:25 AM 9/28/2012
7:51:25 AM 9/28/2012
7:52:25 AM 9/28/2012
7:53:25 AM 9/28/2012
EFFLUENT QUALITY
LEAVING GROUND STORAGE
RESIDUAL XXX.XX MG/L
TURBIDITY XXX.XX NTU
7:52:25 AM 9/28/2012
7:52:45 AM 9/28/2012
7:53:05 AM 9/28/2012
7:53:25 AM 9/28/2012
TURBIDITY
MEDIA FILTER 1 XXX.XX NTU
MEDIA FILTER 2 XXX.XX NTU
7:52:25 AM 9/28/2012
7:52:45 AM 9/28/2012
7:53:05 AM 9/28/2012
7:53:25 AM 9/28/2012
POINT OF ENTRY
RESIDUAL XXX.XX MG/L
TURBIDITY XXX.XX NTU
7:52:25 AM 9/28/2012
7:52:45 AM 9/28/2012
7:53:05 AM 9/28/2012
7:53:25 AM 9/28/2012
DIFFERENTIAL PRESSURE
MEDIA FILTER 1 XXX.XX PSID
MEDIA FILTER 2 XXX.XX PSID
7:52:25 AM 9/28/2012
7:52:45 AM 9/28/2012
7:53:05 AM 9/28/2012
7:53:25 AM 9/28/2012
WELLS
WELL 1
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
MONTHLY TOTAL XXX.XX MGAL
ANNUAL TOTAL XXX.XX MGAL
WELL 2
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
MONTHLY TOTAL XXX.XX MGAL
ANNUAL TOTAL XXX.XX MGAL
WELL 3
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
MONTHLY TOTAL XXX.XX MGAL
ANNUAL TOTAL XXX.XX MGAL
WELL CONTROL
DISTRIBUTION
GUS STEWART
PRESSURE XXX.XX PSIG
SUPPLIED FROM GUS STEWART
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
SUPPLIED TO GUS STEWART
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
IMPERIAL LAKES
PRESSURE XXX.XX PSIG
FLOW RATE XXX.XX MGD
TODAY'S TOTAL XXX.XX MGAL
YESTERDAY'S TOTAL XXX.XX MGAL
DISTRIBUTION CONTROL
SET POINT XXX.XX PSIG
GROUND STORAGE
MGAL
XXX.XX FEET
TK 1
CHEMICAL FEED
SODIUM HYPOCHLORITE
SULFIDE TREATMENT
SET POINT XXX.XX MG/L
DISINFECTION TREATMENT
SET POINT XXX.XX MG/L
POINT OF ENTRY
GAL
HYPO TANK 1 XXX.XX GAL
HYPO TANK 2 XXX.XX GAL
BLENDED PHOSPHATE
SET POINT XXX.XX MG/L
GAL
XXX.XX GAL
TK 1
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION


POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
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RAW WATER WELL HEAD
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FINISHED WATER RESIDUAL
XXX.XX MG/L
FINISHED WATER pH
XXX.XX
FINISHED WATER TURBIDTY
XXX.XX NTU
POINT OF ENTRY RESIDUAL
XXX.XX MG/L
POINT OF ENTRY WATER pH
XXX.XX
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
AUTO/MAN
FAIL
WELL PUMP 1
WATER LEVEL
XXX.XX FEET
FLOW RATE
XXX.XX MGD
TODAY'S TOTAL
XXX.XX MGAL
YESTERDAY'S TOTAL
XXX.XX MGAL
MONTHLY TOTAL
XXX.XX MGAL
ANNUAL TOTAL
XXX.XX MGAL
AUTO/MAN
FAIL
WELL PUMP 2
WATER LEVEL
XXX.XX FEET
FLOW RATE
XXX.XX MGD
TODAY'S TOTAL
XXX.XX MGAL
YESTERDAY'S TOTAL
XXX.XX MGAL
MONTHLY TOTAL
XXX.XX MGAL
ANNUAL TOTAL
XXX.XX MGAL
TO
MEDIA FILTERS
AUTO/MAN
FAIL
WELL PUMP 3
WATER LEVEL
XXX.XX FEET
FLOW RATE
XXX.XX MGD
TODAY'S TOTAL
XXX.XX MGAL
YESTERDAY'S TOTAL
XXX.XX MGAL
MONTHLY TOTAL
XXX.XX MGAL
ANNUAL TOTAL
XXX.XX MGAL
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
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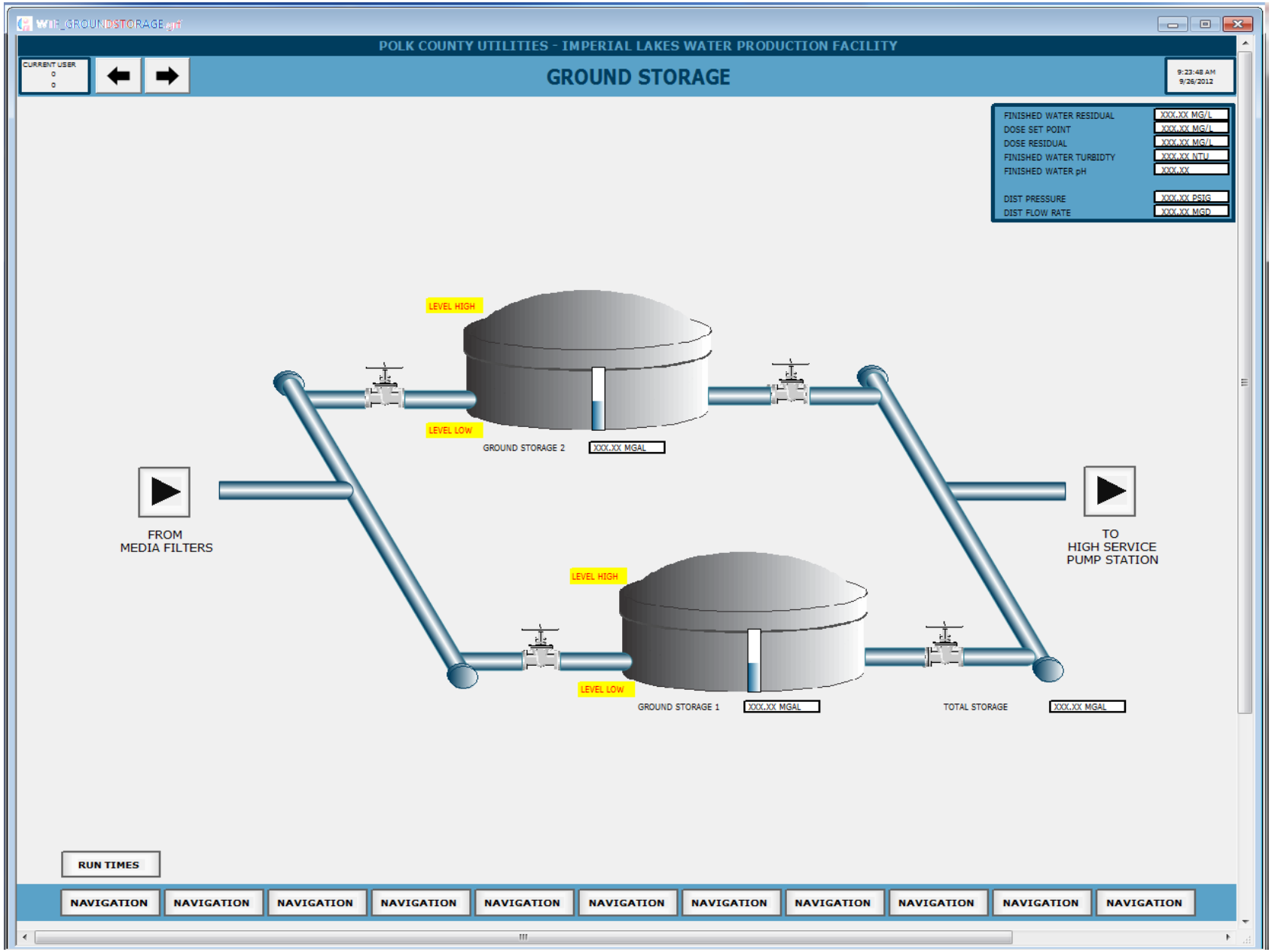
NAVIGATION
NAVIGATION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CURRENT USER
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GROUND STORAGE
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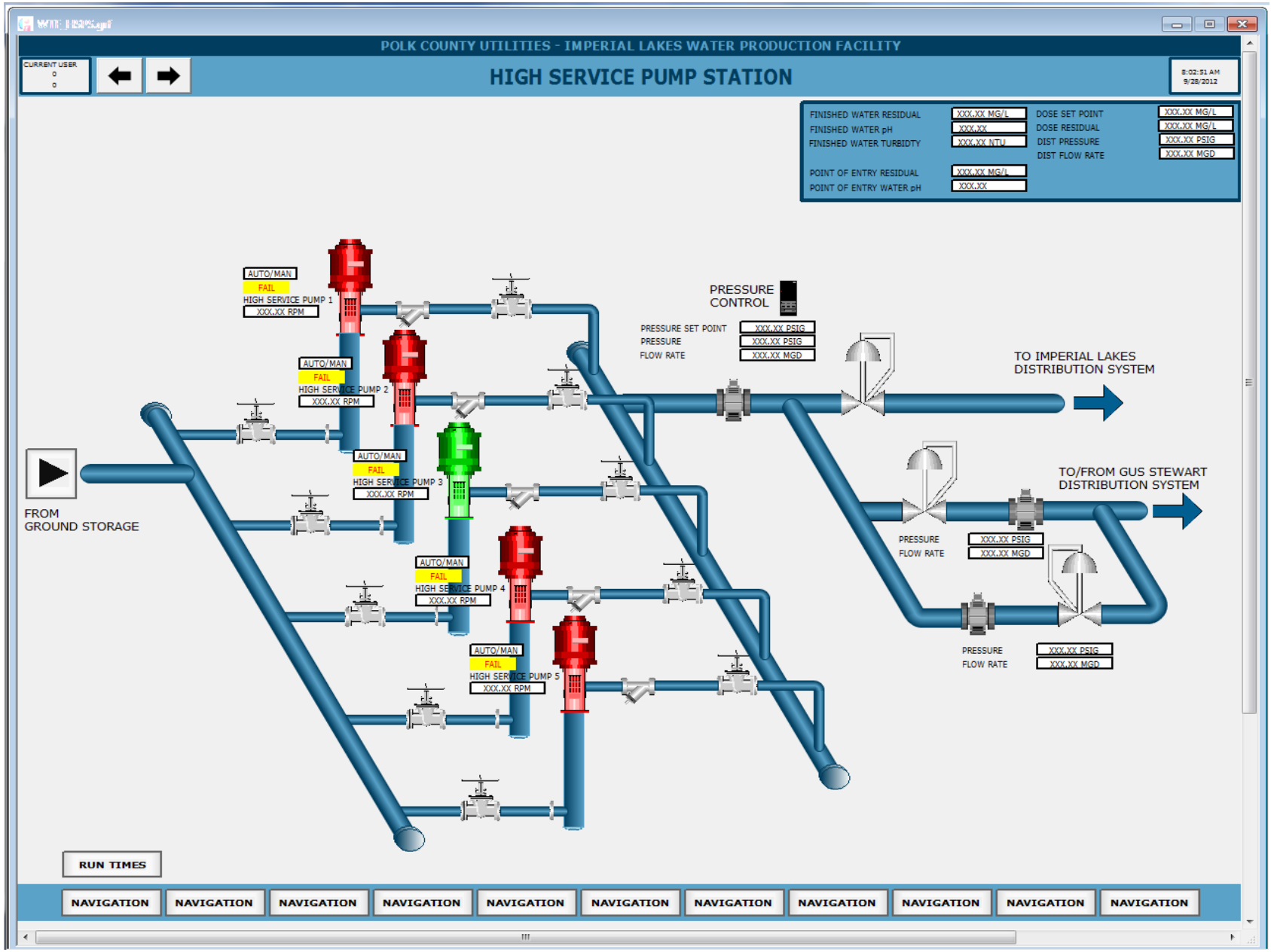
9/26/2012
FINISHED WATER RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
FINISHED WATER TURBIDTY
XXX.XX NTU
FINISHED WATER pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
LEVEL HIGH
LEVEL LOW
GROUND STORAGE 2
XXX.XX MGAL
FROM
MEDIA FILTERS
TO
HIGH SERVICE
PUMP STATION
LEVEL HIGH
LEVEL LOW
GROUND STORAGE 1
XXX.XX MGAL
TOTAL STORAGE
XXX.XX MGAL
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION


POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
HIGH SERVICE PUMP STATION
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9/28/2012
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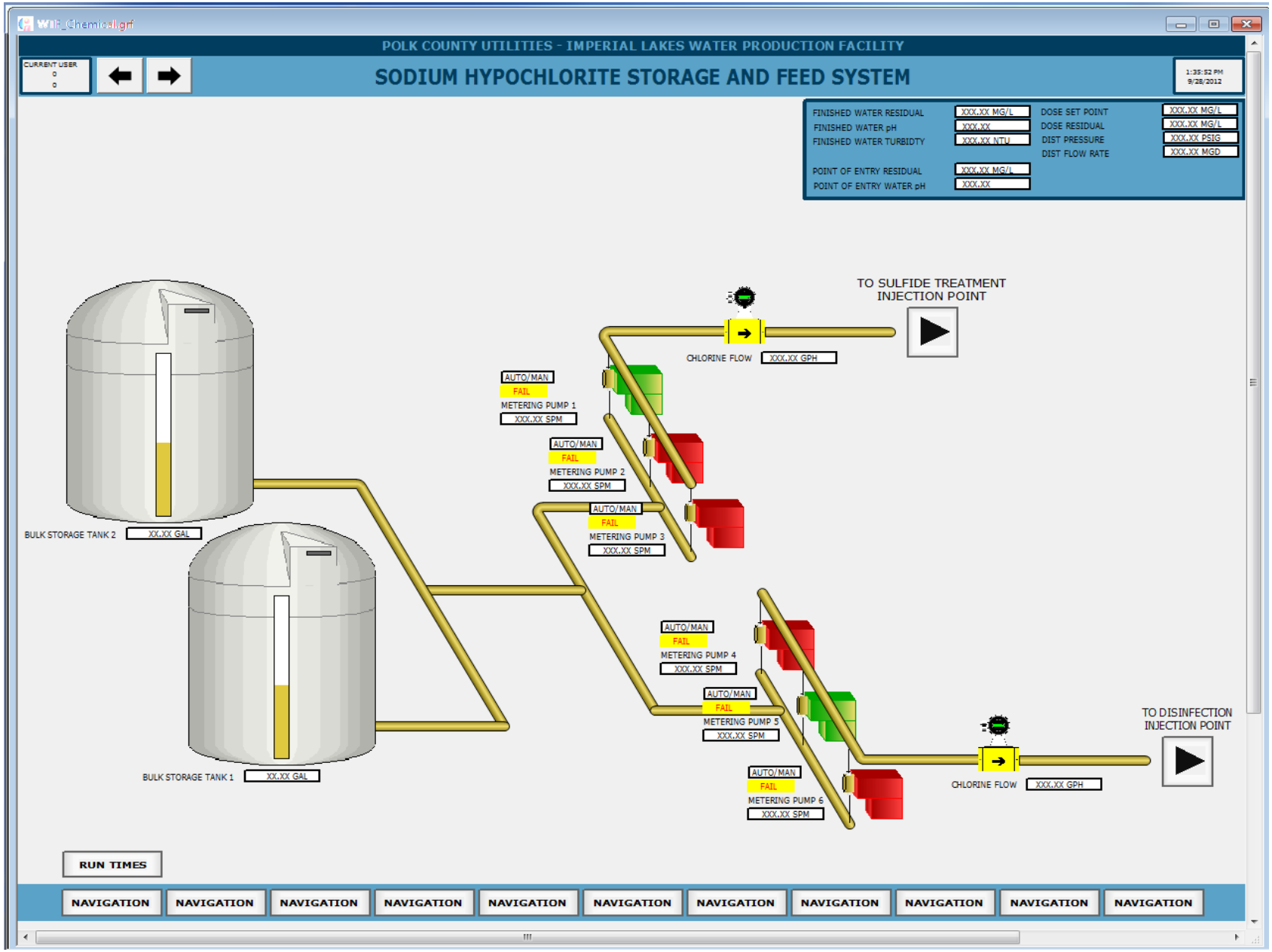
XXX.XX MG/L
FINISHED WATER pH
XXX.XX
FINISHED WATER TURBIDTY
XXX.XX NTU
POINT OF ENTRY RESIDUAL
XXX.XX MG/L
POINT OF ENTRY WATER pH
XXX.XX
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
AUTO/MAN
FAIL
HIGH SERVICE PUMP 1
XXX.XX RPM
HIGH SERVICE PUMP 2
HIGH SERVICE PUMP 3
HIGH SERVICE PUMP 4
HIGH SERVICE PUMP 5
FROM
GROUND STORAGE
PRESSURE
CONTROL
PRESSURE SET POINT
PRESSURE
FLOW RATE
XXX.XX PSIG
XXX.XX MGD
TO IMPERIAL LAKES
DISTRIBUTION SYSTEM
TO/FROM GUS STEWART
DISTRIBUTION SYSTEM
RUN TIMES
NAVIGATION


POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
SODIUM HYPOCHLORITE STORAGE AND FEED SYSTEM
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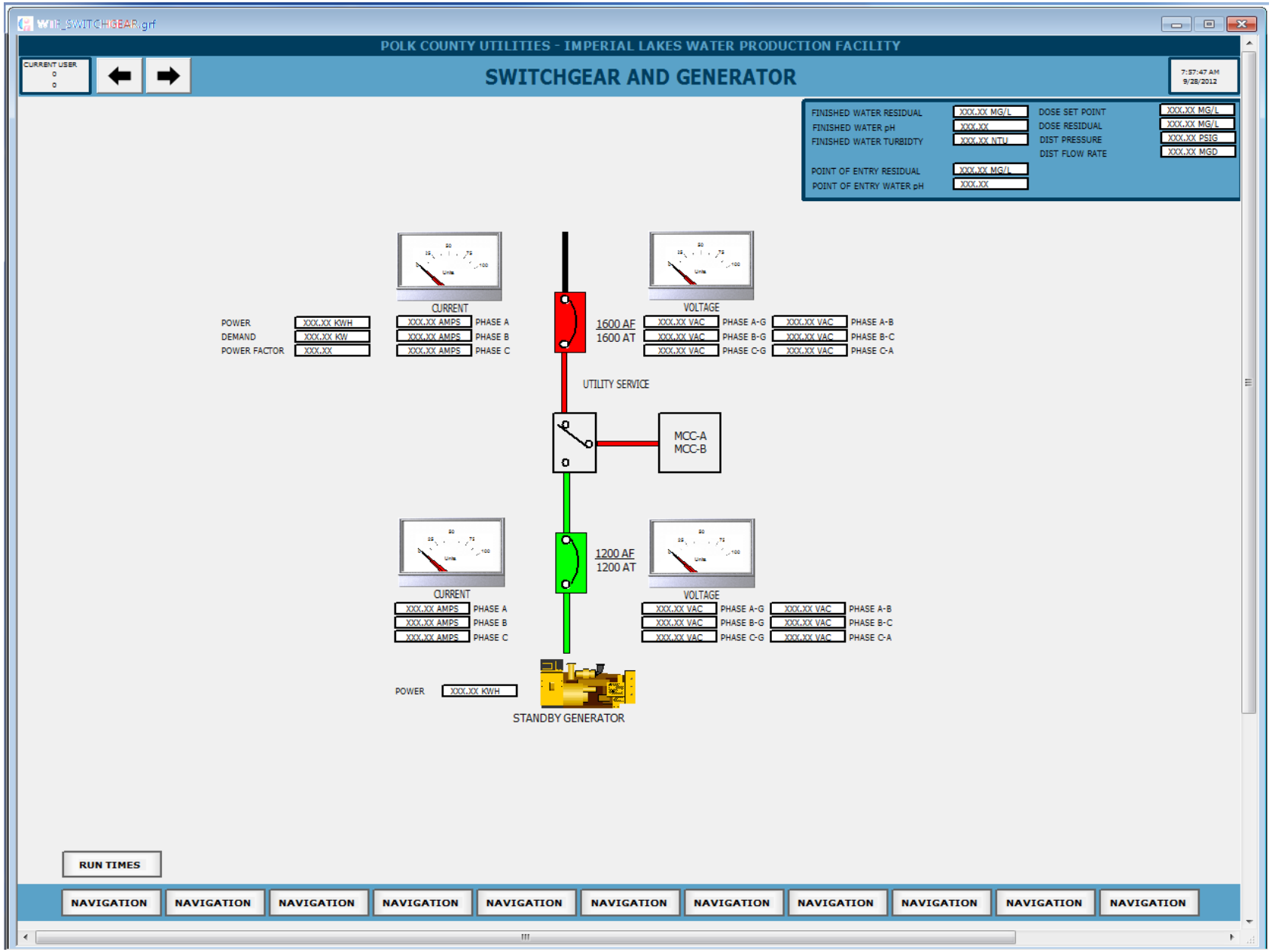
9/28/2012
FINISHED WATER RESIDUAL
XXX.XX MG/L
FINISHED WATER pH
XXX.XX
FINISHED WATER TURBIDTY
XXX.XX NTU
POINT OF ENTRY RESIDUAL
XXX.XX MG/L
POINT OF ENTRY WATER pH
XXX.XX
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
TO SULFIDE TREATMENT INJECTION POINT
CHLORINE FLOW
XXX.XX GPH
AUTO/MAN
FAIL
METERING PUMP 1
XXX.XX SPM
METERING PUMP 2
XXX.XX SPM
METERING PUMP 3
XXX.XX SPM
METERING PUMP 4
XXX.XX SPM
METERING PUMP 5
XXX.XX SPM
METERING PUMP 6
XXX.XX SPM
BULK STORAGE TANK 2
XX.XX GAL
BULK STORAGE TANK 1
XX.XX GAL
TO DISINFECTION INJECTION POINT
CHLORINE FLOW
XXX.XX GPH
RUN TIMES
NAVIGATION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POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
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SWITCHGEAR AND GENERATOR
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9/28/2012
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FINISHED WATER pH XXX.XX
FINISHED WATER TURBIDTY XXX.XX NTU
POINT OF ENTRY RESIDUAL XXX.XX MG/L
POINT OF ENTRY WATER pH XXX.XX
DOSE SET POINT XXX.XX MG/L
DOSE RESIDUAL XXX.XX MG/L
DIST PRESSURE XXX.XX PSIG
DIST FLOW RATE XXX.XX MGD
CURRENT
POWER XXX.XX KWH
DEMAND XXX.XX KW
POWER FACTOR XXX.XX
XXX.XX AMPS PHASE A
XXX.XX AMPS PHASE B
XXX.XX AMPS PHASE C
1600 AF
1600 AT
VOLTAGE
XXX.XX VAC PHASE A-G
XXX.XX VAC PHASE B-G
XXX.XX VAC PHASE C-G
XXX.XX VAC PHASE A-B
XXX.XX VAC PHASE B-C
XXX.XX VAC PHASE C-A
UTILITY SERVICE
MCC-A
MCC-B
1200 AF
1200 AT
CURRENT
XXX.XX AMPS PHASE A
XXX.XX AMPS PHASE B
XXX.XX AMPS PHASE C
VOLTAGE
XXX.XX VAC PHASE A-G
XXX.XX VAC PHASE B-G
XXX.XX VAC PHASE C-G
XXX.XX VAC PHASE A-B
XXX.XX VAC PHASE B-C
XXX.XX VAC PHASE C-A
POWER XXX.XX KWH
STANDBY GENERATOR
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
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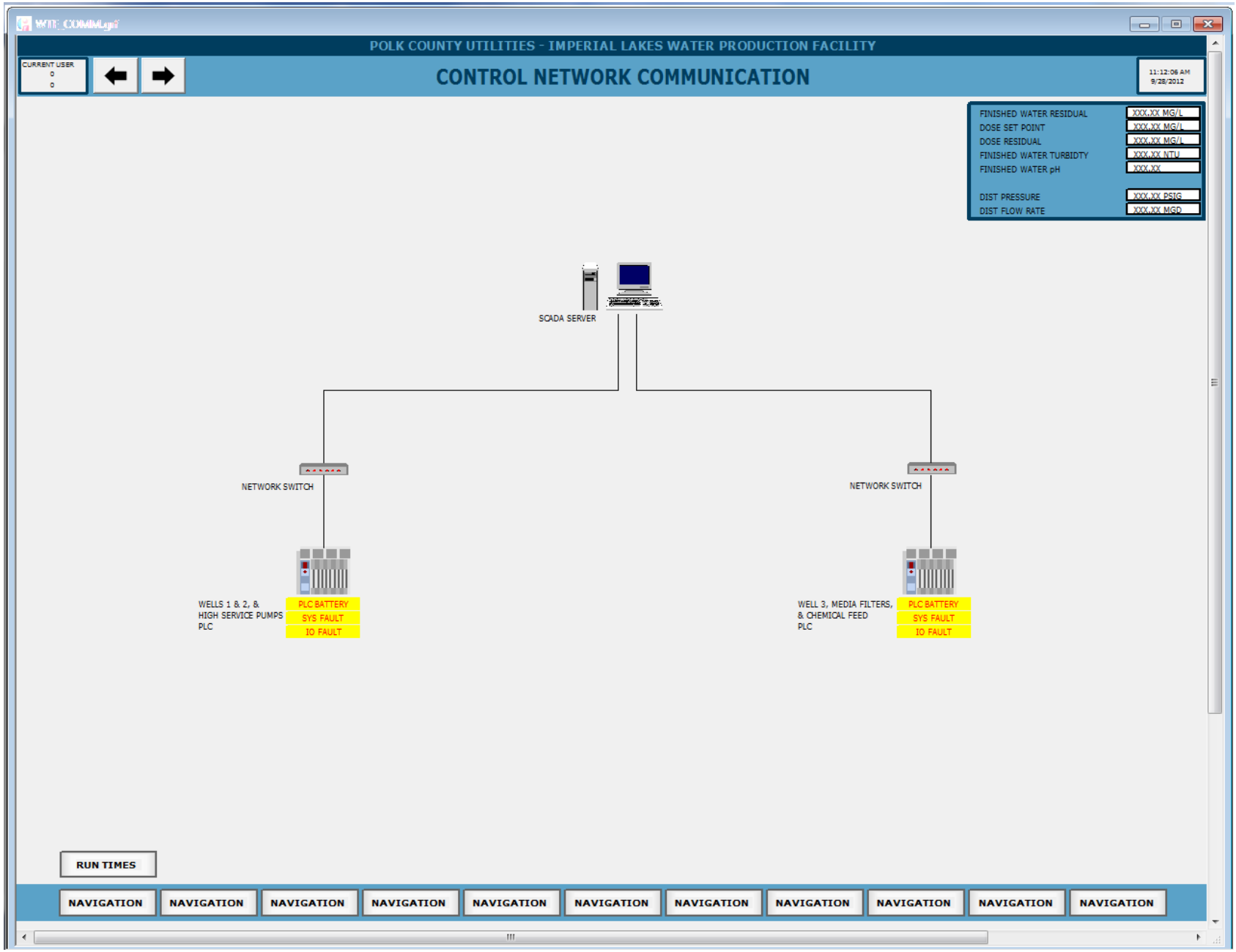
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION


