Gas Feed Installation Guide

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Installation Considerations for Gas Feed Systems
Before designing or installing a new system, consider the following points for optimal gas feed system installation.

NOTICE: Failure to follow these guidelines may void warranty and reduce the life of the equipment. Compliance with local codes and regulations must also be assured. The information given here is basic in nature. For additional installation and equipment details, refer to the appropriate instruction manual and The Chlorine Basics pamphlet by the Chlorine Institute. Complimentary pamphlets are available at www.chlorineinstitute.org.

I.) Safety Equipment
Provide or have available some or all of the following at each installation:
1. Emergency gas cylinder or ton container repair kits
2. SCBA and/or filter type gas mask
3. Eye wash station
4. Gas leak detector
5. Scrubber systems for larger installations

II.) Chemical Storage Considerations
1. Store gas containers in separate or divided rooms (e.g. store chlorine separately from sulfur dioxide).
2. Store chlorine containers separately from flammable materials.
3. Shield chlorine containers from external heat sources.
4. Ensure that the protective hoods are secure on unused chlorine containers.
5. Ensure that small chlorine cylinders are secured to the wall.
6. In earthquake prone regions, chlorine containers can be strapped to the floor as a preventative measure.
7. Place chlorine containers in a way that provides easy access for changing chlorine containers and operating equipment.
8. All chlorine containers in use must be mounted at the same elevation relative to each other.
9. Refer to the manufacturer's instruction manual for proper installation of chlorine container scales. Improper installation of hydraulic scale lines will affect calibration and may require factory service
10. High temperature alarms should be used in installations where run away air heating systems could cause air temperature to exceed the 70 C (158 F) melting temperature of fusible plugs to avoid chemical release under such conditions.

III.) Gas and Liquid Pressure Manifold Piping: This refers to any pressurized chemical piping between the chlorine container(s) and vacuum regulator(s).

III.A.) General Pressure Manifold Piping Considerations:

1. All piping must be selected, cleaned and installed in accordance with Chlorine Institute Pamphlet #6, "Piping Systems For Dry Chlorine".
2. See also, Hydro Instruments technical documents related to pressure manifold piping considerations. Literature exists for both gas and liquid chemical manifolds.
3. Pressure lines should be seamless carbon steel, Grade B, Schedule 80, Type S, ASTM A-106.
4. Heat tracing of long runs of gas pressure piping that is subject to low temperatures is advised. (Never install any heater on liquid chlorine piping.)
5. Drip legs, filters, unions and gaskets must be used and installed strictly according to manufacturer and Chlorine Institute, Inc. instructions.
6. Color changing paint for chlorine gas can be used and will give good, visual indication of a gas leak.

III.B.) Cleaning, Drying and Pressure Testing Pipe, Valves and Fittings

1. All pipe, valves, and fittings must be thoroughly cleaned of all oils and foreign matter (grease, threading chips, dirt, etc.) prior to assembly. Failure to properly clean may result in undesirable chemical reactions and non-warrantable equipment failure. Steam is the suggested method of cleaning metal pipes. Avoid steam contact with non-metallic components. Low areas (drip legs) should be opened to drain condensate. The use of dry (-40°F dew point) air or nitrogen to pressure test all piping and components is recommended. Dry until air being discharged has a dew point of -40°F. After drying, all piping must be protected to prevent moisture from entering the system.
2. Consult The Chlorine Institute Chlorine Basic Pamphlet for further instructions and Chlorine Institute Pamphlet #9, "Chlorine Vaporizing Systems".

III.C.) Thread Sealing

1. Teflon tape or a mixture of litharge and glycerin may be used on carbon steel pipe. IMPORTANT: A litharge and glycerin joint cures forming a permanent joint. These joints cannot be taken apart once set.
2. Teflon pastes certified for liquefied gas and gaseous service for the chosen gas may be used.

III.D.) Paint

1. Paint piping only. If you intend to paint any metallic components then consult factory first.
2. Painting equipment components may damage and interfere with proper operation and identification.
3. Paint fumes have been known to damage gas leak detector sensors. Be sure to seal or remove gas leak detector sensors during painting to avoid fumes reaching and damaging the sensors.

