SECTION 463183 - GAS CHEMICAL FEED ACCESSORIES AND SAFETY 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 basic materials and equipment for gas chemical feed equipment, and is segregated from other such equipment Sections to permit rapid editing and to eliminate necessity of repeating text within other liquid chemical feed equipment Sections.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Control panels.

Personal protective equipment.

Emergency showers.

Emergency eye and face washers.

Emergency combination showers with eye and face washers.

Equipment supports.

Warning signs.

Self-contained breathing apparatus.

Tripod and winch.

Full-body harness and lanyard.

* + - * 1. 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 033000 - Cast-in-Place Concrete: Equipment foundation pads.

Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Wire and cable rated 600 V and less.

Section 260553 - Identification for Electrical Systems: Identification of control panel, wiring, terminations, and other components.

Section 400507 - Hangers and Supports for Process Piping: Piping supports, anchors, and guides.

Section 400593 - Common Motor Requirements for Process Equipment: Requirements for motors as required under this Section.

Section 404213 - Process Piping Insulation: Piping insulation.

Section 404223 - Process Equipment Insulation: Equipment insulation.

* + - 1. REFERENCE STANDARDS

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

* + - * 1. American National Standards Institute:

ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment.

ANSI Z359.1 - American National Standard Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.

ANSI Z359.14 - Self-Retracting Devices for Personal Fall Arrest and Rescue Systems.

ANSI Z87.1 - American National Standard for Occupational and Educational Personal Eye and Face Protection Devices.

* + - * 1. ASME International:

ASME B46.1 - Surface Texture (Surface Roughness, Waviness, and Lay).

* + - * 1. National Electrical Manufacturers Association:

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

* + - * 1. UL:

UL 508 - Industrial Control Equipment.

* + - 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. Section 013300 – Submittals: Requirements for submittals
        5. Product Data:

Submit manufacturer information for drive assemblies, pumps, tanks, mixers, panels, and other system components.

Submit schematics, diagrams, panel layouts, ladder diagrams, and sequence of operation.

* + - * 1. Shop Drawings:

Indicate assembly, foundation, and installation with location.

Indicate critical dimensions, sizes, and support locations.

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

Include separate Paragraphs for additional certifications.

* + - * 1. Manufacturer Instructions: Submit special procedures and assembly of components.
        2. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
        3. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        4. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.
        5. Qualifications Statements:

Coordinate following Subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer and installer.

Submit manufacturer's approval of installer.

* + - 1. MAINTENANCE MATERIAL SUBMITTALS
         1. Extra Stock Materials:

Furnish [**10**] <**\_\_\_\_\_\_\_\_**> respirator [**filters**] [**cartridges**] for vapors, dusts, fumes, and mists that are likely to be present.

Furnish 30-minute, fully pressurized air cylinder with self-contained breathing apparatus.

Furnish [**10**] <**\_\_\_\_\_\_\_\_**> gas mask canisters.

* + - * 1. Tools: Furnish special [**wrenches**] <**\_\_\_\_\_\_\_\_**> and other devices required for Director’s representative to maintain <**\_\_\_\_\_\_\_\_**>.
      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 Owner enforcement responsibilities. Specify warranties with caution.

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

1. PRODUCTS
   * + 1. PERFORMANCE AND DESIGN CRITERIA
          1. Corrosion Resistance: Furnish materials resistant to corrosive attacks from process chemicals being handled.
       2. CONTROL PANELS
          1. Control Panel Enclosure:

Furnish NEMA 250 Type <**\_\_\_\_\_\_\_\_**> enclosure fabricated of [**10**] <**\_\_\_\_\_\_\_\_**>-gage steel with continuously welded seams.

Following Subparagraph applies to enclosures rated NEMA 250 Type 3 and above.

Enclosure door gasketed with neoprene.

Heavy-duty, three-point latching mechanism.

Identify control panel components with engraved nameplate mounted on inside of panel, as specified in Section 260553 - Identification for Electrical Systems.

