SECTION 463111 - CHLORINE 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 chlorination equipment for water and wastewater systems using chlorine gas in 150-lb or 1-ton cylinders.

Check state and local requirements regarding design, installation, and permitting of chlorination systems. Add specific state and local requirements as they apply to this Section.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes: Vacuum-regulated, [**solution**] [**gas**]-feed, [**automatic**] [**manual**]-switchover, [**fully automatic**] [**semi-automatic**] [**program-control**] [**manually adjusted**]-type chlorination 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: Pipe and tubing for process systems.

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

* + - 1. REFERENCE STANDARDS

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

* + - * 1. The Chlorine Institute, Inc.: Requirements for vacuum regulator mounting assembly.
				2. Mining Safety and Health Administration: Requirements for self-contained breathing apparatus.
				3. National Electrical Manufacturers Association:

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

* + - * 1. National Institute for Occupational Safety and Health: Requirements for self-contained breathing apparatus.
			1. COORDINATION
				1. Coordinate Work of this Section with [**plant operations**] [**Director’s Representative**] <**\_\_\_\_\_\_\_\_**>.
			2. PREINSTALLATION MEETINGS
				1. Convene minimum [**one**] <**\_\_\_\_\_\_\_\_**> week prior to commencing Work of this Section.
			3. SCHEDULING
				1. Schedule Work of this Section after finishing concrete work for support pad and prior to connecting piping work.
			4. SEQUENCING
				1. Sequence Work to prevent interference with [**plant operations**] [**Director’s Representative's operation**] <**\_\_\_\_\_\_\_\_**>.
			5. 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 complete information concerning materials of construction, fabrication, and protective coatings.

* + - * 1. Shop Drawings:

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

Submit schematic diagram of each system, including tag marks for each item of equipment cross-referenced to chlorine system equipment list.

* + - * 1. Manufacturer's Certificate: Certify that [**products**] <**\_\_\_\_\_\_\_\_**> meet or exceed [**specified requirements**] <**\_\_\_\_\_\_\_\_**>.

Include separate Paragraphs for additional certifications.

* + - * 1. Test and Evaluation Reports: Submit certified factory test results.
				2. Manufacturer's 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: Indicate that equipment has been installed according to manufacturer's instructions.
				3. Qualifications Statements:

Coordinate following Subparagraphs with the 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. Operation and Maintenance Data: Submit maintenance instructions for equipment and accessories.
			2. MAINTENANCE MATERIAL SUBMITTALS
				1. Spare Parts:

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

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

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

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

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

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

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

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

* + - * 1. Extra Stock Materials:

Furnish [**two**] 4-oz. containers of ammonia.

* + - * 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 the Work of this Section on-Site.
			1. QUALIFICATIONS

Coordinate following Paragraphs with the 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. Deliver materials in manufacturer's packaging; include installation instructions.
				2. Inspection: Accept equipment on-Site in manufacturer's original packaging. Inspect for damage.
				3. Store products [**according to manufacturer's instructions**] [**and**] [**in areas protected from weather, moisture, or possible damage**].
				4. Protect systems from entry of foreign materials by using temporary covers and by isolating parts of completed system.
			2. 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 <**\_\_\_\_\_\_\_\_**>.
1. PRODUCTS
	* + 1. CHLORINE FEED SYSTEM
				1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7706&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, solution-feed, automatic switchover chlorinator for dispensing chlorine gas from standard 150-lb. cylinders.

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

Feed System: Vacuum-operated, solution-feed, automatic switchover chlorinator for dispensing chlorine gas from standard 1-ton cylinders.

Ejector: Provides operating vacuum for feed system.

* + - * 1. Performance and Design Criteria:

A typical maximum gas feed capacity for gas chlorinators is 500 lb./day.

Chlorine Gas Feed Capacity: <**\_\_\_\_\_\_\_\_**> lb./day

Automatically switch gas supply from empty cylinder to full cylinder.

