

## Sample Specification for a Water Distribution System Monitoring Panel and Controller

### I. General Description

- A. The Water Distribution System Monitoring Panel shall be a single panel with instruments pre-mounted, wired and plumbed.
1. The back plane of the panel shall be not greater than 22" wide by 48" long and made of corrosion resistant material.
  2. The back plane shall be affixed to rigid corrosion resistant struts approximately 52" long centered so as to extend approximately 2" past either end of the back plane
  3. The struts shall be predrilled to permit wall mounting of the entire panel using 1/4" steel bolts; one at each end of the two struts.
  4. The panel shall be fully assembled with all instruments, except controller, mounted, plumbed and wired prior to shipment. The controller for the panel shall be mounted separately.
  5. The panel when fully assembled shall fit inside a standard NEMA 4X 36"X60" enclosure with out modifications to the enclosure or panel except to provide for hydraulic and electrical connections.
  6. The sample and drain system for the panel shall accommodate flows of 400 to 600 ml/min.
  7. A common drain system shall be provided for all instruments. The drain manifold shall be terminated with 1/2" hose barb fitting for connection of a flexible drain tube.
  8. Pressure and flow control shall be via a fixed orifice and constant head devices.
    - i. The constant head device shall provide pressure and flow regulation for all sensors down stream from the orifice device.
    - ii. No rotometers or other flow control devices shall be required.
    - iii. Within a pressure range of 20-100 psi, no additional pressure regulation shall be required.
    - iv. The constant head device shall provide a mounting mechanism for the pH and conductivity sensor as well as one additional probe-type sensor.

- B. The panel shall include the following on-line analytical instruments (See Section II for complete instrument descriptions): A turbidimeter, a chlorine residual analyzer, a conductivity cell and a pH sensor. The conductivity and pH sensors shall have built-in temperature measurement and compensation.
1. All analytical instruments shall be pre-wired to a common junction box via quick-connect connectors.
  2. All analytical sensor inputs and sensor power shall be supplied from the junction box.
  3. The junction box shall provide all sensor outputs to the controller and receive all sensor inputs from the controller via a single shielded cable.
  4. All devices on the panel shall operate at 100-115/230Vac ~50/60 Hz.
  5. Total power requirement shall not exceed 500 VA.
  6. All instruments shall be powered using a single connection using a modular cord or wiring with conduit.
  7. All devices on the panel shall be capable of operating at a pressure of 15 - 60 psig.
- C. The controller for the panel shall be a digital device capable of alphanumeric and graphical display with a 1/4 VGA graphical backlit TFT color touch screen. The controller shall consist of two modules, a probe module and a display module.
1. The controller shall provide eight separate fully scalable 4-20 mA outputs for connection to recorders, an RTU or PLC.
  2. The controller shall provide a RS485 Modbus digital output for transmission of all data on a single shielded cable.
  3. The controller shall provide for addition of an optional Profibus DP module in place of the Modbus module.
  4. The controller shall be capable of accepting a GSM wireless modem.
  5. An ethernet port for direct connection to computer for data downloads shall be provided.
  6. The controller shall be capable of direct communication with the Hach Event Monitor Trigger System.
  7. The controller shall act as a data logger storing up to 28 days of data in 1-minute increments.
  8. In graphical mode, any measurement shall be scaleable to periods of one day or one week.
  9. The data shall be downloadable to a Windows-based computer in a delimited format for easy viewing and manipulation by standard spreadsheet or database programs.
  10. All analog outputs from the controller shall be located on a single terminal barrier strip for ease of field connections.

11. The controller shall provide the ability to program hi and low alarm set points for each measurement. Optional dry contact alarm relay modules shall be available from the manufacturer
12. The display module of the controller shall be removable from the probe module without affecting sensor inputs or sensor outputs and without disruption of any network connection to external devices.
13. The instrument manufacture shall offer an OPC driver designed specifically to communicate with the controller.
  - i. The OPC driver shall permit the data from the controller's digital signal to be easily integrated in to the system SCADA.
  - ii. The OPC driver shall be a server and incorporate a separate OPC Logger function to permit simultaneous logging of data to the SCADA and to the OPC Logger for a redundant data path in the event of SCADA failure.
  - iii. The controller shall be powered separate from the panel and shall operate at 100 to 230 Vac, 50/60 Hz, and 75W. 24Vdc operation also shall be available.
14. The controller shall be an SC1000 Controller number LXV402.52.00002 Display module with LXV 400.52.5A322 probe module manufactured by Hach Company.

D. The panel shall include a pressure sensor for monitoring water pressure at the sample manifold.

1. The pressure sensor shall be a CVD Pressure Transducer with a 2 wire, 24 AWG, shielded PVC cable to carry the variable 4 – 20 mA output signal.
2. The pressure sensor shall have a measuring range of 0 – 150 psi.
3. The pressure sensor shall have an accuracy of +/-0.25% with +/- 1.5% thermal error band.
4. The pressure sensor shall be Gems 2200 series, number 68426-00.

II. Analytical Instruments. All analytical instruments installed on the panel shall be from a single manufacturer to minimize maintenance and support issues.

