

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 15 Section "Motors".
  - 2. Division 15 Section "Mechanical Vibrations and Seismic Restraints".
  - 3. Division 15 Section "Piping and Fittings".
  - 4. Division 15 Section "Valves".
  - 5. Division 16 Sections for power-supply wiring, field installed disconnects electrical devices, and motor controllers.

### 1.2 SUMMARY

- A. Skid mounted duplex bag filters with associated valves, gauges by-pass assembly and pressure differential switches. Skid mounted calcium hypochlorite mixing tanks and pump, corrosion inhibitor mixing tank and pump, chlorine injection monitoring system, duplex circulation pumps, corrosion inhibitor injection and monitoring system and master control panel. Provide appropriate test kits to test chlorine and orthophosphate levels.
- B. Water tank fill valves and water tank level transmitters/site gauges.

### 1.3 SUBMITTALS

- A. Product Data: Submit product data for review under provisions of Division 1.
- B. Shop drawings: Show the skid mounted equipment general arrangement drawings that indicate equipment location, field connections to pipe inlets, outlets, and lifting lugs, anchor bolts, shipping, installed and operating weights.
  - 1. Diagrams: Provide a process and instrumentation, wire ladder logic , and terminal block diagrams that indicate sequence of operation, detailed wiring for power, signal, alarms and control systems for the skid mounted system and terminal locations for field installed wiring.
- C. Maintenance Data: Include the maintenance manuals specified in Division 1.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain the Package Water Treatment Equipment from a single source supplier of water treatment equipment.
- B. Product Options: Drawings indicate size, profiles, connections, and dimensional requirements for the package units and are based on specific manufacturer types and models indicated. Other supplier package equipment with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- C. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Retain shipping protective covers for the package equipment to include pump bearings and couplings, pipe flanges, control panels and protect coatings for finishes. All equipment, piping, lifting lugs, instruments, wiring and controls shall be installed within the dimensions of the skid.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
  - 1. Close Coupled Centrifugal Pumps:
    - a. G&K Goulds or equal.
  - 2. Pump Motors:
    - a. US Motor or equal.
  - 3. Chlorine Monitor:
    - a. Kuntze or equal.
  - 4. Chemical Pumps:
    - a. IWAKI or equal.
  - 5. Limit Level Switch/Site Gauge
    - a. Barksdale Model LSSM or equal.
  - 6. Pressure Gauges:
    - a. Ashcroft or equal.
  - 7. Solenoid Operated Fill Valves:

- a. Cla-Valve Model 136-01 series or equal.
- 8. Flow Meters:
  - a. Flow Transmitter and Panel mounted Readout - GF Signet or equal.
  - b. Corrosion Test Rack Flow Meter – Aalborg or equal.
- 9. Bag Filters:
  - a. Rosedale, Inc. or equal.
- 10. Pressure Differential Switch:
  - a. Orange Research Inc. or equal

## 2.2 SKID MOUNTED BAG FILTER ASSEMBLY

- A. Two (2) each in series, with a 50-micron bag filter, followed by a 25-micron bag filter. The basket housing will be made from 304 stainless steel, 1034 kPa pressure rated and DN 80 flanged inlet and outlet. Each housing will be provided with 63 mm diameter 316-stainless steel, liquid filled pressure gauges for visual indication of the pressure drop across each filter housing. Provide a 63mm pressure differential switch with local read out of 0-30 PSID that will be installed at the inlet of the 50-micron bag filter and at the outlet of the 25-micron bag filter using 316 stainless tubing with Swage-lok fittings. The filter assembly shall be equipped with a DN 80 by-pass line with a lockable butterfly valve to allow servicing of the filters. The by-pass shall be placed such to allow removal of the bag filters with out interference to the piping assembly. The contractor is to provide 220-volt single-phase 50 Hz power from the control panel to the pressure differential switch. The filters shall be sized to accommodate a flow rate of 25.24 liters per second.
- B. The skid shall be fabricated from 100 mm steel angles with 6.35 mm checkered steel deck plate. All fabrication of the skid shall have continuous welded seams. The skid and any other bare steel shall be sand blasted, prime with inorganic zinc primer, 3 to 5 mil minimum DFT and polyurethane finish coat, 4-mil minimum DFT.
- C. Skid Dimensions: 1524 mm long x 915 mm depth.

## 2.3 SKID MOUNTED CORROSION INHIBITOR AND CHLORINE INJECTION AND MONITORING SYSTEM

- A. Description: Provide a factory assembled chemical feed system; skid mounted shall include recirculating pumps, chemical pumps, flow monitors, in-line chlorine analyzer, control panel, wiring, and interconnecting piping, valves and fittings. Provide a corrosion inhibitor and chlorine test kit with range of 0-5 ppm with the system.
- B. Recirculating Pumps: Two (2) each, one on line and one on stand-by pumps with premium efficiency electric motors. The pumps shall be close-coupled centrifugal design and be made of all bronze material. The pump shall be single stage, with 4 vanes per stage, closed impellers, single row ball bearing with one in the inbound and one outbound. Refer to the pump schedule

for pump characteristics. Provide 63 mm all 316 stainless steel pressure gauges, liquid filled, rated 0 - 413 kPa at the discharge of each pump.