POLK COUNTY UTILITIES - IMPERIAL LAKES WATER PRODUCTION FACILITY
CURRENT USER
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CONTROL NETWORK COMMUNICATION
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9/28/2012
FINISHED WATER RESIDUAL
XXX.XX MG/L
DOSE SET POINT
XXX.XX MG/L
DOSE RESIDUAL
XXX.XX MG/L
FINISHED WATER TURBIDTY
XXX.XX NTU
FINISHED WATER pH
XXX.XX
DIST PRESSURE
XXX.XX PSIG
DIST FLOW RATE
XXX.XX MGD
SCADA SERVER
NETWORK SWITCH
NETWORK SWITCH
WELLS 1 & 2, & HIGH SERVICE PUMPS PLC
PLC BATTERY
SYS FAULT
IO FAULT
WELL 3, MEDIA FILTERS, & CHEMICAL FEED PLC
PLC BATTERY
SYS FAULT
IO FAULT
RUN TIMES
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION
NAVIGATION

STANDARD DRAWINGS

WA-01-1	Blow Off Valve - Standard
WA-01-2	Blow Off Valve (Above Ground) - Automatic
WA-02	Fire Line Double Check Detector Assembly (4 Inches to 12 Inches)
WA-03	Fire Hydrant Assembly
WA-04-1	Fire Service Master Meter Assembly (Single Cross Connection Control Assembly)
WA-04-2	Fire Service Master Meter Assembly (Double Cross Connection Control Assembly)
WA-05	Meter and Reduced Pressure Zone Cross Connection Control Assembly (Up to 2 Inches)
WA-06	Jumper Connection (Typical)
WA-07-1	Water System Interconnect - Site Plan
WA-07-2	Water System Interconnect – Plan and Section Views
WA-08	Potable Water Irrigation Master Control Assembly (Four Inches and Larger)
WA-09-1	Master Meter Assembly 3” and Larger (Single Cross Connection Control Assembly)
WA-10	Hydraulically Operated Control Valve (Pressure Reducing/Pressure Sustaining)

Testing and Inspection for Acceptance

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications cover the testing and inspection for the acceptance of water systems.

B. Hydrostatic tests shall be conducted for pressure pipes, joints, fittings and valves for allowable limits of pressure and leakage. Air testing of pressure pipes will not be permitted under any circumstance.

C. Requests for testing and acceptance of water systems shall follow the procedure in listed in the Section entitled “Field Testing and Inspection Procedures”.

D. The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, grit, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing and chlorinating of a new pipeline swabbing shall be utilized as specified on the construction plans for each project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TESTS

A. Swabbing

1. All mains shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand, and debris from main.

2. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the CONTRACTOR to provide and remove temporary access and egress points for the cleaning, as required.

3. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled, and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

4. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test.

5. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.

6. The CONTRACTOR shall locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.

7. At the receiver or exit point for the poly swab, the CONTRACTOR is responsible for creating a safe environment for collection of debris, water, and the swab. The CONTRACTOR shall provide for the protection of surrounding personnel and property and the safe retrieval of the swab.

8. Only PCU personnel shall operate the supply valve from the existing distribution system. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab is retrieved.

   a. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
   b. Swabbing speed shall range between two and five feet per second. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

B. Hydrostatic Pressure Testing of Ductile Iron and PVC Pressure Pipe:

1. Hydrostatic pressure tests shall consist of a pressure test and leakage test for non-butt welded jointed pipes. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops and fire hydrants assemblies. Testing shall be performed from in-line valve to in-line valve with a depressurized section behind each valve, whenever possible.

   a) All pipe sections to be pressure tested shall be subjected to a minimum hydrostatic pressure of 150 psi. The duration of each pressure test shall be for a period of two hours. If during the test, the integrity of the tested line is in question, PCU may require a six-hour pressure test. The basic provisions of AWWA C600 shall be applicable.

   b) All testing and the quantity of acceptable leakage shall be documented and certified using the appropriate Pressure Test Form.

   c) Water supply from the existing distribution system shall be provided through a jumper connection consisting of fittings, a reduced pressure zone cross connection control assembly, and installed as shown in the STANDARD DRAWINGS.

d) Procedure for Pressure Test:

Pipe to be tested shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Provisions shall be made to expel air entrapped in the pipe before applying the specified test pressure. To accomplish this, taps shall be made, and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replace by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained. Provisions of AWWA C600 and C651, where applicable, shall apply.

2. Procedure for Leakage Test:

a) After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C600 shall apply.

b) Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{ND(P)^{1/2}}{7{,}400}$$

Note:
L - Allowable leakage in gallons per hour.
N - Number of joints in the tested line.
D - Nominal diameter of the pipe in inches.
P - Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved off section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, the CONTRACTOR shall locate and replace or repair the defective joints, pipe or valve until the leakage from subsequent testing is within the specified allowance.

C. Hydrostatic Pressure Testing of HDPE and Fusible PVC Pressure Pipe:

1. After installation, the butt welded jointed pipe shall be tested in accordance with this MANUAL with the following modifications:

a) Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure, shall not exceed five hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be

depressurized and allowed to "relax" for a minimum of eight hours before it is brought back up to test pressure.

b) Prior to Hydrostatic Pressure Testing Procedure:

i. Hydraulically clean the main to be tested with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.
ii. Insure that main to be tested is restrained against horizontal and vertical movement. Exposing joints only is allowed.

c) Hydrostatic Pressure Testing Procedure:

i. Fill main slowly with water to remove air.
ii. Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.
iii. Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.
iv. Reduce pressure by 10 psi and monitor for 1 hour.
v. Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

D. The CONTRACTOR shall furnish all necessary equipment and material, make all taps and furnish all closure pieces in the pipe as required. Equipment to be furnished by the CONTRACTOR shall include graduated containers, pressure gauges, hydraulic forces pumps, and suitable hoses and piping. The PCU representative shall monitor a satisfactory test.

E. The CONTRACTOR may conduct preliminary hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified. Where any section of pipe is provided with concrete thrust collar, pressure test will not be made until at least five days have elapsed after the thrust collar is installed.

F. Disinfection:

1. Newly installed mains shall be filled, flushed, and disinfected in accordance with the ANSI/AWWA C651. During the chlorination period, valves, hydrants and appurtenances in the treated section shall be operated to ensure they are disinfected with the new main. Before being placed into service, new mains or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 25 milligrams per liter and that a chlorine residual of not less than 10 milligrams per liter remains in the water after

standing 24 hours in the pipe. The free residual chlorine concentration shall be monitored, documented and certified for the initial application and after a 24-hour contact period. The testing/monitoring location points, the disinfection process utilized and free chlorine residuals shall be documented and certified using a PCU approved Disinfection Certification Form.

2. The interior of all pipe and fittings, including couplings and fittings, used in making repairs and connections in shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed.

G. Final Flushing and Testing:

1. Following chlorination, all treated water shall be thoroughly flushed from the new main. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine. Flushing shall take place until, upon testing, the free chlorine residual obtained is not in excess of that normally carried in the system.

2. Water samples shall be collected from the approved sampling points. Each sample result shall show acceptable bacteriological results for two consecutive days. The CONTRACTOR shall have all testing conducted by a private laboratory that is certified by the State of Florida.

3. Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of PCU personnel.

4. Copies of testing results and all related correspondence with the FDEP shall be submitted to PCU.

H. The distribution system piping is to remain isolated and out of service until PCU receives clearance from FDEP.

I. Repetition of Flushing and Testing:

Should the initial treatment result in an unsatisfactory bacterial test, the CONTRACTOR shall repeat the original disinfection procedure until satisfactory results are obtained.

PART 4 - ACCEPTANCE

4.01 LOCATE WIRE CHECK

A. The locating wire will be inspected and tested for continuous continuity along the entire length of the main and correct material as specified in the appropriate "Approved Materials Checklist".

B. Valve locations will be inspected for the proper installation of the locating wire in accordance with the STANDARD DRAWINGS and tested for continuity between the main and the valve.

