

Section 11303

CHEMICAL ANALYZERS

PART 1 GENERAL

1.01 SUMMARY

This Section includes the furnishing and installation of a chemical analyzer for continuous monitoring and testing for free ammonia, total ammonia, total monochloramine and total residual chlorine concentration from two different sample points.

1.02 MEASUREMENT AND PAYMENT

No separate payment will be 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. The Chlorine Institute, Inc. – Chlorine Manual
- B. NEMA ICS 1: Industrial Control and Systems General Requirements [National Electrical Manufacturers Association (NEMA)]
- C. ISO 9001: Quality Management Systems – Requirements
- D. Texas Commission on Environmental Quality 30 TAC Chapter 290

1.04 SUBMITTALS

- A. Submit the following 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, service manuals, and parts lists
 - 4. Shop drawing details for accessory items
 - 5. Number and identify components to correspond with terminology on 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 will 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 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.
11. Provide Installation, Operations and Maintenance, and Troubleshooting Manuals.
12. 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 11260 – "Gas Chlorination System"
- E. Section 11261 – "Sodium Hypochlorite (Bleach) Chlorination System"

- F. Section 11262 – “Liquid Ammonium Sulfate (LAS) System”
- G. Section 15100 – "Chemical Piping"
- H. 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. Do work required by and in accordance with applicable State 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.
- F. Provide a qualified technical representative of the manufacturer to inspect the completed equipment installation, make all the adjustments necessary to place the equipment in trouble-free operation, and to instruct operating personnel in the proper care and operation of the equipment furnished.

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 years from date of shipment.

For a period of 24 months from substantial completion, the manufacturer shall warrant that the equipment shall be free of in material and workmanship under normal use and service, when properly installed.
- B. Contractor will provide a Manufacturer's Service Agreement that covers all of 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. Analyzer

1. Applied Spectrometry Associates, Inc.
2. Or Approved Equal

2.02 MATERIALS AND/OR EQUIPMENT

A. Analyzer

1. Provide a wall-mounted ChemScan Model UV-2150/S Process Analyzer as manufactured by Applied Spectrometry Associates, Inc. or approved equal.
2. The analyzer shall be capable of measuring free ammonia (FAA), total ammonia (TAA), total chlorine (TAC), and total monochloramine (MONO) from two (2) different sample points. The analyzer will automatically sample from one or two sample locations.
3. The analyzer shall pull water samples from each of two (2) sample water locations and discharge the tested water sample into the analyzer drain line which is tied into the existing storm sewer system.
 - a. Provide and install, if needed, a pressure reducer in each sample water line to meet the analyzer's pressure requirement.
 - b. Sample flow to the analyzer shall be drawn through a tee connection in the sample water line into a minimum one-quarter inch inside diameter (¼" I.D.) poly-tube (PET) bypass line with a minimum incoming pressure of 10 psi at the analyzer sample inlet and a sample flow of 0.13 gallons per minute (gpm) [0.5 L/min] to 1.32 gpm (5.0 L/min).
 - c. Provide and install a pressure gauge on each sample water supply line between the pressure reducer and the sample inlet.
4. Operating range for each chemical shall be as follows:
 - a. 0.02 to 1.00 parts per million (ppm) as nitrogen (N) for FAA
 - b. 0.02 to 2.00 ppm as N for TAA

- c. 0.01 to 5.00 ppm as chlorine (Cl₂) for MONO
 - d. 0.05 to 5.00 ppm as Cl₂ for TAC
5. The analyzer shall not use ion-selective electrodes for analysis. The analyzer shall not use toxic reagents for ammonia analysis including Nessler reagent, phenate, or salycalate. Multiple wavelength spectrophotometric methods of analysis are allowed, provided that a minimum of 15 wavelengths are used for analysis. All chemical reagents in contact with the water samples shall be NSF approved.
 6. The analyzer shall be capable of detecting all four (4) designated parameters in water samples from two (2) different sample points. Each sample water line shall have a separate inlet into the analyzer, with sample flow through the inlet and the analyzer flow cell controlled by an internal sample manifold. The analyzer is capable of controlling the sample analysis cycle and flush time through operator initiated commands in the analyzer controls. External sample manifolds and sample manifolds not furnished by the analyzer manufacturer are prohibited. All designated parameters shall be completely analyzed for all designated parameters within five (5) minutes or less following the flush period for any sample water line. Sample transport time and reagent reaction times in excess of five (5) minutes are prohibited.
 7. A filter is required for sample water sources with solids greater than 150 mg/L or turbidity higher than 60 NTU.
 8. The analyzer shall be capable of automatic zeroing using a distilled or de-ionized water standard and automatic cleaning using a cleaning solution recommended by the manufacturer. Zeroing shall be performed automatically by the analyzer at intervals set by the operator. Cleaning shall be performed based on self-test set points measured during the zeroing cycle. The analyzer shall contain an internal pump for the introduction of zeroing and cleaning solutions and a manifold to interrupt sample flow and replace it with a flow of zero standard or cleaning solution. Gravity feed, manual introduction, or external pumps for zeroing and cleaning are not acceptable. The flow cell chamber shall be easily removed for cleaning without disconnection of power, sample lines, light source, or detection optics. The flow cell shall be thermally protected from condensation by the use of inert gas between the internal sample windows and the external light entry or exit windows. Contractor shall provide an open drain line in close proximity to the analyzer as shown on the Plans.
 9. The analyzer shall have internal memory with lithium battery backup. The memory log shall be a 1,000 analysis cycle memory log available for access through an RS-232 serial port.

