

Section 11302

AMMONIA ANALYZERS

PART 1 GENERAL

1.01 SUMMARY

This Section includes the furnishing and installation of ammonia and monochloramine process analyzers for continuous monitoring of total ammonia and monochloramine in water from two different sample points.

1.02 MEASUREMENT AND PAYMENT

No separate payment will be made for made for Work performed under this Section. Include cost of same in Contract price bid for Work of which this is a component part.

1.03 REFERENCES

This specification references the following publications in their current editions. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- A. ISO 9001: Quality Management Systems - Requirements

1.04 SUBMITTALS

- A. Submit the following Shop Drawings in accordance with Section 01330 – "Submittal Procedures:"
 1. Certified shop and working drawings
 2. Certified setting plans, with tolerances, for anchor bolts
 3. Operating and maintenance instructions and parts lists
 4. Shop Drawings details for accessory items
 5. Number and identify components to correspond with terminology on the Plans. Use these numbers on all submittal sheets and Shop Drawings.
 6. Recommendations for short and long term storage
 7. Sales bulletins or other general publications are not acceptable as submittals for review except where necessary to provide supplemental technical data
 8. ISO 9001 certification or other quality control manual demonstrating a complete system for quality management

9. Manufacturer shall provide a list of customers using at least five (5) similar anhydrous ammonia equipment systems for at least ten (10) years.
10. Material Certification:
 - a. Provide certification from the manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated.
 - b. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of three (3) years. Provide proposed materials at no additional cost to the Owner.
 - c. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.

B. Provide Installation, Operations and Maintenance and Troubleshooting Manuals

C. Provide an Operations and Maintenance Manual (O&M) in accordance with Section 01782 – "Operations and Maintenance Data."

1.05 RELATED REQUIREMENTS

A. Section 01330 – "Submittal Procedures"

B. Section 01450 – "Contractor's Quality Control"

C. Section 01782 – "Operations and Maintenance Data"

D. Section 11262 – "Liquid Ammonium Sulfate (LAS) System"

E. Section 15100 - "Chemical Piping"

F. Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment"

1.06 QUALITY ASSURANCE

A. Comply with the requirements specified in Section 01450 – "Contractor's Quality Control."

B. Perform work required by and in accordance with applicable State (Provincial) and local codes; arrange for permits, inspections and tests required by these codes.

- C. Provide systems and items of equipment that conform to applicable safety standards including those for safety of personnel.
- D. Provide components to manufacturer's standard for service intended unless otherwise required.
- E. Provide equipment of manufacturers' latest and proven design. Unit to be a standard cataloged product and as specified and indicated.

1.07 SYSTEM DESCRIPTION (NOT USED)

1.08 DELIVERY, STORAGE AND HANDLING

Pack materials to permit ease of handling and to provide protection from damage during shipping, handling and storage.

1.09 - 1.12 (NOT USED)

1.13 WARRANTY

- A. Warranted from manufacturer defects for two year from date of shipment.
- B. Contractor shall provide a Manufacturer's Service Agreement that covers all the Manufacturer's recommended preventative maintenance, and any necessary repairs beginning from the time of equipment startup through to end user acceptance / plant turnover and the first 24 months of end-user operation post turnover.

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

- A. Hach
- B. Or Approved Equal

2.02 MATERIALS AND/OR EQUIPMENT

- A. Analyzer shall be capable of continually monitoring total ammonia and monochloramine in water from two different sample points. Analyzer also has the capability to intake grab samples for internal measurement and dispense grab samples for external verification.
 - 1. The analyzer shall be capable of a grab sample "IN" (from an external source to the analyzer) and a grab sample "OUT" (from the analyzer to an external source) to save time, without interrupting continuous sample flow to the analyzer.

B. Measurement Method:

The chemical analysis uses a modified phenate method to measure monochloramine concentration by colorimetry. In parallel analysis, an excess of hypochlorite at the correct pH generates total ammonia values measured directly by colorimetry. Immediately after, the analyzer calculates the free ammonia values out of the difference between the directly measured monochloramine and total ammonia.