4.02 FIRE HYDRANTS

A. Fire hydrants will be tested for smooth operation. Fire hydrant assemblies shall be inspected for absence of leakage from any ports, joints, and or fittings in the hydrant assembly to the main. PCU shall confirm that hydrants are painted the correct colors as stated in the Section entitled "Potable Water System Standards and Specifications", installed as shown in the STANDARD DRAWINGS, and located in accordance with the RECORD DRAWINGS.

4.03 VALVES

A. Valves will be operated to verify a smooth and correct operation, plus the correct direction of opening. PCU shall confirm the location in accordance with the RECORD DRAWINGS and installed in accordance with the STANDARD DRAWINGS.

4.04 VALVE BOXES

A. Valve boxes will be inspected to ensure they are clear of debris, centered over the operating nut, and installed with a collar as shown in the STANDARD DRAWINGS. The depth of the operating nut will be measured to finished grade to confirm that a riser is installed or not required. Valve boxes shall meet the material standards listed in the appropriate "Approved Materials Checklist".

4.05 SERVICE LINES

A. Service lines shall be properly identified, free from conflicts with any structure, installed as shown in the STANDARD DRAWINGS, and the number location and size is as shown on the RECORD DRAWINGS to serve all intended properties. The materials shall be as listed in the appropriate "Approved Materials Checklist".

4.06 BLOW OFF VALVE ASSEMBLIES

A. Blow off valve assemblies shall be free from any conflicts with any structures, installed in accordance with the STANDARD DRAWINGS, located as shown in the RECORD DRAWINGS and tested to ensure correct operation. The materials shall be as listed in the appropriate "Approved Materials Checklist".\

4.07 AUTOMATIC AIR RELEASE VALVE ASSEMBLIES

A. Valve assemblies shall be free from any conflicts with any structures, installed in accordance with the STANDARD DRAWINGS, and located as shown on the RECORD DRAWINGS tested to ensure correct operation and confirm materials as listed in the appropriate “Approved Materials Checklist”.

Approved Materials Checklist

PLEASE TYPE OR PRINT CLEARLY IN BLACK INK

Project Name: _____

PCU Project File Number: _____

Contractor's Name: _____

Contractor's Address: _____

Contractor's Signature: _____

Engineer's Name: _____

Engineer's Address: _____

PCU Reviewer: _____ Date: _____

Approved: ____ Denied/Resubmit: ____

Comments:
_____
_____
_____
_____
_____
_____

With the submission of this document, the CONTRACTOR understands that the use of the following selected items, as individually indicated by the use of an "X", is mandatory.

Substitutions using other items contained within this Checklist shall be initiated by the CONTRACTOR submitting a revised Checklist to PCU for its review and approval at least 10 calendar days in advance of need.

It is also understood by the CONTRACTOR that PCU shall reject materials and products not in accordance with this document and the MANUAL. Any material or product not contained within this Checklist shall be approved in advance by the Utilities Code Committee in accordance with the provisions of the Utilities Code.

Shop drawings shall be required for all structures and similar items not contained on this checklist, such as manholes, wet wells, and other castings.

Approved Materials Checklist

Four (4) sets of the CONTRACTOR's and ENGINEER's executed APPROVED MATERIALS CHECKLIST and any necessary shop drawings shall be submitted to PCU for its use and approval, plus the number of sets needed for the CONTRACTOR use. Ordering materials and products without specific written approval from PCU of the submitted list and shop drawings is NOT recommended and is done at the CONTRACTOR's sole expense and responsibility.

NOTE: The latest changes approved by the Utilities Code Committee are indicated by "underlining" and deleted items by "~~strikethroughs~~".

Water Category 1 of 10: VALVES AND ACCESSORIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Combination Air / Vacuum Release Valves:			
	ARI	D-040	Combination
	ARI	S-050	Air Release Only
	ARI	S-010	Air Release Only
	Val-Matic	VM-38	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-45	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-200C	Combination – Plant, Facility Use Only
Air / Vacuum Release Valve Enclosure (Horizontal Venting and Medium Blue):			
	Water Plus	131632	
	Channell	BPH 1730	
	Hydro-Guard	Safety-Guard 15100 Low Profile or 02100	
Air / Vacuum Release Valve Vault Frame And Cover:			
	US Foundry	USF-679-BK-M	
	CertainTeed	Pamrex 36"	Alternative – Not to be used in paved roadways.
Blow Off Valve:			
	Hydro Guard	HG-2 Low Profile	Automatic Blow Off (Self-contained unit)
	Charles Multi-Purpose Housing (CMPH) with individual parts to assemble	Series CMPH 5500 (Enclosure)	Alternative to all-in-one blow off valves.
		Solorain 8014N Programmable Actuator	Enclosure color may be

Approved Materials Checklist

		HRC-990-SD-MD Latching Solonoid for HRC 990 Controller	Sand Stone or Granite. Assembly required
		HRC-990-04-MS Hydro-Rain 1-4 Zone Battery Controller	
		205T Glove Valve Npt Threads without FC Irritrol	
	Channell Budget Pedestal Housing (BPH) with individual parts to assemble	Series BPH 1230 (Enclosure)	Alternative to all-in-one blow off valves Enclosure color may be Sand Stone or Granite. Assembly required
		Solorain 8014N Programmable Actuator	
		HRC-990-SD-MD Latching Solonoid for HRC 990 Controller	
		HRC-990-04-MS Hydro-Rain 1-4 Zone Battery Controller	
		205T Glove Valve Npt Threads without FC Irritrol	
Butterfly Valves 42-inch And Larger: (8 mil Epoxy Coated, Lined (AWWA), And For On-Site Water Production Facility Use Only):			
	M & H	4500	
	Mueller/Pratt	Linseal III / BV (Ground Hog)	
Butterfly Valves 16-inch And Larger: (Rubber Seated (AWWA):			
	Val-Matic	2000	To be utilized as directed by PCU.
Gate Valves 16-inch Through 48-inch (Resilient Seated Only With Side Actuators):			
	American Flow Control	Series 2500	
	Mueller	Series A-2361	
	M & H	Series 4067	
Gate Valves 12-inch And Smaller (Resilient Seated Only):			
	American Flow Control	Series 2500	
	M & H	Series 4067	
	Mueller	Series A-2360	
	Clow	Series F-6100	
Hydraulically Operated Control Valves (Pressure Reducing/Sustaining Valves):			
	Cla-Val		Model or Series based on field application.
	OCV		Model or Series based on field application.

Approved Materials Checklist

	Watts/Ames		Model or Series based on field application.
Sample Station (Above Grade) (Blue in Color):			
	Water Plus	Series 301W	May be used as an alternative to the field assembled sample station.
	Hydro-Guard	Safety-Guard SGBSS-05 SS or -06 SS with S300 Enclosure	May be used as an alternative to the field assembled sample station.
Tapping Valves (Resilient Seated Only):			
	American Flow Control	Series 2500	
	M & H	Series 4751	
	Mueller	Series T-2360 & T-2361	
	Clow	Series F-6114	
Insertion Valves - MJ/Ductile Iron RWGV (In Place of Line Stop/Tapping Sleeve)			
	Team Industrial Products	InsertValve	Available 4” through 12”
Test Station Box For Buried Valves:			
	Bingham/Taylor	P200NFG2T	
Valve Boxes with Lids (5¼ -Inch, ASTM A48 30B Cast or Ductile Iron, With “WATER” cast into the lid top):			
	Bingham / Taylor Foundry	4905-X, 4905, 4904L	
	Tyler	Series 6850	
	American Flow Control*	Trench Adapter Models 1 through 9	* For mains with valve nuts that are 6’ or deeper.
	Sigma	VB261, VB262, VB264, VB4650W	
	Mueller	MVB	Use w/ AJBV-4” Locking Bolt
	Star		Heavy Duty Screw or Slip Type

Approved Materials Checklist

Water Category 2 of 10: SERVICE MATERIALS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Angle Stops Ball Type (1-inch And 2-inch CTS OD Tubing By 5/8-inch By ¾-inch And 2-inch Meter):			
	Ford	BA43-242W, BFA43-777W	
	Mueller	P24258, P24276	
	McDonald	4642B-22, 4602B-22	
Angle Stops Ball Type (3/4-inch FIP By 5/8-inch By 3/4-inch Meter):			
	Ford	BA13-232W	
	Mueller	B24265R	
	McDonald	4604B	
Corporation Stops Ball Type (1-inch and 2-inch With AWWA Iron Pipe Threads Only/Pack Joint Outlet For CTS):			
	Ford	FB1000	
	Mueller	P25008	
	McDonald	4701B-22	
Curb Stops Straight Valves (Curb Stop To Be Ball Type, Reduced Port FIP By FIP 3/4-inch By 3/4-inch):			
	Ford	B11-233W	
	Mueller	B-20200-R	
	McDonald	6101W	
Curb Stops Straight Valves (Ball Type Compression By Meter, 1-inch And 2-inch CTS OD Tubing By 5/8-inch By ¾-inch Meter):			
	Ford	B43-342W, BF43-777W	
	Mueller	P24350, B24337, B24335	
	McDonald	6100MW-22	
Curb Stops Straight Valves (Ball Type Compression By Compression):			
	Ford	BA44-444W	
	Mueller	P25146	
	McDonald	6100W-22	
Dual Check Valve (Two Independently Acting Spring-Loaded Check Valves)			
	Apollo	4NLF-3C5-5B	For ¾-inch Meter
	Apollo	4NLF-3S6-5B	For 1-inch Meter
Polyethylene Tubing (Blue With UV Protection [SDR-9] 1-inch And 2-inch Only):			
	Endot	PE-4710 EndoPure	