10. Electronics, optics, external keypad, and cabinet mounted interface display shall be in a NEMA-4X enclosure. Flow cell module, internal manifold, internal pump, and reagent injection system shall be in an attached NEMA-4X enclosure.
11. Power for the analyzer and the zero/clean pump shall be a 4 amp maximum at 120V AC, 60 cycle. Provide a NEMA 5-15P plug and cord to for connection to a UPS.
12. Contractor shall provide a 316 stainless steel Unistrut channel frame (or equal), to wall-mount the analyzer inside the building as shown on the Plans.
13. The ambient temperature inside the building shall not be greater than 35°C or less than 5°C.

B. Communications

1. The analyzer will generate 4-20mA signals for each measured chemical residual and send signals to the customer operated control panel or PLC and/or the Owner's Supervisory Control and Data Acquisition (SCADA) system. 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 be programmed to send alarm signals to the autodialer when the measured FAA or TAC levels fall below or exceed the most current requirements of the Texas Commission on Environmental Quality (TCEQ) 30 TAC §290 rules and regulations. The chemical residual level set points shall be field adjustable. Alarm signals shall be adjustable to any residual within the analyzer range.
3. The following alarms can be programmed:
 - a. Low alarm point for each chemical sample,
 - b. High alarm point for each chemical sample,
 - c. Analyzer failures, and
 - d. Analyzer maintenance.
4. The analyzer shall provide continuous, dedicated 4-20mA outputs for each measured chemical residual. All outputs will be held at the most recent analysis value until updated by a new analysis. Outputs will also be held constant during auto zero and clean cycles.

5. The analyzer shall be provided with a network communications board and associated software for instrument control.
6. The analyzer will show alarm conditions on its face and produce alarm outputs for programmable chloramine concentrations or for system malfunctions from a self-diagnostics system.

C. Electrical Interface

1. The analyzer manufacturer shall provide a wall-mounted electrical interface compatible with its analyzer specified above. The electrical interface enclosure shall be a NEMA-4X enclosure.
2. Contractor shall provide a 316 stainless steel Unistrut channel frame (or equal), to wall-mount the electrical interface inside the building as shown on the Plans.
3. The electrical interface shall be connected to the analyzer with a network cable providing power and electrical signal to the interface. The interface shall have four (4) 4-20mA signal analog outputs for each of the two (2) sample water sources to send information to the proposed data logger.
4. The electrical Interface shall have a minimum of ten (10) relay outputs connected to the existing automatic telephone dialer to communicate high and low chemical residuals for each chemical sample, analyzer failure, and analyzer maintenance alarms.

D. Analyzer Accessories

1. Manufacturer shall provide three month supply of reagents including reagent containers.
2. Contractor to supply three month supply of DI water and muriatic acid including storage containers.
3. Applied Spectrometry Associates, Inc. single instrument software license for chemometric algorithm suitable for on-line analysis of the four (4) designated parameters.
4. Contractor to provide and install one (1) APC Back-UPS RS 900VA (BR900) 540W/900VA, or Engineer approved equal, uninterruptible power supply (UPS). The UPS shall have an input and output voltage of 120 V, a minimum 500 watts, 900 VA of output power, an audible and visual alarm for battery failure notification, a maintenance free sealed lead acid battery, and an operating environment of 32 to 104 degrees Fahrenheit.