C. Measurement Range:

0.01 to 2 ppm Ammonia (NH₄ as N) or Monochloramine (as N)

D. Detection Limit: 0.01 ppm NH₄ (as N)

E. Accuracy:

1. ± 5% or 0.01 ppm for 41 to 104°F, whichever is greater
2. ± 10% or 0.02 ppm for 104 to 122°F, whichever is greater

F. Repeatability: 3% or 0.01, whichever is greater

G. Response Time: less than 5 minutes

H. Operational Requirements:

1. Storage Temperature: -4 to 140°F
2. Operating Temperature: 41 to 122°F
3. Relative Humidity: 5 to 95%, non-condensing
4. Pressure requirements: 2-100 psi to preset pressure regulator

I. Power Supply:

Power shall be directly connected to the analyzer or use a power cord supplied by the Contractor. See "ATTACHMENT" and Plans for type of connection.

J. Number of Analyzers:

See "ATTACHMENT" and Plans for number of analyzers.

K. Provide pressure regulator(s) required to control pressure at acceptable ranges entering the analyzer.

L. Display screen

1. Display measurements, recent calibration information, and reagent status at a

minimum.

2. Screen shall be capable of displaying a graph of all parameters on a scalable time.
3. Colored, easily readable displays
4. Built in help screens shall be included

M. Measurement Timing:

Capability of continual measurement every 4.5 minutes for a single channel analyzer or every 9 minutes for a dual channel analyzer. Any interval between 4.5 to 240 minutes can be selected by the operator. See "ATTACHMENT" for time between samples.

N. Power Requirements: 110-240 VAC, 50/60 Hz

O. Calibration:

1. The analyzer must be capable of performing a self-test and auto-blanking between analysis points to compensate for sample color, turbidity, and changes in light intensity due to voltage fluctuations or light source aging.
2. The analyzer must be able to conduct 2-point automatic calibration using installed standards.

P. The analyzer shall operate with an LED light source at a peak wavelength of 650 nm.

Q. Communications:

1. Analyzer shall be provided with all necessary hardware and software needed to allow all data to be sent to the customer operated control panel or PLC and/or the Owner's Supervisory Control and Data Acquisition (SCADA) system. This shall be accomplished through use a single pair of wires to bring in all the data to an RS232 port instead of multiple 4-20mA signals that have been converted from digital to analog to digital again. See Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment" for more information on the interface between the analyzer and the Owner's SCADA system, if applicable.
2. The analyzer shall have capability to communicate measurements and provide calibration information between the analyzer and laboratory spectrophotometers.

3. Provide four electromechanical, UL rated, SPDT relays (Form C) for user-configurable contacts
 - a. Rated 100 to 230 VAC, 5 Amp at 30 VDC resistive maximum.
 - b. The following can be programmed:
 - 1) Alarm
 - 2) Warning
 - 3) Scheduler
 - 4) Feeder control
 - 5) Event control
 - 6) Specific event alarm (defined in analyzer)
 - c. The following parameters can be assigned to a relay:
 - 1) Total Ammonia measurement
 - 2) Free Ammonia measurement
 - 3) Monochloramine measurement
 - 4) Calculated ratio
 - 5) Real time clock
4. 4-20 mA analog outputs
 - a. Provide four (4) to eight (8) analog 4-20 mA outputs with a maximum impedance of 500 ohms.
 - b. The following can be programmed:
 - 6) Alarms
 - (a) Low alarm point
 - (b) Low alarm point deadband
 - (c) High alarm point
 - (d) High alarm point deadband
 - (e) Off delay

- (f) On delay
 - 7) Controls
 - (a) Linear
 - (b) Bi-linear
 - (c) Logarithmic
 - (d) PID
- c. The following parameters can be assigned to a 4-20mA output:
 - 1) Total Ammonia measurement
 - 2) Free Ammonia measurement
 - 3) Monochloramine measurement
 - 4) Calculated ratio
- R. The analyzer shall have capability to provide self and predictive diagnostics and provide preventive maintenance alerts and reminders.
- S. Software provided with the analyzer shall be capable of receiving updates as necessary. Contractor shall insure that all licensing fees are paid once installation is complete.
- T. The analyzer shall provide for continuous purge of sample to drain to assure fresh sample to the analyzer and reduce analysis lag time.
- U. The analyzer shall provide separate discharge lines for unchanged (bypass) and contaminated sample (waste)
- V. Reagents and Standards
 - 1. The analyzer shall use quick connect reagent bottles with pre-installed tubing.
 - 2. Reagents shall be pressurized using a built-in air compressor
 - 3. Provide three (3) month's supply of reagents, standards, and cleaning solution (3 liters of each reagent assuming a 4.5 minute cycle time)
 - 4. Manufacturer shall provide certified pre-mixed reagents and standards
- W. Provide Installation Kit for all analyzers