Approved Materials Checklist

	Endot	PE-4710 EndoTrace	Alternative Pipe and Locating Wire Combo
	Charter Plastics	PE-4710	
	ARNCO	PE-4710 Perma-Guard	
	ARNCO	PE-4710 Perma-Find	Alternative Pipe and Locating Wire Combo
	ADS	CTS PE4710	Service Tubing
Service Saddles (Epoxy Or Nylon Coated Ductile Iron Body with Stainless Steel 18-8-Type 304 Straps, CC Threads – 2-inch To Be Iron Pipe Threads Controlled OD Saddles To Be Used On C-900 And IPS OD PVC Pipe, Double Straps To Be 2-inch Minimum Width Each):			
	Ford	Series FC202	
	JCM	Series 406	
	Mueller	DR2S, DR2SOD	
	McDonald	3855, 3855	
	Cascade	CNS 1, CNS 2	
	Romac	202N	
	Romac	202N-H	For Use With HDPE Pipe
Y Branch (1-inch By 2-inch):			
	Ford	U-48-43	
	Mueller	P15363	
	McDonald	08U2M	
Y Branch Assemblies With Angle Ball Valves (1-inch By 2-inch):			
	Ford	UVB43-42W	
	Mueller	P15363-05	
	McDonald	09U2BW	
Meter Boxes w/ Cast Iron Lids (Black, HDPE):			
	Carson	10152026 (Box) 10151033 (Combo)	10154018 (Lid)
	DFW Alliance	DFW1200-12-Body (Box) DFW1200-12-1C (Combo Unit)	DFW1200-1C-LID (Lid)

Approved Materials Checklist

Water Category 3 of 10: PIPE MATERIAL			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Casing Spacers (All Sizes) Stainless Steel With Vinyl Runners:			
	Cascade	Series CCS / CCPS / AZ	
	PSI	Series S-G-2	
	PSI-Ranger	Ranger II	
	RACI	S/T, F/G, P/Q, M/N, E/H	
	CCI	CSS8, CSS12	
	Advanced Systems		
Ductile Iron Pipe Cement Lined (4-inch To 12-inch = PC 350, 16-inch To 20-inch= PC 250, 24-inch = PC 200, 30-inch To 64-inch = PC 150) (DI Flanges As Applicable, AWWA C115):			
	American		
	Clow		
	Griffin		
	McWane		
	US Pipe		
Paint: Aerial Pipe, Fittings, And Valves (Field and Factory Primer):			
	Color Wheel	635 Primer Red	
	Glidden	Alkyd Metal Primer	
	Porter/International	286 U-Primer	
	Tnemec	37H-77 Chem-Primer	
	Tnemec	Pota-Pox Plus N140	
	Wasser	Ferro Clad Primer	
Paint: Finish (Exterior):			
	Color Wheel	600 Alkyd Enamel	
	Glidden	Alkyd Industrial Enamel	
	Porter/International	2749 Alkyd Gloss	
	Tnemec	Tnemec - Gloss 2H	
	Tnemec	Pota-Pox 100 Series 22	
PVC (Blue) 4-inch Through 12-inch Pipe (AWWA C-900, DR18) and 16-inch and larger pipe (AWWA C-905 or C-909, DR 25):			
	Bristolpipe	4” to 12”	
	Certainteed	Certa-Lok 4” to 12”	
	Diamond Plastic		
	Ipex		
	JM-Eagle		

Approved Materials Checklist

	National Pipe		
	NAPCO		North American Pipe Company
	Upinor ETI 9	Ultra Blue-C-909	
	Underground Solutions	Fusible PVC	For Horizontal Directional Drill Use Only
HDPE Pipe DR11 (Blue Striped):			
	Chevron/Phillips	Performance Pipe / ISCO Pipe	
	CSR	Polypipe/Charter Plastics	
	JM-Eagle		
	National Plastics		
	ARNCO		
Potable Water Main Identification Tape (Blue, 6-Inches Wide, 2-Inch High Black Lettering, Adhesive Backed):			
Buried Potable Water Main Warning Tape (Blue, 3-inches Wide, 1-Inch High Black Lettering, Non-Adhesive Backed):			
Locating Wire (Single Strand 14-Gauge Solid Copper Wire with Blue Colored Insulated Covering):			
	Copperhead	Reinforced Locating Wire	Alternative
Locating Marker Systems (Potable Water) (Blue In Color):			
	3M	Scotch Mark EMSII Electronic Marker Blue Locator #1265	
	3M	Scotch Marker Electronic Ball Marker #1404	
Curb and Pavement Markers (Blue in Color, Imprinted With The Words "POLK COUNTY UTILITIES" And "CALL 811 BEFORE YOU DIG" With "POTABLE WATER SERVICE" or "POTABLE WATER VALVE" As Applicable):			
	Rhino	ATAGNCT-C (Custom Imprinting)	New Construction
	Rhino	ATAGRFT-C (Custom Imprinting)	Retrofit to Existing Improvements
	DAS Manufacturing	Reflective Duracast Style (Custom Imprinting)	New Construction or Retrofit

Approved Materials Checklist

Water Category 4 of 10: PIPE FITTINGS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Expansion Joints:			
	EBAA Iron		
	Metraflex		
	Star	Star Flex Series 5000, 5100, & 5200	
	Proco		
	Mercer Rubber		
Fittings C153 SSB / C110 Flange (Cement Mortar Lined And Asphaltic Coated In Accordance With C104) (Outside Surfaces Shall Be Prime Coated Only If Located Aboveground And Painted):			
	American		
	Union/Tyler		
	US Pipe		
	Serampore Industries (SIP)		
	Sigma		
	Star Pipe		
Restrained Joints - Ductile Iron Pipe:			
	American	Fast Grip Gasket Flex Ring Field Flex Ring Lok Ring	
	EBAA Iron Inc.	Mega-lug Series 1100 Series 1700 Bell Restrainer Series RS-3800 Restrainer - sleeve included	
	Serampore Industries (SIP)	EZ Grip	For DI Pipe
	Sigma	One LOK SLD	
	Sigma	LOK Series PVP and PVPF	

Approved Materials Checklist

	Star	Stargrip Series 3000, 3000S,& 3000OS Series 3100S & 3100P Flange Adapter Series 200 & 400 Retainer Gland Series 600 Series 1000, 1100, & 1200 Adapter Flange Series 3200 & 4200	
	Tyler/Union	Tuf Grip TLD Series 1000, 1000S Tuf Grip Dual Wedge Restraint Series 1500	For DI Pipe Use For PVC, DIP, HDPE pipe use
Restrained Joints - PVC Pipe:			
	EBAA Iron Inc.	Mega-lug Series 2000PV Series 1500 & 1600 Bell Restrainer (4-inch to 12-inch) Series RS-3800 Restrainer – sleeve included	
	JCM	620 Sur-Grip Bell Joint 621 Sur-Grip Bell Joint	
	Uni-Flange/Ford	1350 Bell Restrainer 1360 Bell Restrainer 1390 Bell Restrainer 900 Adapter Flange 1300 Fitting Restrainer 1500 Series	
	Serampore Industries (SIP)	EZ Grip	For PVC
	Sigma	One LOK SLC	
	Sigma	PV LOK Series PVP and PVPF	
	Star	PVC Stargrip Series 4000 & 4000P PVC Harness Series 1000, 1100, & 1200 Adapter Flange Series 3200 & 4200 Adapter Flange Series 200 & 400	

Approved Materials Checklist

	Tyler/Union	Tuf Grip TLP Series 2000, 2000S Tuf Grip Dual Wedge Restraint Series 1500 Bell Joint Restraints Series 3000: 32U, 33U, 34U, 35U	For PVC Pipe Use For PVC, DIP, HDPE pipe use For PVC Pipe Use
Tapping Sleeves (For All Taps On IPS OD PVC pipe, Including Size On Size (18-8 Type 304 Stainless Steel Body, Flange And Bolts), Flange To Accept Standard Tapping Sleeves):			
	Ford	Series FTSS	
	JCM	Model 432	
	Mueller	Series H-304 S/S	
	Cascade	CST-EX	
	Total Piping Solutions	Triple Tap	
Tapping Sleeves (Mechanical Joint For All Taps On Cast Iron, Ductile Iron, PVC-900 & AC Pipe, All Taps Including Size On Size):			
	American Flow Control	Series 2800	
	Mueller	Series H-615, H-616, H-619	
	JCM	Series 432	
	Total Piping Solutions	Triple Tap	
Tapping Sleeves (Fabricated Steel, Mechanical Joint, Fusion Bonded Epoxy Coated):			
	JCM	Series 414	

Water Category 5 of 10: FIRE HYDRANT ASSEMBLIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Fire Hydrants (5 1/4 Inch Valve Opening, Final Exterior Color - Painted International Orange):			
	American Flow Control	B-84-B	
	Kennedy	K81A	
	Mueller	Super Centurion 250	
Anti-Terrorism Valve for Fire Hydrants (5 1/4 Inch Valve Opening) (For Installation in New and Existing Non-HS Type Fire Hydrants):			
	Davidson	ATV	To be utilized as directed by PCU for potable water system security purposes.