2.03 – 2.04 NOT USED

PART 3 EXECUTION

3.01 – 3.02 NOT USED

3.03 ERECTION/INSTALLATION APPLICATION AND/OR CONSTRUCTION

A. Analyzer Installation

1. Contractor shall install the analyzer on the wall inside the building located as shown on the Plans. All Unistrut channels, brackets, and hardware used for mounting shall be 316 stainless steel.
2. Tie the proposed sample water lines into the existing sample water supply lines valved off or capped inside the building. Verify the existing sample water lines are flowing prior to tying into new piping.
3. Provide and install each proposed sample water line with true union ball valves, a true union ball check valve, and fittings as shown on the Plans. Provide 316 stainless steel Unistrut channels, brackets, and hardware as needed to securely attach the piping to the interior building wall face.
4. Provide and install one (1) one-inch PVC Schedule 80 by one quarter inch (1"x¼") I.D. PET adapter for each analyzer sample water source with the PET tied into a ¼-inch (¼") PVC Schedule 40 sample water supply line.
5. Provide each PVC Schedule 40 analyzer sample water supply line with one (1) ¼-inch PVC ball valve, one (1) ¼-inch PVC 100 mesh wye strainer, one (1) ¼-inch rotameter (0 – 10 GPM), one (1) ¼-inch pressure gauge (0 – 100 psi), and one (1) pressure regulator (if required) as shown on the Plans.
6. Provide and install a three-inch PVC Schedule 80 wall-mounted drain line assembly below the analyzer drain port as shown on the construction drawings. The horizontal piping shall be sloped slightly along the wall to allow the piping to gravity flow into the storm sewer drain. Provide a minimum one-inch (1") air gap and an in-line "P" trap in the drain line as detailed on the Plans. Provide 316 stainless steel Unistrut channels, brackets, and hardware as needed to securely attach the piping to the interior building wall face.
7. Prior to pressure testing the new sample line piping, remove or valve off from the sample lines all instrumentation and appurtenant equipment that is not capable of withstanding the hydrostatic test pressure.
8. All piping inside the building shall have adhesive stickers indicating the direction of flow.
9. Install all piping, fittings, valves and appurtenances required to install and

operate the analyzers in accordance with Section 15100 – “Chemical Piping” and the Plans.

10. For all associated chlorination equipment to be installed, refer to Section 11260 – “Gas Chlorination System” or 11261 – “Bleach Chlorination System”.
11. For all associated liquid ammonium sulfate (LAS) equipment to be installed, refer to Section 11262 – “Liquid Ammonium Sulfate (LAS) System”.

3.04 – 3.07 NOT USED

3.08 DEMONSTRATION / TESTING AND INSPECTION

- A. Contractor shall include the Manufacturer’s services of a factory-trained representative to perform installation and start-up of the instrument. Activities to include basic operational training and certification of performance of the instrument.
- B. Manufacturer’s technical representative to assist Contractor in testing and calibration of all components. And shall correct any defects or malfunctions of the equipment.
- C. Provide four (4) hours of training by the representative for the plant operating personnel, including start- up and calibration of the analyzer. The training may be videotaped by the Owner and the manufacturer will be allowed to edit the videotape.
- D. Start-Up Procedures:
 1. Following construction, but prior to commissioning equipment for normal use, the Manufacturer shall perform a start-up inspection to verify the proper operation of the equipment and its conformance with the specified duty condition.
 2. The inspection shall be performed by a factory-trained representative of the Manufacturer. Results shall be documented by the Manufacturer’s representative and shall be on factory letterhead, signed by the individual conducting the tests, and provided to the Engineer.
 3. If a formal start-up is to be created at a later date, the field notes must be copied and given to the Engineer immediately upon completion of the tests. Ensure Engineer is present to witness the start-up of the analyzer equipment.
- E. Test chlorination system per Section 11260 – “Gas Chlorination System” or 11261 – “Bleach Chlorination System”.
- F. Test LAS system per Section 11262 – “Liquid Ammonium Sulfate (LAS) System”.

3.09 – 3.10 NOT USED

ATTACHMENT

[Design Engineer is to complete blanks per site requirements]

A. Chemical Analyzer

1. Manufacturer: Applied Spectrometry Associates, Inc.
2. Model: ChemScan Model UV-2150/S
3. Type of Mounting: Wall Mounted
4. Power connection: Directly connected or use a power cord
5. Time between samples: _____
6. No. of 4-20mA outputs: _____

END OF SECTION