SECTION 463113 - SULFUR DIOXIDE GAS FEED EQUIPMENT

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section includes sulfur dioxide feed equipment for water and wastewater systems using sulfur dioxide gas in high-pressure cylinders.

In the water and wastewater industry, sulfur dioxide may be used for dechlorination. Sulfur dioxide may also be used to remove dissolved oxygen or hydrogen sulfide and to treat chromium wastes.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes: Vacuum-regulated, gas-fed, [**automatic**] [**manual**] switchover, [**fully automatic**] [**semi-automatic**] [**program-control**] [**manually adjusted**]-type sulfur dioxide feed controls.
          2. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 400523 - Stainless Steel Process Pipe and Tubing: Stainless-steel pipe and tubing materials.

Section 400563 - Ball Valves: Execution requirements for ball valves as specified by this Section.

Section 400567 - Specialized Pressure and Flow-Control Valves: Pressure-regulating valves to prevent over-pressurization and to help prevent liquefaction.

Section 400567.39 - Pressure-Relief Valves: Pressure-regulating valves to prevent over-pressurization and to help prevent liquefaction.

Section 401649 - Sulfur Dioxide Gas Piping: Requirements for aboveground process piping systems.

Section 407636 - Sulfur Dioxide Analyzers: Analyzing and monitoring equipment.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. ASTM International:

ASTM A182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

* + - * 1. National Electrical Manufacturers Association:

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

* + - 1. PREINSTALLATION MEETINGS
         1. Convene minimum [**one week**] <**\_\_\_\_\_\_\_\_**> [**weeks**] prior to commencing Work of this Section.
      2. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
        2. Manufacturer’s installation instructions shall be provided along with product data.
        3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
        4. Product Data: Submit manufacturer information describing materials of construction, fabrication, and protective coatings.
        5. Shop Drawings:

Indicate materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.

Indicate schematic diagram of each system, including tag marks for each item of equipment cross-referenced to sulfur dioxide feed system equipment list.

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

Include separate Paragraphs for additional certifications.

* + - * 1. Manufacturer Instructions:

Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.

Submit installation, selection, and hookup configuration, with pipe and accessory elevations.

Submit hanging and support requirements and recommendations.

* + - * 1. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        2. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.
        3. Qualifications Statements:

Coordinate following Subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer and installer.

Submit manufacturer's approval of installer.

* + - 1. CLOSEOUT SUBMITTALS
         1. Project Record Documents: Record actual locations and final orientation of equipment and accessories.
      2. MAINTENANCE MATERIAL SUBMITTALS
         1. Spare Parts:

Furnish [**one set**] [**two sets**] of manufacturer's recommended spare parts, including following:

[**One**] <**\_\_\_\_\_\_\_\_**> flow rate indicators for each vacuum regulator.

[**One**] <**\_\_\_\_\_\_\_\_**> spare remote gas flowmeters with rate valve.

[**Three**] <**\_\_\_\_\_\_\_\_**> gaskets to fit joints and unions.

[**One**] <**\_\_\_\_\_\_\_\_**> sets of hose clamps to suit hose connection.

[**Fifty**] <**\_\_\_\_\_\_\_\_**> cylinder valve gaskets.

[**One**] <**\_\_\_\_\_\_\_\_**> cylinders for self-contained breathing apparatus.

<**\_\_\_\_\_\_\_\_**>.

* + - * 1. Tools: Furnish special [**wrenches**] <**\_\_\_\_\_\_\_\_**> and other devices required for Director’s Representative to maintain and calibrate <**\_\_\_\_\_\_\_\_**>.
      1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following Paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
      1. QUALIFICATIONS

Coordinate following Paragraphs with requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
        2. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
      1. DELIVERY, STORAGE, AND HANDLING
         1. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
         2. Store materials according to manufacturer instructions.
         3. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. EXISTING CONDITIONS
         1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

* + - 1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and Director’s Representative enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for sulfur dioxide feed equipment.