Approved Materials Checklist

Water Category 6 of 10: VALVES AND ACCESSORIES (PLANTS AND REMOTE FACILITIES)			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Combination Air / Vacuum Release Valves:			
	Val-Matic	VM-38	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-45	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-200C	Combination – Plant, Facility Use Only
Gate Valves, Butterfly Valves			
	DeZurik	BAW Series Butterfly	According to Application.
	DeZurik	Knife Gate Valve	According to Application
	Val-Matic	American BFV Butterfly	According to Application.
	Val-Matic	Ductile Iron RSGV	According to Application.
Valve Actuators			
	Beck	Model 11	Remote Indication or Position Display According to Application
	Auma	SA	Remote Indication or AumaMatic, According to Application
Hydraulically Operated Control Valves (Pressure Reducing/Sustaining Valves):			
	Cla-Val		Model or Series based on field application.
	OCV		Model or Series based on field application.
	Watts/Ames		Model or Series based on field application.

Approved Materials Checklist

Water Category 7 of 10: PUMPS, CHEMICAL FEED SYSTEMS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Vertical Turbine			
	Goulds		
	Flowserve	VIC, VIT, SMVT, or DWT	based on application.
	Deming		(AKA: Process Systems, Inc.)
	National		
Centrifugal/Split Case			
	Aurora		
	Flowserve		
	Goulds		
Chemical Pumps			
	Prominent		Appropriate series based on flow rate. Degassing heads for NaOCl.
Skid, Shelf Mounted Feed Systems			
	Blue Planet		Utilize "Polk County" junction box with hour meter/operating indication.
Chemical Tanks			
	Snyder	Captor/Dual Containment	HDLPE with NaOCl Resin
	Poly Processing Co.	Saf-T tank,	XLPE with OR 1000 Inner Coating

Approved Materials Checklist

Water Category 8 of 10: TANKS and GENERATORS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Pre-stressed Concrete Tanks			
	Crom		
	Pre-con		
Hydro-pneumatic			
	Modern Welding		15,000 gallons unless otherwise determined by PCU. All coatings shall be approved by Polk County Utilities in accordance with NSF, AWWA, FDEP or other recognized authority for potable water service.
Standby Power Generators			
	Kohler		3-Ph, 480V Diesel
	Caterpillar		3-Ph, 480V Diesel
	Cummins		3-Ph, 480V Diesel
Fuel Tanks (Stand-alone)			
	Convault		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Modern Welding		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Phoenix		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.

Approved Materials Checklist

Water Category 9 of 10: FLOW METERS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Flow Meters (Electro-magnetic)			
	Siemens	Sitrans FM Mag, 5000 series unless using bussed network.	
	ABB	WaterMaster Series	
	Foxboro	9100A w/ IMT 25	

Water Category 10 of 10: ELECTRICAL			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
VFDs, Relays, Breakers			
	Schneider-Electric	Square D	
Security/Surveillance System			
	Axis		Camera/Equipment
	Bosch		Camera/Equipment
	Pelco		Camera/Equipment
	Exaqvision		Software

Water Hydraulic Modeling Standards

Water Main Design Criteria		
Maximum Velocity	6 fps	
Minimum Transmission Pressure	40 psi	Peak Hour
Maximum Transmission Pressure	100 psi	
Minimum Distribution Pressure	40 psi	Peak Hour
	20 psi	Residential Max. Day + Fire
	20 psi	Commercial Max. Day + Fire
Hazen Williams Friction Coefficient (C) New	130	All existing and future pipe materials (Nominal ID)

Peaking Factors			
	NE PWS	NW PWS	All Other Svc Areas
Peak Hour	3.5	4.0	4.0
Maximum Day	1.75	2.0	2.25

System Fire Flow Criteria		
Low Density - Residential	750 gpm	2 hour duration
Commercial / Industrial / High Density Residential	2,000 gpm	4 hour duration

Water Treatment Facility Capacity		
Wells (Treatment) Capacity	Greater of	• Max. Day with Firm Capacity (one well out of service) • Approximately 75% of Total Well Capacity Utilized
Storage	Greater of	• [(Max. Day + Fire Flow) – (Wells on Standby Power)] x 4 hrs • (Peak Hour) x 2 hrs • [(Peak Hour) – (Wells on Standby Power)] x 4 hrs
High Service Pumping Capacity	Includes Maximum	• Max. Day + Fire Flow with largest pump out of service • Peak Hour with largest pump out of service

Remote Storage and Pumping Capacity		
Storage	Greater of	• [(Max. Day + Fire Flow) – (Wells on Standby Power)] x 4 hrs • [(Peak Hour) – (Wells on Standby Power)] x 4 hrs
High Service Pumping Capacity	Includes Maximum	• Max. Day + Fire Flow with largest pump out of service • Peak Hour with largest pump out of service

Approved Meters List

PCU approved meters that are 3/4 inch through 2 inch shall be provided and installed by PCU in accordance with the Utilities Administration Manual. For all other sizes, PCU approved meters shall be selected in accordance with this List, purchased privately, and installed by the CONTRACTOR in accordance with this Manual. All meters, regardless of manufacturer, shall come equipped with Master Meter AMR Registers.

Reclaimed water meters shall be equipped with purple register faces and meter lids, as a minimum.

Fire Service Type ~~Compound~~ Meters that are 4 inch and larger shall be utilized when a development has a combined Domestic and Fire Suppression Water System.

In general, 2 inch and larger Turbine Type Meters shall not be considered in lieu of similar size Compound Meters without full justification.

Ratio = Equivalent Residential Connection Ratio MCD = Max Continuous Demand

Unless otherwise stated, the Maximum Continuous Demand flow is based on AWWA standards.

NOTE: All strainers shall be designed and manufactured by each meter manufacturer for its specific meter.

METER SIZE	METER TYPE	RECOMMENDED APPLICATION	APPROVED METER
3/4"	Multi-Jet	Small to Medium House, Individual Apartment, and Small Business. Ratio: 1.0 MCD: ≤20 GPM	1) Master Meter BLMJ B13-A31-A01-0101A-1
1"	Multi-Jet	Medium Apartment Bldg., Gas Station, Salon, Small Motel, and Small Business. Ration: 2.5 MCD: ≤50 GPM	1) Master Meter BLMJ B16-A31-A01-0101A-1
1 1/2"	Multi-Jet	Medium Motel,	1) Master Meter IMJ

Approved Meters List

		Medium Hotel, Large Apartment Bldg., Small to Medium Business, and Small Industry. Ratio: 5.0 MCD: ≤100 GPM	M22-A00-A01-0101A-1
2"	Multi-Jet	Medium to Large Hotel, Medium to Large Motel, Medium to Large Apartment Complex, Medium to Large Business, and Small to Medium Industrial Plant. Ratio: 8.0 MCD: ≤160 GPM	1) Master Meter IMJ M24-A00-A01-0101A-1
2"	Turbine	Industrial Plant and Irrigation. Ratio: 8.0 MCD: ≤160 GPM	1) Master Meter MMT T31-A1-A02-0101A-1
2"	Ultra Sonic	Medium Hotel, Medium Motel, School, Public Building, Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 8.0 MCD: ≤160 GPM	1) Master Meter Octave O302-E1-A01

3"	Turbine	Industrial Plant and Irrigation. Ratio: 17.5 MCD: ≤350 GPM	1) Master Meter MMT T32-A1-A02-0101A-1
3"	Ultra Sonic	Medium Hotel, Medium Motel, School, Public Building, Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 16.0 MCD: ≤320 GPM	1) Master Meter Octave O303-E1-A01
4"	Turbine	Large Industrial Plant, and Irrigation Ratio: 30.0 MCD: ≤600 GPM	1) Master Meter MMT T33-A1-A02-0101A-1
4"	Ultra Sonic	Medium Hotel, Medium Motel, School, Public Building, Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 25.0 MCD: ≤500 GPM	1) Master Meter Octave O304-E1-A01

6”	Turbine	Large Industrial and Manufacturing Plant, and Irrigation. Ratio: 62.5 MCD: ≤1250 GPM	1) Master Meter MMT T34-A1-A02-0101A-1
6"	Ultra Sonic	Medium Hotel, Medium Motel, School, Public Building, Medium to Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 50.0 MCD: ≤1000 GPM	1) Master Meter Octave (Strainer) O305-E1-A01
8"	Turbine	Industrial and Manufacturing Plant. Ratio: 90.0 MCD: ≤1800 GPM	1) Master Meter MMT T35-A1-A02-0101A-1
8"	Ultra Sonic	Medium Hotel, Medium Motel, School, Public Building, Medium to Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 80.0 MCD: ≤1600 GPM	1) Master Meter Octave (Strainer) O306-E1-A01