* + - * 1. Vacuum Regulator:

Mounting: On each gas cylinder valve by means of corrosion-resistant, gasketed yoke assembly conforming to standards of The Chlorine Institute, Inc.

Vacuum Control: Tantalum inlet valve springs opposing diaphragm that closes tightly upon loss of vacuum.

Pressure Relief Valve:

Furnish separate ports for chlorine feed and chlorine vent.

Vent gas away from pressure relief port to atmosphere outside of building; furnish insect screen at end of vent.

Furnish inlet filter to remove particulate matter from the gas before it enters inlet safety valve.

Furnish flowmeter to indicate gas feed rate and to indicate which cylinder is in use.

Gas Flow Rate Range: Maximum <**\_\_\_\_\_\_\_\_**> lb./day day and minimum of 1/20 of maximum rate.

Solid silver control valve for manual feed rate adjustment.

Mounting: Wall.

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

* + - * 1. Automatic Switchover Module:

Vacuum-operated, automatically switching from empty cylinder to standby cylinder.

Mounting: Wall.

* + - * 1. Ejector Assembly:

Type: Water-operated venturi nozzle.

Automatic gas flow shutoff upon loss of water supply.

Chlorine Feed Rate: <**\_\_\_\_\_\_\_\_**> lb. per day.

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

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

Maximum Water Supply Flow Rate Available: <**\_\_\_\_\_\_\_\_**> gpm

* + - * 1. Check Valve:

Spring loaded, normally closed.

* + - * 1. Mounting: Wall mounted with required piping connections for gas and ejector supply water and discharge.
			1. MATERIALS
				1. Vacuum Regulator:

Inlet Adapter: Corrosion-resistant [**Hastelloy C**] <**\_\_\_\_\_\_\_\_**>.

Body: PVC.

* + - 1. ACCESSORIES
				1. Chlorine Vacuum Monitor:

Sense low or high gas vacuum condition on chlorine gas line.

Display: Three-digit LED digital display of system vacuum.

Operating Range: Zero to 30 in. Hg

One normally open-normally closed latching output relay.

One-to-100-second adjustable delay for latching alarm relay.

Adjustable LOW VACUUM alarm within range of zero to 10 in. Hg

Adjustable HIGH VACUUM alarm within range of 20 to 30 in. Hg

LED indicator for each alarm condition.

Enclosure: NEMA 250, Type 4X.

* + - * 1. Ball Valves:

As specified in Section 400563 - Ball Valves.

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

End Connections: True-union type.

Materials:

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

O-Ring: [**Viton**] <**\_\_\_\_\_\_\_\_**>.

Seat: [**Self-lubricating PTFE**] <**\_\_\_\_\_\_\_\_**>.

Removable Handle: [**Plastic**] <**\_\_\_\_\_\_\_\_**>.

* + - * 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 to 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, 4X.

Finishes: Scale materials and coatings suitable for use in chlorine atmosphere.

* + - * 1. Chlorine Leak Detector:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=7713&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.

Detector:

Specific to chlorine gas and responsive to less than one part per million by volume.

Indications: Warning and alarm with indicating lights.

Operating Temperature Range: Minus 20 to plus 150 degrees F.

Electrical Characteristics: 120 V, single phase, 60 Hz.

Furnish contact closures for separate warning and alarm circuits to activate external safety devices, including external fan and alarm.

Sensor:

Solid-state material for remote, wall mounting in plastic, chlorine-resistant enclosure.

Chemical-less type.

Furnish 20 feet of No. 4 conductor, shielded cable between sensor and electronics enclosure.

Electronics Enclosure:

High-impact plastic construction, wall mounted.

ON-OFF power switch and POWER light.

LOW CHLORINE LEVEL warning light.

HIGH CHLORINE LEVEL alarm light.

Test switch to verify operation of alarm and warning circuits.

Reset switch to manually acknowledge and cancel alarm indication.