Mount components that are not mounted on front of panel on removable back panel secured to enclosure with collar studs.

Group, bundle, support, and route horizontally and vertically.

Terminate wires leaving panel at terminal strips inside enclosure.

Identify terminals and wires according to panel wiring diagrams, as specified in Section 260553 - Identification for Electrical Systems.

Furnish copper grounding plate inside control panel for terminating ground wires.

* + - * 1. Transient Voltage Surge Suppressor:

Furnish three-phase transient voltage surge suppressor in control panel to protect panel components from potential damage from transient voltages caused by lightning or surges on incoming power line.

Furnish indication light to indicate unit is functioning.

* + - * 1. Three-Phase Monitor:

Furnish three-phase monitor in control panel to monitor incoming power and sense loss of any one of three phases.

Inhibit equipment operation if phase loss occurs.

Mounting: Surface.

* + - * 1. Motor-Circuit-Protector-Type Circuit Breakers:

Furnish molded-case circuit breaker for each starter.

Type: Quick make, quick break.

Mounting: Individual.

Minimum Interrupting Capacity:

At 240 V: 22,000 A, rms symmetrical.

At 480 V: 40,000 A, rms symmetrical.

* + - * 1. Motor Starters:

Type: Across-the-line magnetic.

Rating: According to NEMA standards, sizes, and horsepower ratings.

Size: According to equipment motor horsepower.

Relays:

Type: Three-pole overload.

Furnish heater element in each phase of relay, sized for motor nameplate full-load amperage.

Furnish overload reset button for each motor starter.

* + - * 1. Control Transformer:

Description: 120-V control transformer to provide 120-V ac control power.

Size: As required to power connected devices.

Protection: Primary and secondary fusing.

* + - * 1. Circuit Breakers:

Type: Quick make, quick break with thermal-magnetic molded case.

Description: Individually mounted and identified.

Furnish individual circuit breakers for each of following:

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

* + - * 1. Selector Switches: NEMA 250 Type 4X, 30.5-mm, heavy-duty, non-illuminated, maintained-contact type, with double-break silver contacts.
        2. Push Buttons: NEMA 250 Type <**\_\_\_\_\_\_\_\_**>, heavy-duty, non-illuminated, momentary-contact type, with double-break silver contacts.
        3. Pilot Lights:

NEMA 250 Type <**\_\_\_\_\_\_\_\_**>.

Type: Heavy duty, transformer.

Rating: 120-V ac.

Color Caps: Green for RUN and red for ALARM.

Energization:

Furnish RUN pilot light for each energizeable component.

Energize each light through auxiliary contact on motor starter.

Furnish MOTOR HIGH TEMPERATURE alarm pilot light for each motor.

* + - * 1. Legend Plates for Pilot Devices:

Description: 2-1/4-inch square plastic legend plate for each selector switch, push button, and pilot light.

Colors: Gray with white lettering.

* + - * 1. Relays:

Heavy-duty, general-purpose type, with 10-A contacts.

Terminals: Blade type that plug into socket.

DIN Rail: Mount to inside of panel enclosure.

Contact Configuration: As required for proper operation of control logic.

Operating Power: 120-V ac unless otherwise indicated.

Furnish indicator light to indicate that relay coil is energized.

* + - * 1. Terminal Blocks:

NEMA 250 Type <**\_\_\_\_\_\_\_\_**>, rated for 600-V ac.

Identification: Permanent machine-printed marking according to terminal numbers indicated on panel wiring diagrams.

Furnish 20 percent spare terminal blocks in control panel.

* + - * 1. Wiring:

Furnish control panel completely wired by manufacturer.

Comply with UL 508.

Isolate wiring and terminal blocks by voltage levels to greatest extent possible.

Stranded copper, Type MTW or THHN/THWN, 600 V, and color-coded as follows:

Line and Load Circuits, AC Power: Black.

AC Control Circuit Less Than Line Voltage: Red.