1. PRODUCTS
   * + 1. SULFUR DIOXIDE GAS FEED EQUIPMENT
          1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=12741&mf=04&src=wd):

Designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Feed System: Vacuum-operated, gas-feed, automatic switchover, sulfur dioxide feed system using standard high-pressure cylinders.

Ejector: Provides operating vacuum for feed system.

* + - * 1. Performance and Design Criteria:

Sulfur Dioxide Flow Rate: [**50**] [**500**] [**5,000**] <**\_\_\_\_\_\_\_\_**> lb./day .

Operating Temperature:

Minimum: <**\_\_\_\_\_\_\_\_**> deg. F

Maximum: <**\_\_\_\_\_\_\_\_**> deg. F

Accuracy: Plus or minus [**4**] <**\_\_\_\_\_\_\_\_**> percent of full scale.

Repeatability: Plus or minus [**1**] <**\_\_\_\_\_\_\_\_**> percent of full scale.

Linearity: Plus or minus [**0.5**] <**\_\_\_\_\_\_\_\_**> percent of full scale.

Automatically switch gas supply from empty cylinder to full cylinder.

Vacuum Checking: Entire system capable of being checked in place.

Available Water Supply Pressure: <**\_\_\_\_\_\_\_\_**> psig

* + - * 1. High-Pressure Storage Tanks:

Capacity: [**5**] [**35**] [**50**] <**\_\_\_\_\_\_\_\_**> lb

Rated Service Pressure: [**1,800**] <**\_\_\_\_\_\_\_\_**> psig

* + - * 1. Vacuum Feed Systems:

Description:

Mounting: On manifold piping.

Furnish loss-of-gas indicator to indicate when cylinder is empty and requires replacement.

Vacuum Regulator:

Type: Spring-opposed diaphragm.

Valve springs close upon loss of vacuum.

Inlet Filter: Adequate to remove particulate matter from gas before entering inlet safety valve.

Flow Meter: Furnish control valve for manual feed rate adjustment.

* + - * 1. Operation:

Electrical Characteristics:

Voltage: <**\_\_\_\_\_\_\_\_**> V, [**single**] [**three**] phase, 60 Hz.

Maximum [**Fuse Size**] [**Circuit-Breaker Size**] [**Overcurrent Protection**]: <**\_\_\_\_\_\_\_\_**> A.

Minimum Circuit Ampacity: <**\_\_\_\_\_\_\_\_**>.

Control Panel:

Factory mounted.

NEMA 250 Type [**1**] [**4**] [**4X**] <**\_\_\_\_\_\_\_\_**>.

Single-point power connection and grounding lug.

Controller:

Turn-Down: [**20:1**] <**\_\_:\_\_**>.

Accuracy: Plus or minus [**2**] <**\_\_\_\_\_\_\_\_**> percent of full scale.

Mounting: [**Manifold**] [**Wall**].

Display: 20-character digital display.

Inputs:

[**Three**] <**\_\_\_\_\_\_\_\_**> analog channels.

[**Four**] <**\_\_\_\_\_\_\_\_**> 12- to 24-V dc.

Outputs:

[**Two**] <**\_\_\_\_\_\_\_\_**> 4- to 20-mA dc signals.

[**Two**] <**\_\_\_\_\_\_\_\_**> alarm contacts.

[**Communication Protocol: Modbus RS-485.**]

Disconnect Switch: Factory mounted [**in control panel**] [**on equipment**].

Operation Sequences: [**Manual**] [**Remote**] [**Flow pacing**] [**Proportional**] <**\_\_\_\_\_\_\_\_**>.

* + - 1. MATERIALS
         1. Vacuum Regulator:

Inlet Adapter: [**CPVC**] [**Titanium**] <**\_\_\_\_\_\_\_\_**>.

Body: CPVC.

* + - * 1. Vacuum Tubing: CPVC.
        2. [**Pressurized**] [**Manifold**] Piping:

Material: Type 316 stainless steel.

Comply with ASTM A182.

As specified in Section 400523 - Stainless Steel Process Pipe and Tubing.