- X. Provide one rotameter on each sample line upstream of analyzer to control flow rates entering the analyzer.
- Y. Provide pressure relief valve and pressure regulator immediately upstream of analyzer on sample line to control the pressure of the line entering the analyzer.

2.03-2.04 (NOT USED)

PART 3 EXECUTION

3.01 GENERAL / MANUFACTURERS (NOT USED)

3.02 PREPARATION

A. Mounting:

Analyzer shall be mounted on a panel or wall. See "ATTACHMENT" and Plans for type of mounting.

B. Sample Inlet:

1/4 inch (6mm) outer diameter (OD) quick connect fitting

C. Drain Outlet:

7/16 inch (11mm) inner diameter (ID) slip-on fitting

D. Sample Flow Rate:

0.026 gallons/minute (100 mL/minute) to 0.26 gallons/minute (1,000 mL/minute)

E. Sample Pressure:

2.5 to 100 psi (0.17 to 6.8 bar)

F. Sample Temperature:

41°F to 122°F (5°C to 50°C)

3.03 ERECTION / INSTALLATION APPLICATION AND/OR CONSTRUCTION

- A. Contractor shall install the analyzer and connecting piping in strict accordance with the Manufacturer's instructions.
- B. Prior to testing and start-up, inspect the installation to verify the system is ready for complete testing and calibration of equipment.
- C. Manufacturer's representative shall include a half-day start-up service by a factory trained technician.

- D. Contractor shall schedule a date and time for start-up.
- E. Contractor shall require the following people to be present during the start-up procedure.
 - 1. General Contractor
 - 2. Electrical Contractor
 - 3. Manufacturer's factory trained representative
 - 4. Project Manager
 - 5. Owner's Operator
 - 6. Water District Operator
 - 7. Engineer
 - 8. Controls Technician (as required)
- F. Install all piping, fittings, valves and appurtenances required to install and operate the analyzers in accordance with Section 15100 - "Chemical Piping" and the Plans.
- G. For all associated liquid ammonium sulfate (LAS) equipment to be installed, refer to 11262 – "Liquid Ammonium Sulfate (LAS) System."

3.04-3.07 (NOT USED)

3.08 MANUFACTURER'S SERVICE, START-UP, TESTING AND INSPECTION

- A. Contractor shall include the Manufacturer's services to perform start-up on instrument to include basic operational training and certification of performance of the instrument.
- B. Manufacturer's technical representative shall assist Contractor in testing and calibration of all components.
- C. Contractor shall include a Manufacturer's Service Agreement that covers all the Manufacturer's recommended preventative maintenance, and any necessary repairs beginning from the time of equipment startup through to end user acceptance / plant turnover and the first 24 months of end-user operation post turnover.
- D. Items A and C are to be performed by Manufacturer's factory-trained service personnel. Field service and factory repair by personnel not employed by the manufacturer is not allowed.

- E. Test chemical feed system per Section 11262 – "Liquid Ammonium Sulfate (LAS) System."
- F. Use of manufacturer's service parts and reagents is required. Third-party parts and reagents are not approved for use.

3.09-3.10 (NOT USED)

END OF SECTION

ATTACHMENT

[Design Engineer is to complete blanks per site requirements]

A. Ammonia Analyzer

1. Manufacturer: Hach
2. Model: 5500sc Ammonia Monochloramine Analyzer, 2 Channel
3. Type of Mounting: Panel or Wall Mounted
4. Power connection: Directly connected or use a power cord
5. No. of 4-20mA outputs: _____

END OF SECTION