DC Control Circuit: Blue.

Interlock Control Circuits from External Source: Yellow.

Equipment Grounding Conductor: Green.

Current-Carrying Ground: White.

Minimum Control Wiring: No. 16 AWG, copper.

Tagging:

Tag control wiring at both ends in control panel with legible permanent-coded wire-marking sleeve.

Mark with white PVC tubing sleeves with machine-printed black marking.

Mark according to wire numbers as indicated on control wiring diagrams and terminal strip numbers.

* + - * 1. Nameplates:

Furnish laminated phenolic nameplates on front of control panel.

Colors: White with black engraved letters.

Minimum Engraving Size: 1/4 inch

* + - 1. MOTORS
         1. As specified in Section 400593 - Common Motor Requirements for Process Equipment.
      2. PIPING CONNECTIONS
         1. Provide supports, anchors, and guides <**\_\_\_\_\_\_\_\_**> as specified in Section 400507 - Hangers and Supports for Process Piping.
         2. Flexible Connections:

Provide flexible connectors in piping connections to vibrating equipment.

Harness or anchor flexible connectors as necessary.

* + - 1. SAFETY EQUIPMENT
         1. As required by <**\_\_\_\_\_\_\_\_**> code.

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

* + - * 1. Personal Protective Equipment:

Gloves:

Type: [**As recommended by manufacturer of chemical being handled**] [**According to Material Safety Data Sheet**] <**\_\_\_\_\_\_\_\_**>.

Furnish leather or metal mesh gloves for personnel handling glass products or materials that may cause a cut.

Cryogenic materials: Furnish tight-fitting, insulated [**leather**] gloves.

Disposable Gloves for Handling Small Quantities of Chemicals: Non-reusable type, made of [**latex rubber**] [**, nitrile rubber**] [**, PVC**] [**, or**] [**neoprene**].

Safety Glasses:

Comply with ANSI Z87.1.

Furnish side shields.

Safety Goggles:

Comply with ANSI Z87.1.

Frames: Soft vinyl material, conforming to every size face, and able to fit over prescription glasses.

Lens: Coated polycarbonate material to resist fogging, scratching, and damage from dust and UV rays.

Furnish heavy-duty carrying case.

Respirators:

Type: Full face.

Description: Soft silicone face piece with wraparound polycarbonate lens with minimum 200-degree field of vision.

Lens: Impact resistant and complying with ANSI Z87.1.

Furnish multi-strap head harness, nose cup, and speaking diaphragm.

Furnish [**filter**] [**cartridge**] suitable for vapors, dusts, fumes, and mists that are likely to be present.

Furnished storage cabinet with adjustable shelves for storing respirator, cartridges, filters, and accessories.

Disposable Particulate Respirators:

Description: Lightweight, moisture-resistant filter media with adjustable nose piece and foam seal conforming to facial contours.

Furnish manufacturer's standard package of multiple quantities of disposable respirators.

Gas Masks:

Description: Distortion-free face piece, adjustable universal harness, and crush-proof breathing tube, all contained within a water-resistant equipment pouch.

Canisters:

Furnish [**two**] <**\_\_\_\_\_\_\_\_**> canisters in a hard-shell case.

Capable of filtering hydrogen sulfide, chlorine, phosphine, organic vapor, dust, and mists.

Equipment Cabinets:

Adequate for storage of personal protective equipment, as indicated on Drawings, and clearly labeled as [**SAFETY EQUIPMENT**] <**\_\_\_\_\_\_\_\_**>.

Number and Locations: As [**directed by Director’s Representative**] [**indicated**].

* + - * 1. Warning Signs:

Text: As [**indicated on Drawings**] [**required by <\_\_\_\_\_\_\_\_> code**].

* + - * 1. Emergency Showers:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8088&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.

Comply with ANSI Z358.1.

Shower Head:

Description: Self-cleaning and non-clogging.

Type: [**Drench**] [**Deluge**].