* + - 1. ACCESSORIES
         1. Flexible Connectors: Type 316 stainless-steel tubing.
         2. Elastomers: [**Viton**] [**EPDM**] <**\_\_\_\_\_\_\_\_**>.
         3. Ball Valves:

As specified in Section 400563 - Ball Valves.

Working Pressure: <**\_\_\_\_\_\_\_\_**> psig

Ball valves for vacuum piping may be constructed of PVC.

Materials:

Body: [**CPVC**] <**\_\_\_\_\_\_\_\_**>.

Internal Components: [**CPVC**] <**\_\_\_\_\_\_\_\_**>.

Furnish provision to vent cavity in closed position, on upstream side of valve.

Pressure-reducing valves are commonly used to help prevent liquefaction in pipeline and to prevent excessively high inlet pressures in regulator.

* + - * 1. Pressure-Reducing Valves:

Type: Self-actuating, spring loaded.

Type: [**Pneumatically**] [**hydraulically**] [**or**] [**electrically**] actuated.

As specified in Section 400567 - Specialized Pressure and Flow-Control Valves.

Materials: Suitable for sulfur dioxide use.

* + - * 1. Pressure Relief Valves:

As specified in Section 400567.39 - Pressure-Relief Valves.

Set Point: [**150**] <**\_\_\_\_\_\_\_\_**> psig

Materials: Suitable for sulfur dioxide use.

* + - * 1. Cylinder Scale:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=7712&mf=04&src=wd):

Designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Description: Two-cylinder scale with individual, circular weighing platforms consisting of PVC base, plastic-coated supporting column, and plastic-coated, adjustable crossbar with chains to restrain cylinders.

Furnish scale head with two indicators and two tare-weight adjusting knobs.

Minimum Height of Scale Platform: 1-1/2 inches

Accuracy of Tare-Weight Adjustment: 0.5 percent of full scale.

Indicator: Display net weight of each cylinder.

Gross Capacity of Each Scale Platform: <**\_\_\_\_\_\_\_\_**> lb

Tare Capacity Range: Zero to <**\_\_\_\_\_\_\_\_**> lb. with readability to 0.1 lb

Indicators:

Two independent digital displays.

Electrical Characteristics: 110 V, single phase, 60 Hz.

Enclosure: NEMA 250 Type [**1**] [**4**] [**4X**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Self-Contained Breathing Apparatus:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=7715&mf=04&src=wd):

Designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Subparagraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Description:

[**One**] <**\_\_\_\_\_\_\_\_**> demand types, suitable for use in high-concentration sulfur dioxide atmosphere.

Full face mask.

Speaking diaphragm to project user's voice through mask.

High-pressure air cylinder containing 30-minute air supply.

Audible LOW AIR SUPPLY alarm bell.

Foam-padded cylinder harness assembly.

Cylinder pressure gage.

Approved by National Institute for Occupational Safety and Health and by Mining Safety and Health Administration.

Cabinet:

Constructed of chemical-resistant fiberglass; suitable for wall mounting outdoors.

Corrosion-proof hinges.

Stainless-steel door latch.

Neoprene door gasket.

Interior hardware for mounting self-contained breathing apparatus and spare cylinder.

Color: [**Safety**] yellow.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify layout and orientation of equipment, accessories, and piping connections.
       2. INSTALLATION
          1. According to manufacturer instructions and as indicated on Drawings.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
      1. FIELD QUALITY CONTROL
         1. Leak Testing: As recommended by feed equipment manufacturer.
         2. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <**\_\_\_\_\_\_\_\_**> days on Site for installation, inspection, startup, field testing, and instructing Director’s Representative's personnel in operation and maintenance of equipment.
         3. Equipment Acceptance:

Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

Make final adjustments to equipment under direction of manufacturer's representative.

* + - * 1. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
      1. CLEANING
         1. Before use, dismantle and clean new valves or other equipment received in oily condition.
         2. Test valves with clean, dry air at 150 psig for seat tightness before installation.
      2. DEMONSTRATION
         1. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Director’s Representative.

END OF SECTION 463113