- C. Chemical Pumps: Provide two (2) duplex units, one on line and one on stand-by electronic metering pumps, one (1) set for the chlorine injection and one (1) set for the corrosion inhibitor injection system. The chemical output capacity shall be from 0.01 liters per hour to 20.8 liters per hour with a maximum operating pressure of 1034 kPa and up to 360 strokes/minute. The pump head and fittings shall be made of polyethylene with a PTFE diaphragm; Alumina ceramic valve balls, Fluorelastomer valve seat, PTFE Gasket, polyethylene tubing and double ball check valves. The chemical pump shall be provided with an external digital input mode, pulse multiply microprocessor-based control circuitry that shall be used with the flow meter, to regulate precisely the amount of chemical feed. The pumps motors shall be 220v/1ph/50hz power. Provide a local on/off switch to control the mixer.
- D. Chemical Tanks/Mixers: Provide two (2) 50-gallon ultraviolet resistant, molded yellow polyethylene tanks with 5-gallon (20-liter) graduations and a high rigidity black polyethylene covers with molded recess for mounting equipment for the calcium hypochlorite and the corrosion inhibitor. Provide a mixer for the calcium hypochlorite with a 316 steel shaft and impeller with epoxy coating. The mixer will come with a 1/20 hp motor rated at 220v/1ph/50Hz.
- E. Flow Controllers: One (1) in-line paddle wheel flow sensor with a panel mounted digital flow controller for constant monitoring of the flow in the recirculating line. One (1) in-line paddle wheel flow sensor with a panel mounted digital flow controller for monitoring of the flow in the pump room main water entry for the corrosion inhibitor injection system. The flow controllers shall have 24-volt DC control power.
- F. In-Line Chlorine Analyzer: The analyzer shall be a continuous in-line monitor and shall measure the chlorine residual in the recirculating loop. A sample flow shall be taken from the recirculating loop at a rate of 15 to 30 liters per hour. The analyzer shall have a measuring range of 0-5 ppm of free chlorine, with an accuracy of 1%. There shall be two adjustable set points from 0.5 ppm, proportional feedback, relays outputs for the chemical metering pumps with adjustable pulse/frequency and 4-20 mA output. The analyzer shall be provided with local display and controller out put that can be set to activate the metering pumps. The analyzer shall activate the chemical feed pump, on/off, to provide a constant residual in the storage tank. The analyzer shall operate with 220v/1ph50hz power. The discharge from the chlorine analyzer shall discharge into the water storage tanks thru a DN 20 copper line.
- G. Corrosion Test Rack: Provide a three (3)-coupon corrosion test rack mounted on the skid on connected to the discharge side of the pump header. Provide coupons for steel, copper and bronze. The test rack shall be provided with a flow meter equal to Aalborg Model number MS-VJA-MO3-OIST-A or equal rated for 11.36 liters per minute. Refer to the plumbing drawings for details of the corrosion test rack and supports.
- H. Control panel: The panel shall be NEMA 4X, stainless steel with PLC controller and contain the pump motor starters, HOA switch, pump on/off lights, run lights, flow controller, relays, contacts, low voltage transformer, terminal blocks, alarms, and electrical disconnect. There shall be terminal blocks located at the panel to connect 220v/1ph/50Hz and 380v/3ph/50Hz power from the building supply. Provide a step down transformer for low voltage supply.
- I. The controller shall have the following functions:

1. When a storage tank level transmitter reaches the fill or full liquid level the electric actuated valves on the fill lines shall open and close, through a relay provided in the panel.
2. When a storage tank level transmitter reaches the high-level alarm set point it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system.
3. When a storage tank level reaches the domestic water low water alarm level set point it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system.
4. When a storage tank reaches the domestic water tank circulation pump shutdown level set point it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system.
5. When a storage tank level reaches firewater low-level set point it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system and the fire alarm annunciating panel.
6. If the on-line water tank circulation pump fails, the stand-by pump shall automatically start and a pump failure alarm it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system. If the stand-by pump fails to start it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system. When the circulation pumps operate a dry contact shall be provided in the control panel to transmit a signal to the building automation system indicating pump run status for each pump. The control panel shall have a lead/lag pump alternator capable of remote operation from the building automation system and a HOA switch for each pump located on the front of the panel with pump run indicator lights. A digital run time meter shall be located on the control panel for each water tank circulation pump with an interface to the building automation system.
7. When the pressure differential switch located on the bag filter skid reaches 15 PSI it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system.
8. When the chlorine level in the storage tank reaches the low-level set point of 1 PPM, or a high-level set point of 3 PPM it shall illuminate a visual indicator and sound a local audio alarm. A dry contact shall be provided in the control panel to transmit a signal the building automation system.
9. The control panel shall have panel mounted audible alarm and corresponding lights for alarm conditions on each tank and operational status of the pumps, fill valves, chlorine analyzer, etc. located on the front of the panel for visual indication of the systems operation.
10. The control panel shall have a maintenance mode switch to enable either tank to be drained while the other tank, water fill valve, alarms, pumps and water treatment system remain operational. When one tank is drained the fill valve shall be locked in the closed position and the low domestic water level alarm, the low firewater level alarm, domestic water booster pump shutdown and the circulation system pump shutdown on the tank that is in the maintenance mode shall be locked out and the audio alarm shall be silenced. All controls and alarms shall function on the tank that remains in operation. Provide a maintenance mode switch for each tank on the front of the control panel with visual indicating lights. A green light shall indicate the tank is in normal operation and a red light shall indicate the tank(s) are in the maintenance mode.
11. Each pump operated from the control panel shall be individually fused.