Mounting: [**Wall**] [**Freestanding**].

Material: [**Stainless steel**] [**Copper alloy**] [**Plastic**].

Diameter: 8 inches

Furnish elbow, [**1**] [**1-1/4**]-inch [**galvanized-steel**] [**stainless-steel**] [**PVC**] pipe pedestal with floor flange, and instant-action stay-open valve actuated by rigid stainless-steel pull rod.

Furnish emergency signage as [**recommended by manufacturer**] [**indicated on Drawings**] [**required by <\_\_\_\_\_\_\_\_> code**].

Finish: Corrosion-resistant coating.

* + - * 1. Emergency Eye and Face Washers:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8089&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.

Comply with ANSI Z358.1.

Mounting: [**Wall**] [**Pedestal**].

Bowl: [**Plastic**] [**Stainless steel**], with elbow.

Pedestal:

Material: [**Galvanized**] [**Stainless**]-steel pipe.

Diameter: [**1 inch**] [**1-1/4 inches**]

Furnish floor flange of same material as pedestal.

Valve:

Type: Instant action, stay open.

Actuation: [**Push flag**] [**or**] [**foot pedal**].

Furnish twin spray heads [**with face spray ring**] [**, dust cover assembly**] [**, wall-mount bracket,**] tailpiece, and chrome-plated brass P-trap.

Furnish emergency signage as [**recommended by manufacturer**] [**indicated on Drawings**] [**required by <\_\_\_\_\_\_\_\_> code**].

Finish: Corrosion-resistant coating.

* + - * 1. Emergency Combination Showers with Eye and Face Washers:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8090&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.

Shower:

Comply with ANSI Z358.1.

Mounting: Freestanding.

Description: Self-cleaning and non-clogging.

Shower Head:

Type: [**Drench**] [**Deluge**].

Material: [**Stainless steel**] [**Copper alloy**] [**Plastic**].

Diameter: 8 inches

Furnish instant-action stay-open valve actuated by rigid stainless-steel pull rod.

Eyewash:

Comply with ANSI Z358.1.

Bowl: [**Plastic**] [**Stainless steel**], with elbow.

Pedestal:

Material: [**Galvanized**] [**Stainless**]-steel pipe.

Diameter: [**1 inch**] [**1-1/4 inches**]

Furnish floor flange of same material as pedestal.

Valve:

Type: Instant action, stay open.

Actuation: [**Push flag**] [**or**] [**foot pedal**].

Furnish twin spray heads [**with face spray ring**] [**, dust cover assembly**] [**, wall-mount bracket,**] tailpiece, and chrome-plated brass P-trap.

Furnish emergency signage as [**recommended by manufacturer**] [**indicated on Drawings**] [**required by <\_\_\_\_\_\_\_\_> code**].

Finish: Corrosion-resistant coating.

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

[Manufacturers](http://www.specagent.com/LookUp/?ulid=12707&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 <**\_\_\_\_\_\_\_\_**> gas atmosphere.

Full face mask.

Speaking diaphragm to project user's voice through mask.

High-pressure air cylinder containing 30-minute air supply, mounted on a formed carrier provided with nylon harness.

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.

Carrying Case:

Type: Heavy duty.

Furnish brackets for wall mounting.

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

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. Tripod and Winch:

Tripod:

Description: Capable of spanning openings up to [**78**] <**\_\_\_\_\_\_\_\_**> inches in diameter.

Material: [**Aluminum**] <**\_\_\_\_\_\_\_\_**>.

Height: [**7**] <**\_\_\_\_\_\_\_\_**> feet

Working Load: [**350**] <**\_\_\_\_\_\_\_\_**> lbf

Winch: Geared winch capable of lowering, raising, and self-retracting lifeline cable, with independent braking system and overload clutch.

Cable:

Material: Stainless steel.

Size: 1/4 inch

Length: [**60**] <**\_\_\_\_\_\_\_\_**> feet

Carrying Bags: Furnish separate carrying bags for tripod and winch.

