



## **Key Considerations for Installing Centrifugal Air Compressors**

*By Compressed Air & Gas Institute*

The installation of any type of air compressor requires proper planning as well as adherence to the manufacturer's recommended guidelines. Centrifugal air compressors are no different in that care must be taken during the installation process to ensure reliable, safe operation, and ease of maintenance. The manufacturer should always be consulted for specifics concerning the location and the application of the system. Proper planning and prep work will ensure a safe and efficient installation for maximum return on investment.

### **Planning a Centrifugal Air Compressor Installation**

Before arrival of the new compressor, the end user or customer should convene a pre-installation meeting with the user site managers, site maintenance staff, the compressor manufacturer's technical representative(s), and the contractors responsible for installation. Most compressor manufacturers have an installation checklist that can be — and should be — reviewed during the meeting. The goals of the meeting should include:

1. Clearly define scope of work, roles and responsibilities.
2. Identify any ship loose items and accessories that may require installation.
3. Review the manufacturer's installation instructions.
4. Discuss site safety requirements, and address any questions or concerns.
5. Outline the timetable for completion.

### **Location of the Centrifugal Air Compressor**

Choosing the right location is very important. While we would like to simply tuck the compressor in a corner and forget about it, the reality is proper location selection can assure the user of receiving maximum value from their system over its economic life. Obviously the location should be able to physically accommodate the compressor installation, but there are some other points to consider:

- Can the compressor be safely and efficiently maneuvered into place?
- Is there adequate room between other pieces of equipment?
- Are the required utilities (i.e. electricity and water) available nearby?

We recommend referring to the manufacturer's supplied drawings and rigging instructions prior to handling the compressor.

### **Inspection and Maintenance of a Centrifugal Air Compressor**



All compressors will require periodic inspection and maintenance. Adequate space needs to be provided for both routine maintenance and periodic overhauls. If permanent rigging is not in place, the location should allow for temporary rigging (such as forklift access) as required to perform maintenance.

Some of the components are heavy and awkward, and planning at the installation phase will ensure that compressors can be efficiently and safely serviced.

While centrifugal compressors do not require special foundations, a level surface capable of supporting the weight is a must. The foundation should be free of any external sources of vibration created by nearby equipment. Many customers prefer to grout the compressor baseplate to ensure a level surface, although this is not always a requirement.

### **Major Considerations for Inlet Air**

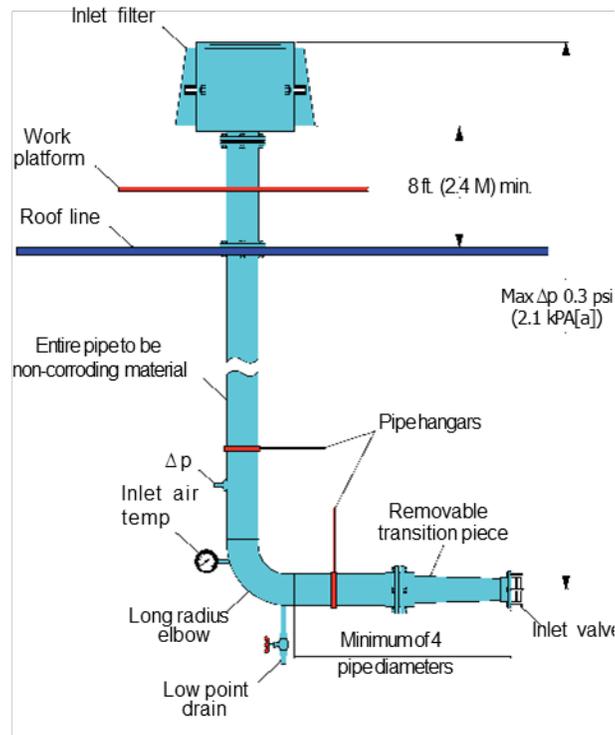
The ambient environment can adversely impact a compressor system's reliability, and centrifugal compressor systems are not an exception. We always suggest avoiding damp, dusty, or corrosive environments. If there is concern about a corrosive ambient, discuss options with the compressor sales engineer.

Solutions could include special filtration and/or alternative component materials of construction. A compressor sales engineer can also assist the user to ensure that adequate ventilation and ambient temperature in the room are controlled for optimum system performance.

**Inlet Air Piping:** once the location is determined and finalized, it is time to consider connection points. As mentioned, the quality of inlet air is important. Whether the inlet air source is within the compressor room or taken from outside, review the air quality to prevent potential problems. If air is coming from outside, look for warning signs, such as nearby cooling towers or exhaust vents. If the inlet air is taken from within the compressor room, confirm there is adequate make-up air coming into the room.

Inlet piping should be nonferrous material and contain a spool piece near the compressor inlet to facilitate inspection and maintenance. The inlet pipe must be sized to minimize pressure drop. The inlet pipe should be properly supported and not rely on the compressor for support.