III.E.) Model VPH-10000-1 and VPH-10000-2 Vaporizers

1. The vaporizer should be located as close to the chemical source as possible.
2. Pressurized chemical liquid and gas lines should be kept to a minimum.
3. A 10 ft. (3.3 m) clearance from the vaporizer base is necessary to allow the chamber to be removed for cleaning.
4. Use potable water only to fill the vaporizer water bath.
5. Refer to the vaporizer instruction manual for further details.

III.F.) Series PRV-71H Pressure Reducing Valve

1. Locate the electronic pressure reducing valve as close as possible to the gas discharge of the vaporizer to prevent liquefaction.
2. Each electronic pressure reducing valve must be connected to one dedicated vaporizer and wired accordingly.
3. Pressure reducing valves can also be used for gas withdrawal manifolds without evaporators.
4. An external heater is included from Hydro Instruments to avoid external condensation and resultant corrosion on the pressure reducing valve body.
5. Vent piping should be seamless carbon steel, Grade B, Schedule 80, Type S, ASTM A-106 for vent lines from all components handling gas under pressure. Terminate vents outdoors in an area that can tolerate gas discharge or at the scrubber intake if desired. Position piping so it will not collect foreign matter or water. A mesh screen over the discharge end of the vent line is recommended to prevent clogging.

NEVER MANIFOLD VENT LINES. Separate vent lines from each component are recommended to assure safe operation.

6. Refer to the pressure reducing valve instruction manual for further details.

III.G.) Series NRDPRV Pressure Relief Valve for vaporizer

1. Locate the pressure relief valve at the gas discharge of the vaporizer with no valves that could isolate this assembly from the vaporizer.
2. Vent piping should be seamless carbon steel, Grade B, Schedule 80, Type S, ASTM A-106 for vent lines from all components handling gas under pressure. Terminate vents outdoors in an area that can tolerate gas discharge or at the scrubber intake if desired. Position piping so it will not collect foreign matter or water. A mesh screen over the discharge end of the vent line is recommended to prevent clogging.

NEVER MANIFOLD VENT LINES. Separate vent lines from each component are recommended to assure safe operation.

3. Refer to the vaporizer instruction manual for further details.

IV.) Vacuum Regulators: Between the chlorine containers and the vacuum regulators the chemical is under pressure. The chemical leaves the vacuum regulator under vacuum up until it mixes with the water inside the ejector.

IV.A) Direct Ton Container Mounted Vacuum Regulators

1. Ensure that container valves are vertically aligned and the ton mounted vacuum regulator is mounted on the top (gas) valve.
2. Use a drip leg heater and plug it in 15 minutes before initially opening the chlorine gas container valve.
3. Ton containers should be allowed to sit for 1 hour after being put into place before opening container valve for use.

IV.B) Wall/Manifold Mounted Vacuum Regulator Installation

1. Ensure that the gas manifold is installed such that the vacuum regulator will be elevated higher than the top of all containers. Failure to do so could result in liquefaction and non-warranty damage to the vacuum regulator caused by liquid chemical.
2. Drip legs with heaters must be installed in gas section of the manifolds to prevent liquefaction or liquid from ton containers entering and damaging the vacuum regulators.

IV.C) Vent Lines for Vacuum Regulators

1. Vacuum Regulator vent piping should be made of polyethylene tubing, PVC pipe, Schedule 80, or similar materials suitable for use with moist gas service.
2. It is recommended that vent lines be installed such that they flow downhill only from the vacuum regulator to avoid collecting in the lines. (chlorine is heavier than air)
3. The termination point must be open, pointing downward and covered with a fine mesh screening.
4. If an outdoor location or scrubber is not available, each vent line can be connected to a Hydro Instruments VA-100 Vent Arrestor on each vacuum regulator unit.
5. NEVER MANIFOLD VENT LINES. Separate vent lines from each component are recommended to assure safe operation.