10"	Turbine	Industrial and Manufacturing Plant Ratio: 145.0 MCD: ≤2900 GPM	1) Master Meter MMT W36-E1-A02-0101A-1
10"	Ultra Sonic	Medium to Large Hotel, Medium to Large Motel, School, Public Building, Large Apartment Complex, Large Condo Complex, and Hospital. Ratio: 110.0 MCD: ≤2200 GPM	1) Master Meter Octave (Strainer) O307-E1-A01
12"	Turbine	Industrial and Manufacturing Plant. Ratio: 250.0 MCD: ≤5000 GPM	1) Master Meter MMT W37-E1-A02-0101A-1
12"	Ultra Sonic	Medium to Large Hotel, Medium to Large Motel, School, Public Building, Large Apartment Complex, Large Condo Complex and Hospital. Ratio: 140.0 MCD: ≤2800 GPM (Calculated)	1) Master Meter Octave (Strainer) O308-E1-A01

Water System Hydrostatic Pressure Test Report
(PVC and Ductile Iron Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in strict conformance with AWWA standard C600, latest revision. Maximum allowable leakage shall be: $L = \frac{ND(P)^{1/2}}{7{,}400}$

Where:
L = maximum allowable leakage, measured in gallons per hour
N = number of joints in the tested line (where a pipe joins a pipe or a pipe joins a fitting)
D = nominal diameter of pipe, measured in inches
P = test gauge pressure, measured in pounds per square inch (minimally 150 psi)
(For a 2-hour test at 150 psi, equation simplifies to: L = ND x 0.00331)

TESTING PARAMETERS & SYSTEM INFORMATION

Test Pressure (minimally 150 psi):			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 2 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	
Test Segment Location:			

Pipe Type	Diameter, inches	Length, feet	Number of joints	Max. Leakage for 2 Hour Test, gallons
Total Maximum Allowable Leakage, gallons:				
Total Actual Leakage, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

Water System Hydrostatic Pressure Test Report
(HDPE Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in accordance with ASTM F 2164 and AWWA Standard C600, latest revision, where applicable. Pneumatic Testing is strictly prohibited.

Prior to Hydrostatic Pressure Testing Procedure:

1) Hydraulically clean the main to be tested with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.
2) Insure that the main to be tested is restrained against horizontal and vertical movement. Exposure of end connection joints only may be allowed.

Hydrostatic Pressure Testing Procedure:

1) Fill main slowly with water to remove air.
2) Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.
3) Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.
4) Reduce pressure by 10 psi and monitor for 1 hour.
5) Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

Disinfection is to be performed in accordance with AWWA Standard C651.

TESTING PARAMETERS & SYSTEM INFORMATION

Calculated Test Pressure:			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 5 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	

Diameter, inches	Length, feet	Pressure Class, psi	Test Segment Location

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		

Water System Pigging Report

Project: _____

PCU Project No.: _____

Procedures for pigging the system shall be in strict conformance with the Polk County Utilities Standards and Specifications Manual.

PIGGING PARAMETERS & SYSTEM INFORMATION

Date of Pigging:			
Time at Start of Pigging		Time at End of Pigging:	
Pigged Segment Location:			
Pig Outside Diameter:		Pig's Maximum % Compression of Full Size:	
Pig Exterior Material Composition:		Pig Interior Material Composition:	
Pig Manufacturer:			

Pipe Type	Diameter, inches	Length, feet	Number of Times Pigged	Estimated Amount of Water Used for Pigging, gallons
Total Estimated Amount of Water Used for Pigging, gallons:				
Total Actual Amount of Water Used for Pigging, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

Fire Hydrant Flow Test Form

Call 863-298- 4265 to coordinate a fire hydrant flow test with the PCU Distribution and Collection Manager. The Manager shall schedule a test for the next available date, usually within 5 business days. The Developer/Design Engineer shall hire a qualified fire protection contractor or engineer to perform this test. Engineers can be found in the phone book under "Fire Protection". Contractors can be found under "Fire Hydrants"

Tests will only be performed between 10:00 am and 2:00 pm, Monday through Friday

DATE:_____ TIME:_____ AM PM

PROJECT NAME: _____ PCU PROJECT #: _____

PCUD WATER SYSTEM NE NW SW Central East SE

A MINIMUM OF TWO HYDRANTS SHALL BE USED (attach sketch of hydrant locations)

HYDRANT #1 LOCATION _____ ELEV _____

HYDRANT #2 LOCATION _____ ELEV _____

HYDRANT #3 LOCATION (Optional) _____ ELEV _____

HYDRANT PORT SIZE: ___ 2 ½" hose ___ 4" pumper ___ 4 ½" pumper ___ 5 ¼" pumper
(Reminder: measure the port size and choose the proper pitot setting for the port used)

ATTENDEES: _____
(print name) PCU

_____
(print name) FIRM

_____
(print name) FIRM

RESULTS:

TIME	CONDITION	FLOW (gpm)		PRESSURE (psi)		
		Q1	Q2	P1*	P2*	P3*
	Begin Static	0	0			
	Hydrant 1		0	pitot		
	Hydrant 2	0			pitot	
	Hydrant 1+2**			pitot	pitot	
	End Static	0	0			

* Denotes pressure at Hydrant #
** Simultaneous test recommended for commercial/industrial/multi-family development.

Water System Schedule of Values

Date: _____

Contractor: _____

Project: _____

PCU Project No.: _____

Item No.	Item Description	Qty.	Unit	Unit Cost ($)	Extended Cost ($)
1	Single Service, Long				
2	Single Service, Short				
3	Double Service, Long				
4	Double Service, Short				
5	Blow-Off Assembly, Complete				
6	Fire Hydrant Assembly, Complete Including Branch Valve				
7					
8					
9					
10	4” PVC, AWWA C-900, DR 18, Blue				
11	4” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
12	4” Gate Valve Assembly, Complete				
13	4” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
14	4” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
15	4” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
16	4” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
17	4” Tee, CI, C153, Cement-Lined, Bituminous Coated				
18	4” Cross, DI, C153, Cement-Lined, Bituminous Coated				
19					
20	4” HDPE				
21					
22	6” PVC, AWWA C-900, DR 18, Blue				

Water System Schedule of Values

23	6” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
24	6” Gate Valve Assembly, Complete				
25	6” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
26	6” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
27	6” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
28	6” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
29	6” Tee, DI, C153, Cement-Lined, Bituminous Coated				
30	6” Cross, DI, C153, Cement-Lined, Bituminous Coated				
31					
32	6” HDPE				
33					
34	8” PVC, AWWA C-900, DR 18, Blue				
35	8” DIP, Pressure Class 350 Cement-Lined, Bituminous Coated				
36	8” Gate Valve Assembly, Complete				
37	8” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
38	8” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
39	8” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
40	8” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
41	8” Tee, DI, C153, Cement-Lined, Bituminous Coated				
42	8” Cross, DI, C153, Cement-Lined, Bituminous Coated				
43					
44	8” HDPE				
45					
46	10” PVC, AWWA C-900, DR 18, Blue				
47	10” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
48	10” Gate Valve Assembly, Complete				

Water System Schedule of Values

49	10” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
50	10” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
51	10” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
52	10” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
53	10” Tee, DI, C153, Cement-Lined, Bituminous Coated				
54	10” Cross, DI, C153, Cement-Lined, Bituminous Coated				
55					
56	10” HDPE				
57					
58	12” PVC, AWWA C-900, DR 18, Blue				
59	12” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
60	12” Gate Valve Assembly, Complete				
61	12” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
62	12” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
63	12” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
64	12” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
65	12” Tee, DI, C153 Cement-Lined, Bituminous Coated				
66	12” Cross, DI, C153, Cement-Lined, Bituminous Coated				
67					
68	12” HDPE				
69					
70	16” PVC, AWWA C-905, DR 25, Blue				
71	16” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
72	16” Gate Valve Assembly, Complete				
73	16” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				

Water System Schedule of Values

74	16” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
75	16” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
76	16” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
77	16” Tee, DI, C153 Cement-Lined, Bituminous Coated				
78	16” Cross, DI, C153, Cement-Lined, Bituminous Coated				
79					
80	16” HDPE				
81					
82					
83					
84	18” PVC, AWWA C-905, DR 25, Blue				
85	18” DIP, Pressure Class 350, Cement-Lined, Bituminous Coated				
86	18” Gate Valve Assembly, Complete				
87	18” 11 ¼ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
88	18” 22 ½ Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
89	18” 45 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
90	18” 90 Degree Bend, DI, C153, Cement-Lined, Bituminous Coated				
91	18” Tee, DI, C153 Cement-Lined, Bituminous Coated				
92	18” Cross, DI, C153, Cement-Lined, Bituminous Coated				
93					
94	18” HDPE				
95					
96					
97					

Total Constructed Value: $ _____

Reviewer:_____ Date:_____

Comments_____