[**Three**] <**\_\_\_\_\_\_\_\_**> independent, single-pole, double-throw contact closures, rated at 10 A at 120 V AC resistive load, for malfunction warning and alarm.

Gasketed door with observation window and compression-type latch.

Universal mounting brackets for wall or panel mounting.

* + - * 1. Chlorine Residual Analyzer:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=7714&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:

Wall mounted.

Electrodes fixed and continuously cleaned.

Constant sample flow to cell controlled by built-in gravity-flow-regulator design.

Automatic temperature compensation.

Signal drift reduced by pH-buffer-solution feed system in cell.

Sensing Cell:

Fixed gold and copper electrodes with fixed output contacts.

Output: Isolated 4 mAdc into maximum of 800 ohms.

Constant cleaning provided by motor-driven plastic striker agitating small PVC spheres against both electrodes to keep dirt and other substances from face of electrodes.

Reagents:

Chemical reagents fed from incorporated storage bottle through rotary valve.

Furnish regent storage bottle with seven-day capacity.

Field-Selectable Operating Ranges: Zero to 0.5 mg/L, zero to 1 mg/L, zero to 2 mg/L, zero to 3 mg/L, zero to 5 mg/L, zero to 10 mg/L, zero to 20 mg/L.

Residual Indication:

Digital display.

Enclosure: NEMA 250, Type 4X.

Residual values in mg/L.

Field-adjustable, separate high and low set points from zero to 100 percent of selected range.

LED indicator on face of unit for each set point.

Provide each set point with corresponding relay contact of 10 A at 120 V.

* + - * 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 type, suitable for use in chlorine gas 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 gauge.

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**] [**Yellow**].

1. EXECUTION
	* + 1. EXAMINATION
				1. Verify layout and orientation of equipment, accessories, and piping connections.
			2. INSTALLATION
				1. Install equipment and accessories as recommended by manufacturer and as indicated on Drawings.
				2. Install chlorine vent and vacuum tubing in Schedule 80 PVC pipe to location outside of building wall. Install turned-down elbow and terminate with fine mesh insect screen.

\*\*\*\*\*\* [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. Preliminary Leakage Testing: Pressurize entire chlorine system with nitrogen to at least 150 psig. With system under pressure, test each joint and connection for leaks by applying soapy water to each joint and connection.
				2. Final Leakage Testing: Test automatic chlorinators first to ensure chlorinators are operational. Use chlorinators to evacuate system in event leaks are found. Perform in the following sequence:

Check unions and pipe connections in chlorine system for tightness.

Open header and auxiliary valves one turn.

Soak rag with strong ammonia water (commercial 26-degree Be), and swab each joint and connection.

Momentarily open one chlorine cylinder valve to pressurize system to approximately 10 psig , then shut off tight; observe chlorine leaks evident by formation of dense, white smoke.

When leaks are found, turn on automatic chlorinators to evacuate system, then repair leaks; retest joints and connections after repairs are made.

* + - * 1. Performance Testing: Test each piece of chlorination equipment under design conditions for two to four hours to demonstrate proper functioning and automatic regulation of system; test alarms and signal generation; exercise equipment control and manual override where applicable; demonstrate equipment safety features.
				2. 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.
				3. 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, field testing, and instructing Director’s Representative in maintenance of equipment.
				4. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.
			1. CLEANING
				1. Clean portions of chlorine system to remove cutting oil, grease, and other foreign materials; do not use hydrocarbons or alcohols for cleaning residuals from these materials.
				2. Before use, dismantle and clean new valves or other equipment received in oily condition. Test valves with clean, dry air at 150 psig for seat tightness before installation.
				3. Dry chlorine piping before use using steam and dry air; if steam and dry air are not available, purge completed system with dry cylinder air or nitrogen to remove moisture.
			2. DEMONSTRATION
				1. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Director’s Representative.

END OF SECTION 463111