* + - * 1. Full-Body Harness and Lanyard:

Description: Type I full-body harnesses, including back and shoulder D-rings, chest and shoulder straps, and adjustable buckles for sub-pelvic support.

Comply with ANSI [**Z359.1**] and [**Z359.14**].

Lanyard:

Length: Stretchable from [**4 to 6**] [**<\_\_\_\_\_\_\_\_> to <\_\_\_\_\_\_\_\_>**] feet

End Connections: Double-locking snaps.

Furnish carrying bag for full-body harness and lanyard.

* + - 1. EQUIPMENT SUPPORTS
         1. Support and anchor chemical feed equipment and piping on concrete pads as specified in Section 033000 - Cast-in-Place Concrete.
         2. Fabricated Metal Supports Exposed to Chemical Spillage:

Type 316 stainless steel or enameled steel.

Anchor Bolts, Nuts, and Washers: Type 316 stainless steel.

* + - 1. INSULATION
         1. Piping Insulation: As specified in Section 404213 - Process Piping Insulation.
         2. Equipment Insulation: As specified in Section 404223 - Process Equipment Insulation.
      2. FINISHES
         1. Machine Finish: Comply with ASME B46.1.
      3. SOURCE QUALITY CONTROL
         1. Control Panel:

Perform factory test of completed control panel by demonstrating operation of control functions, and provide certified test results.

Factory assemble and test each control and alarm function.

Test sequence of operation.

Include one or both of following Paragraphs to require Director’s inspection or witnessing of test at factory.

* + - * 1. Director’s Inspection:

Make completed control panel available for inspection at manufacturer's factory prior to packaging for shipment.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.

* + - * 1. Director’s Witnessing:

Allow witnessing of factory inspections and test at manufacturer's test facility.

Notify Director’s representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following Paragraph if reliance on manufacturer's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance:

If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved manufacturer.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify that designated areas, clearances, structural requirements, piping, utility connections, and electronic signals are ready to receive equipment.
       2. PREPARATION
          1. Disconnect electrical systems scheduled for removal.
          2. Provide temporary wiring and connections to maintain existing systems in service during construction.
          3. Remove, relocate, and extend existing installations as necessary to accommodate new construction.
       3. INSTALLATION
          1. According to manufacturer instructions.
          2. Equipment Bases and Supports:

Material: Concrete, as [**specified in Section 033000 - Cast-in-Place Concrete**] [**indicated on Drawings**].

Minimum Thickness: 3-1/2 inches

Length and Width: [**Extending 6 inches beyond supported equipment**] [**As indicated on Drawings**].

Anchor Bolts and Accessories: Use templates furnished with equipment.

Supports:

Material: [**Steel members**] [**Formed steel channel**] [**Steel pipe and fittings**] <**\_\_\_\_\_\_\_\_**>.

Brace and fasten with flanges bolted to equipment structure.

* + - * 1. Install insulation as indicated on [**Shop**] Drawings and as specified in Section 404213 - Process Piping Insulation and Section 404223 - Process Equipment Insulation.
      1. FIELD QUALITY CONTROL
         1. Inspect for proper alignment.
         2. Testing:

Demonstrate operation without undue noise, vibration, or overheating.

[**Director’s Representative**] <**\_\_\_\_\_\_\_\_**> will witness field testing.

Control Systems:

Start control system by energizing equipment and test operation of hardware and process control logic under supervision of manufacturer's representative and in presence of [**Director’s Representative**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <**\_\_\_\_\_\_\_\_**> [**days**] [**hours**] on Site for installation, inspection, startup, field testing, and instructing Director’s Representative in operation and maintenance of equipment.
        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.

* + - * 1. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
      1. DEMONSTRATION
         1. Demonstrate equipment startup, shutdown, routine maintenance, alarm condition responses, and emergency repair procedures to Director’s Representative.

END OF SECTION 463183