- J. Face Piping: Type L copper.
- K. Provide inline pressure gauges on the circulation pump suction and discharge lines. Pressure gauges shall have a cock to isolate the pressure gauge.
- L. Pumps shall be provided with suction service valves and discharge service and check valves.
- M. Conduit: Rigid steel for power and 316 stainless, Swage-lok tubing for instrument wiring and control valves.
- N. Skid: Shall be made from 100 mm steel angles with 6.35 mm checkered steel deck plate. All fabrication of the skid shall have continuous welded seams.
- O. Finish: The skid and any other bare steel shall be sand blasted and primed with inorganic zinc primer to a thickness of 35 mil DFT and have polyurethane finish coat with a minimum thickness of 4-mil DFT.
- P. Skid Dimensions: 3350 mm long x 1219 mm depth x 1625 mm high.
- Q. Design flow rate: 8.52 l/s continuous.

#### 2.4 WATER TANK FILL VALVES AND TANK ACCESSORIES

- A. Solenoid Operated Fill Valves: Provide two (2) each DN80 electric actuated, ASTM B283 cast iron bodied Clayton Hytrol globe valves to be installed on the fill lines to the water storage tank by the contractor. The valves shall have NEMA 4 X-solenoid controls, manual operator, flow clean strainer and in the event of power failure the valve shall fail in the closed position. The valves are to be supplied with 220v/1ph/50 Hz power supply.
- B. Liquid Level Transmitter and Site Gauge
  - 1. Tank Level Indicating Transmitter: Provide a continuous tank level indicating transmitter system for each level site gauge. The transmitter will be provided with a 4-20ma signal that will be sent back to the control panel that is located on the water treatment system skid. The wiring from the level transmitter shall be installed by the contractor and terminate in the control panel located on the water treatment system skid. The gauge shall have reed switches for the following levels:
    - a. High Water Level Alarm.
    - b. Fill Valves Closed.
    - c. Fill Valves Open.
    - d. Low Domestic Water Level Alarm.
    - e. Domestic Booster System Pump Shutdown. (Tied into the booster system control panel).
    - f. Domestic Water Tank Circulation Pump Shutdown.
    - g. Low Firewater Level Alarm.
  - 2. Level Site Gauge: Provide two (2) each class 150 level site gauges to be installed on the domestic water tanks by the contractor. The gauges shall be provided with Mini-Level Site with a clear polycarbonate flag assembly that shall indicate the water level in the storage tank. The housing material shall be made from electro-polished 304-stainless steel and come with a 316-stainless steel float. The top and bottom side connections shall be 25 mm raised face flange and be provided with 316-stainless steel DN 25 raised face

flange isolation ball valves. The bottom of the site gauge shall be provided with a DN 15 drain and shut off valve. The site glass shall be provided with a 6.35 mm top vent with plug. The site gauges shall have a centerline flange-to-flange dimension of 4720 mm.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine packaged equipment for damages before installation.

#### 3.2 INSTALLATION

- A. Follow manufacturers written instructions in the installation manuals provided with the packaged equipment.

#### 3.3 CONNECTIONS

- A. Connect to the piping, electrical and controls located on the skid and in the installation manual.
- B. Electrical wiring and connections are specified in Division 16 Sections.
  - 1. Ground equipment.

#### 3.4 COMMISSIONING

- A. Follow instructions location in the operator's manual provided with the equipment.
- B. Install bag filters in the filter housings prior to filling the water storage tanks. Replace filters as necessary during the construction phase to prevent debris from entering the tank. Provide the owner with a supply of twenty-five (25) 50-micron bag filters and twenty-five (25) 25-micron bag filters when the building is placed in the Owners possession.
- C. Set residual chlorine level in the water tank on start-up between 2 to 3 PPM. Flush water from the piping distribution system and adjust the chlorine level upward or downward within the storage tank to maintain a minimum residual chlorine level throughout the piping distribution system between 0.2 and 0.4 PPM.
- D. Set residual NSF approved solution of Phosphoric Acid/Zinc Sulfate injection levels for corrosion control as recommended by the water treatment equipment manufacturer and as listed in the Operations and Maintenance Manuals.

#### 3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain the packaged water treatment systems as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining the systems.
2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout".
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data".

END OF SECTION 15465