A. On-line Turbidimeter:

1. The On-line Turbidimeter sensor shall meet requirements of US EPA method 180.1.
2. Range of the turbidity sensor shall be 0-100 NTU.
3. The analyzer shall be designed to eliminate the need for a sample cell to eliminate errors due to dirt and scratches.
4. The detector shall be immersed in the sample to prevent fogging.
5. The sensor shall be a digital design and receive sensor inputs from the panel's controller and provide sensor outputs to the controller.
6. All sensor calibration information and sensor diagnostics shall be stored in the sensor not in a remote controller or other device.

7. All optical components – light source, lenses and detector – shall be mounted on a head assembly removable from the turbidimeter body without the use of tools or removal of any fastening device.
8. The turbidimeter body shall have a built-in bubble removal system.
9. Parts comprising the bubble removal system must be removable for cleaning without the use of tools.
10. Calibration of the analyzer shall be via StablCal Formazin manufactured and supplied by the instrument manufacturer.
11. The on-line turbidimeter sensor shall be a Hach Brand 1720E number 60101-60

B. Chlorine Residual Analyzer:

1. The analyzer shall be capable of measuring free or total residual chlorine utilizing the DPD colorimetric method.
2. The analyzer shall be configured for either free or total residual chlorine measurement by simply changing the reagent package.
3. Range of measurement shall be 0-5 mg/l for either free or total residual.
4. Reagents for the analyzer shall be prepared by the instrument manufacturer and supplied in three components: Indicator powder, Indicator solvent and buffer.
  - i. The indicator powder and indicator solvent shall be designed to be mixed by the user immediately prior to use for optimum reagent shelf life and stability.
  - ii. The analyzer shall use approximately 1 pint each of indicator solution and buffer per month.
  - iii. The instrument manufacturer shall offer an automatic reagent replacement program for shipment of reagents once per month to eliminate warehousing costs.
5. The light source for the colorimeter shall be a long-life solid-state device.
6. The colorimeter cell shall have constant mixing provided by a magnet immersed in the sample and caused to rotate by an electromagnetic mixing device with no moving parts.
7. The analyzer shall have digital network capability based on LonWorks as well as standard 4-20 mA outputs.
8. The analyzer shall have an LCD display.
9. The enclosure of the analyzer shall be non-metallic and molded construction.
10. All components of the analyzer shall be accessible for servicing from the front of the instrument. No tools shall be required for access.
11. The door of the analyzer enclosure shall have shatter-resistant, plastic viewing windows for the LCD display and reagent levels.
12. The Cl-17 shall communicate with the panel controller via an analog/digital gateway device.
13. The chlorine residual analyzer shall be a Hach Brand Cl-17 number 54402-60

### C. On-line pH Analyzer

1. The On-line pH Analyzer shall consist of a control unit and a pH sensor
2. Range of measurement shall be -2 to 14 pH units
3. The pH sensor shall utilize the differential electrode technique.
  - i. The pH sensor shall have a long-life filling solution, which needs to be replenished not more frequently than once every five years.
  - ii. The pH sensor shall be constructed of PEEK
  - iii. The pH sensor shall be mounted in a pipe tee for a continuous flowing sample.
  - iv. The pH sensor mounting shall be designed for easy removal without the use of tools to expedite cleaning and calibration.
  - v. The pH sensor shall have built-in temperature sensor and temperature compensation.
4. The sensor shall be a digital design and receive sensor inputs from the panel's controller and provide sensor outputs to the controller.
5. All sensor calibration information and sensor diagnostics shall be stored in the sensor not in a remote controller or other device.
6. The pH sensor shall be the GLI probe DPD1R1-WDMP

### D. On-line Conductivity Analyzer:

1. The On-line Conductivity Analyzer shall consist of a control unit designed to operate at 115Vac and a conductivity cell.
2. The conductivity cell shall have a cell constant of 1.0 and range of 0-2000  $\mu\text{S}/\text{cm}$ .
  - i. The cell shall be calibrated by the DRYCAL calibration method.
  - ii. The cell shall be mounted in a pipe tee for a continuous flowing sample.
  - iii. The cell mounting shall be designed for easy removal without the use of tools to expedite cleaning and calibration.
  - iv. The conductivity cell shall have a built-in temperature sensor.
3. The sensor shall be a digital design and receive sensor inputs from the panel's controller and provide sensor outputs to the controller.
4. All sensor calibration information and sensor diagnostics shall be stored in the sensor not in a remote controller or other device.
5. The conductivity cell shall be GLI probe 3422C3A-WDM

IV. Performance Testing –

- A. All instruments offered as part of the panel must have been manufactured and offered for sale for a minimum of 24 months prior to the date of award of the bid.

V. Manufacturer's Start Up and Training.

- A. The supplier of the panel shall provide the services of a technical representative or service technician and employee from the instrument manufacturer for a minimum of 1 hour but not to exceed 2 hours for start up and configuration of each panel provided.
- B. The technical representative or service technician and employee of the manufacturer also shall offer a minimum of one (1) two-hour training sessions on care, calibration and maintenance of all instruments on the panel.

VI. Warranty

- A. All analytical instruments on the Water Distribution System Monitoring Panel shall carry a warranty for a minimum period of 1 year from the date of invoice for all analytical instruments.
- B. The warranty shall be the responsibility of the supplier awarded the bid.