**SECTION 40 75 53**

**Low-level Turbidity Analysis System**

1. **General**
   1. **SUMMARY**
      1. Requirements for an online instrument for low and medium process turbidity measurement. For measurement, a light beam will be sent through the medium and diverted from its original direction by optically denser particles (solid matter), resulting in light scatter. The sensor shall work using 90° scatter principle in accordance with U.S. EPA 180.1 requirements. The sensor will be equipped with a visible spectra white-light source. The instrument shall incorporate integral electronics with a local display.
      2. Related Sections.
         1. Control and Information Systems Scope and General Requirements.
         2. Power Instruments, General.
   2. SUBMITTALS
      1. Furnish co­mplete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer’s certifications, Manufacturer’s Field Reports.
      2. Product Data:
   3. Dimensional Drawings.
   4. Materials of Construction.
   5. Measurement accuracy.
   6. Measurement range.
   7. Enclosure Rating.
   8. Classification Rating.
   9. Power.
   10. Output options.
   11. **QUALITY ASSURANCE**
       1. Manufacturing facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.
   12. **DELIVERY, STORAGE, AND HANDLING**
       1. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the Manufacturer.
       2. Any instruments that are not stored in strict conformance with the manufacturer’s recommendation shall be replaced.
   13. **PROJECT OR SITE CONDITIONS**
       1. Provide instruments suitable for the installed site conditions including, but not limited to, material compatibility, site altitude, process and ambient temperature, and humidity conditions.
   14. **CALIBRATION AND WARRANTY**
       1. Upon arrival the instrument shall require installation at the on-line measurement location by connecting a sample source at the inlet to the instrument and the outlet to an open drain. The instrument will require field calibration following the manufacturer’s installation and start-up instructions. Calibration can be performed using a Formazine standard.
       2. The sensor shall store the user calibration, using a reference in the lab or at the sensor installation point.
       3. The manufacturer’s warranty does not cover normal wear and tear, damage to the sensor due to improper storage or handling, or any other mode of failure or reduced sensor life that is not a direct consequence of a manufacturing defect.
       4. The sensor and transmitter system shall have standard one year warranty from date of shipment and if the instrument is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.
   15. **MAINTENANCE**
       1. Provide all parts necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.
   16. **LIFE CYCLE MANAGEMENT** 
       1. Instrument documentation, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.
2. **Products**
   1. **SYSTEMS/ASSEMBLIES**
      1. Manufacturer
         1. Endress+Hauser On-line Turbimax CUE22.
      2. Performance Criteria
         1. Turbidity range: 0 to 1000 NTU/FNU (Nephelometric Turbidity Units/Formasin Nephelometric Units), with a display range of 1000.0.
         2. Resolution (Below 10 FNU): 0.0001 NTU.
         3. Temperature range (Process): 1 to 50 °C (34 to 122 °F)
         4. Measurement error:
            1. Below 40 NTU: ±2% of reading or ±0.02 NTU; whichever is greater.
            2. Above 40 NTU: ±5% of reading
         5. Response time: Approx. 5 to 500 seconds, adjustable. 0 to 100 NTU.
         6. Repeatability: ±1% of reading.
      3. Certifications
         1. CE Mark.
         2. ETL Approal: CSA C22.2#1010.1-92.
         3. EMC compatibility: Complies with EN 61326: 1997 0A1: 1998.
         4. U.S. EPA 180.1 compliance.
      4. Environment
         1. Process temperature: 1 to 50 °C (34 to 122 °F).
         2. Medium temperature: 1 to 50 °C (34 to 122 °F).
         3. Process pressure: 13.78 bar max. (200 psi), controlled by integral pressure regulator.
         4. Storage temperature: -20 °C to 60 °C (-4 °F to 140 °F).
         5. Relative humidity: Max. 95%, non-condensing.
         6. Flow rate: 0.1 to 1 liter/min. (0.026 to 0.26 gal/min.)
         7. Ingress protection: NEMA 4X (IP66).
   2. **MANUFACTURED UNITS**
      1. Transmitter
         1. Shall be an integral electronics in the Nema 4X housing with integral display.
         2. Interface buttons shall be accessible on the front display panel.
         3. RS-485 or 4-20 mA output will provide the measured value output.
      2. Measurement system
         1. The measurement system shall be comprised of a sample cuvette with an ultrasonic cleaning system.
         2. The measurement shall be based on long-life white-light source and one receiver based on 90° light scatter in accordance with U.S. EPA 180.1.
         3. The measurement cell system shall incorporate a desiccant pack to avoid the effects of humidity formation on the measurement cell.
         4. The instrument shall require simple commissioning and calibration following installation.
         5. The instrument shall incorporate ultrasonic cuvette cleaning.
   3. **ACCESSORIES**
      1. Calibration kit
         1. A calibration kit comprised of 0.02 NTU, 10.0 NTU and 100 NTU solutions.
      2. Cleaning
         1. Replacement cuvette with ultrasonic transducer for use with the integral ultrasonic cleaner.
      3. Bubble suppression
         1. Optional bubble suppression flow chamber.
   4. SOURCE QUALITY CONTROL & CALIBRATION
      1. Any standards and cleaning solutions will be supplied with MSDS data sheets.
   5. SAFETY
      1. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest addition.
      2. All devices shall be suitable for operation in a non-hazardous area.
3. Execution
   1. EXAMINATION
      1. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process condition.
      2. Examine the installation location for the instrument and verify that the instrument will work properly when installed.
   2. **INSTALLATION**
      1. Contractor will install the instrument in strict accordance with the manufacturer’s instructions and recommendation.
      2. The instrument must be mounted using a suitable location to ensure the sample supplied to the instrument is representative of the process.
      3. The standard one-year warranty against manufacturing defects shall be extendable to three-years on covered equipment if paid start-up service is accomplished on that covered equipment by an authorized service provider.
      4. Coordinate the installation with all trades to ensure that the mechanical system has all necessary appurtenances for proper installation of instruments.
         1. General contractor
         2. Electrical or Instrumentation contractor
         3. Factory trained authorized service provider or representative
         4. Site (owner/operator) personnel
         5. Engineer
   3. **FIELD QUALITY CONTROL**
      1. Each instrument shall be tested before commissioning and the ENGINEER shall witness the interface capability in the PLC control system and associated registers.
      2. The ENGINEER shall witness all instrument verifications in the field.
      3. Manufacturers Field Services are available for start-up and commissioning by a manufacturer authorized service provider – the warranty against manufacturing defects is three years.
         1. Manufacturer field service representative shall verify installation of the instrument.
         2. Manufacturer representative shall notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.
         3. Manufacturer representative shall generate a configuration report for each instrument following commissioning.
   4. **ADJUSTING**
      1. Verify calibration of all instruments in accordance with the Manufacturer’s instructions.
   5. **PROTECTION**
      1. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.
         1. The ENGINEER shall be the sole party responsible for determining the corrective measures.