V.) Gas Vacuum Piping (Chlorine, Sulfur Dioxide, Ammonia)

1. Vacuum lines should be polyethylene tubing, PVC pipe, Schedule 80, or similar materials resistant to moist gas.
2. Coat all threads on PVC pipe and fittings with Teflon (PTFE) tape. Teflon pastes certified for liquefied gas and gaseous service for the chosen gas may be used.
3. Routing tubing through unventilated conduit is discouraged. A minute portion of gas flowing through tubing will slowly diffuse at the molecular level through its walls and collect in the closed conduit over an extended period of time.
4. Vacuum connections must not be over-tightened (hand tight only) to prevent cracking of plastic components.
5. When painting of the plastic piping is desired, make sure that the paint is compatible with the pipe material.
6. Paint fumes have been known to damage gas leak detector sensors. Be sure to seal or remove gas leak detector sensors during painting to avoid fumes reaching and damaging the sensors.
7. See Hydro Instruments instruction manuals for torque specifications. See Hydro Instruments vacuum tubing and piping sizing guide for sizing guidance. (based on feed rate and length)
8. Color changing paint for chlorine gas can be used if painting is desired and will give good, visual indication of a pressurized gas leak in the vacuum line.

VI.) Ejector and Hydraulic Considerations

1. Hydraulic conditions are unique to every installation and must be evaluated for each installation before booster pumps, ejectors, or related piping is installed. Failure to do so often results in failure of the ejector to create vacuum.
2. In every installation, it should be evaluated as to whether there is any possibility of there being a siphon effect (when the ejector is not operating). In cases where the ejector is installed at an elevation higher than the injection point (usually if the injection point is not pressurized) then it may be possible that a siphon could occur (and cause unintended feeding of chlorine gas during times of no feed). If such a situation is deemed possible then take steps to avoid such siphoning (anti-siphon ejectors, siphon breaker, gas solenoid).

2. Consult Hydro Instruments ejector performance curves and "Ejector and Booster Pump Guide" document to evaluate pressure and flow requirements before selecting booster pump (or other sufficient pressurized water supply source).
3. Installing the ejector as close to the injection point as possible will both reduce ejector back pressure and reduce the pressurized solution line length. It is often better to run the gas vacuum piping the long distance rather than the solution piping.

4. Upon installation of each ejector, there may be PVC shavings or other debris inside the ejector water/solution piping that could get stuck in the ejector check valves. It is highly recommended to thoroughly flush these ejector pipe lines. Also before the ejectors are connected to any other equipment by vacuum piping or tubing, they should first be tested with air and water only to confirm suction and also confirm that the ejector check valves are sealing and will not allow water to back up into the vacuum piping/tubing.

VII.) Chemical Solution Piping (between ejector and injection point)

1. Chemical solution piping is generally under pressure and contains pockets of gas in highly concentrated and corrosive solution. It is critical to use appropriate materials, reduce the length of such pipes, and protect this piping from damage.
2. Typically such piping should be schedule 80 PVC pipe and fittings, but carefully consult pressure and temperature ratings for each site.
3. Any gauges or switches installed in this piping must include suitable diaphragm protection or else the chemical will corrode through and cause a pressurized leak.
4. This piping should be kept out of direct sunlight and protected from physical damage.
5. Do not directly pour such pipes in concrete, but rather run in trenches with grate covers (or elevate under a protective cover from the elements).
6. Such piping should use appropriate socket welding (not threaded joints).

VIII.) Residual Analyzer

1. Locate the analyzer as close as possible to the sample point to reduce lag time and improve control. Before selecting location and sample piping diameter, calculate the sample water transit time.
2. Try to keep total lag time less than 5 minutes (the shorter the better). Longer than 10 minutes will often not result in good process control results.
3. The sampling location must be at a point where good mixing provides a representative sample for the analyzer.
   NOTE: If other chemicals (e.g. corrosion inhibitors) are being injected into the process line that can interfere with residual measurement and/or the measurement instrumentation it is good practice to install the analyzers sample water point upstream of the other chemical injection points.
4. DO NOT operate the analyzer without maintaining a constant sample or damage to the analyzer's internal components may occur.
5. A/C power supply to the residual analyzer must be properly grounded. Otherwise, this could cause the analyzer readings to oscillate due to ground loop interference.