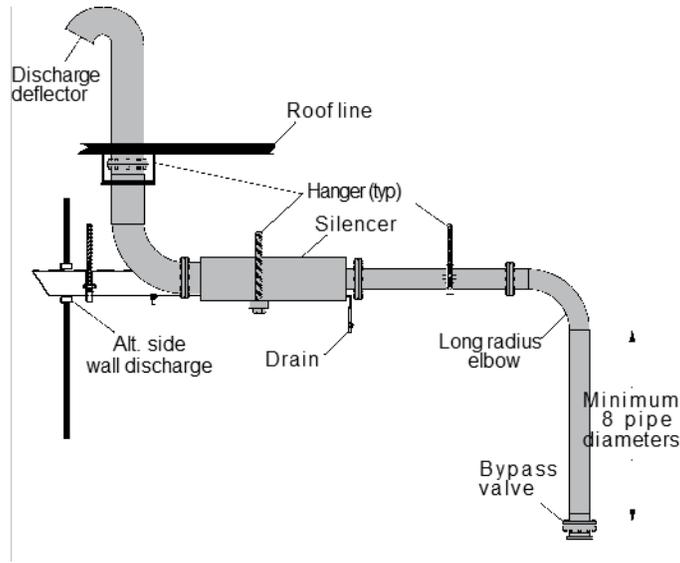
Loose material, such as welding slag, can damage the compressor if ingested, and the inlet pipe should be inspected prior to start-up to ensure cleanliness. Refer to Figure 1 to see an example of properly installed inlet piping.



**Figure 1** – Properly installed inlet piping and inlet filtration are essential for optimal centrifugal operation.

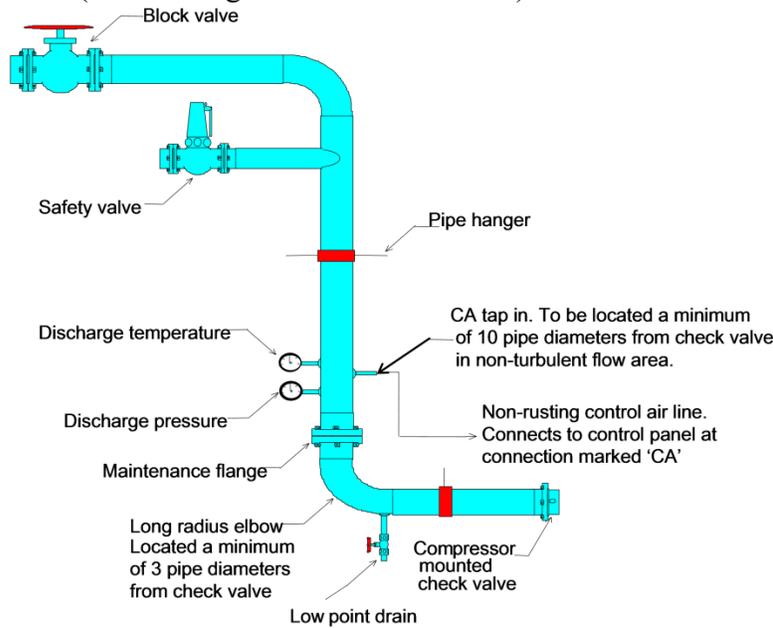
## Designing Ventilation for Centrifugal Air Compressors

**Bypass Piping:** Most centrifugal compressors have a shipped loose bypass silencer. The silencer can be installed indoors or outdoors. Typically the bypass line is vented outdoors. If vented outside, a rain hood and screen are needed to prevent water and small animals or birds from entering the line. In some cases, the bypass air can be hot. Therefore, proper consideration should be given to the outlet location (See Figure 2 for details).



**Figure 2** – Bypass lines require special attention when routed outside, particularly when the bypass air is hot.

**Discharge Piping:** The discharge piping has to be rated according to the expected compressor pressure and temperature. Any elbows should be at least 3 pipe diameters downstream of the outlet and should be long radius type. In similar fashion to the inlet pipe, install a spool piece, and do not rely on the compressor for support. If a check valve was not supplied with the compressor, one should be installed in the discharge pipe. Make sure a properly sized safety relief valve is positioned before the required block valve (Refer to Figure 3 for more details).



**Figure 3** – Be sure to install a properly sized safety valve before the block valve for centrifugal compressor discharge piping.



**Water:** Water quality is equally as important as air quality. Consult with the compressor representative regarding water quality and quantity requirements. Installation of inlet and outlet pressure and temperature gauges is usually recommended. Throttle valves on the outlet will help control water flow. A block valve on the inlet is needed to isolate the compressor for service.

As with any compressor, condensate is expelled from the unit. Condensate traps will either be shipped loose for field installation or factory mounted on the compressor. The condensed water should be piped to a drain location and designed to facilitate reliable operation. Local regulations concerning handling of condensate should be followed.

**Electrical:** The design and installation of electrical systems should be performed by qualified personnel and must meet all applicable electrical codes. The majority of compressors require a single electrical input, but some require a separate source of control voltage. Review the electrical schematics to determine any additional control or wiring requirements.

Some compressors utilize an external source of instrument quality air for valves and seals. When applicable, follow all of a manufacturer's recommendations for instrument air.

This document only highlights the main aspects of installing a typical centrifugal compressor. We recommend users always thoroughly review and adhere to the manufacturer's instructions to result in a safe and successful installation.

CAGI's Centrifugal Compressor Section members include Atlas Copco, FS-Elliott, Hanwha Power Systems, Ingersoll Rand, and Sullair Corporation. They each have trained engineers to assist and guide users through selecting the appropriately sized compressor for their operation. A compressor system assessment is recommended when upgrading and/or replacing existing systems to assure that system performance is maximized.

The Compressed Air and Gas Institute (CAGI) is the united voice of the compressed air industry, serving as the unbiased authority on technical, educational, promotional, and other matters that affect compressed air and gas equipment suppliers and their customers. CAGI educational resources include e-learning coursework, selection guides, videos, and the *Compressed Air & Gas Handbook*.

For more information, visit the CAGI web site at [www.cagi.org](http://www.cagi.org) or on [LinkedIn](#).

Refreshed August 2023