

Nine steps to successful steam humidifier installation.

Following the guidelines listed here for installing a steam humidification system will help save time and ensure proper system operation.

By Joe Haag and Lynne Wasner

Because of ever-increasing technological advancements and greater concern about indoor air quality (IAQ), the demand for proper humidification in businesses grows each year—requiring more engineers and contractors who can properly design and install humidification systems.

Although there are many humidification methods, steam humidifiers represent the largest portion of humidification equipment being installed in commercial and industrial applications. For that reason, in this article we will focus on the installation of nonresidential steam humidifiers.

There are two basic types of steam humidifiers: boiler-steam humidifiers and self-generating humidifiers. Boiler-steam humidifiers (see Figure 1) discharge steam, created by an in-house boiler, into a ducted airstream or into spaces that don't have duct work. They consist of a small water-steam separator, a control valve, a steam trap, a strainer, and a dispersion tube.

The dispersion tube, or disperser, has steam discharge holes along its length, and should span the full width of the duct. This tube is surrounded by a jacket of steam at supply pressure, keeping the inner dispersion tube hot to prevent humidification steam from condensing and dripping.

Self-generating humidifiers (see Figure 2) create their own steam by boiling water in an evaporating chamber. The steam is then discharged into a ducted airstream, or into spaces not served by ductwork.

The self-generators vary in style depending on their source of heat energy for creating steam. They use electricity or a heat exchanger with either steam, hot water, or gas burners as the heat energy source.

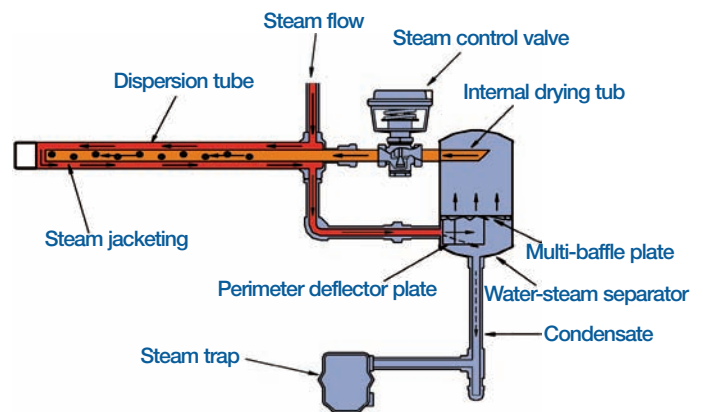


Figure 1. A nonresidential boiler-steam humidifier is illustrated above.

These units consist of an evaporating chamber containing an appropriate heating device; a water level control; a water makeup system; a steam conductor (flexible hose or rigid tubing) for carrying steam from the evaporating chamber to the duct dispersion tube; and, typically, a microprocessor-based control system.

Before installing a humidifier, read the manufacturer's literature. This will save time and avoid expensive corrections. Product literature should contain recommended humidifier location, piping method, dispersion tube installation, and electrical wiring methods.

Achieving proper installation

Here are nine pointers for successfully installing humidification systems:

- 1. Locate humidifier where noise won't be objectionable.** Boiler-steam humidifiers, due to pressurized steam passing through the control valve, will generate some noise. The higher the steam pressure and the greater the steam volume, the louder the sound.

Locate humidifiers away from relatively quiet and occupied areas where noise would be bothersome.

Some electric humidifiers generate noise from contactors cycling on and off. For very quiet areas, consider an electric unit with quiet solid state relay (SSR) or silicone controlled rectifier (SCR) control rather than contactors.

2. Create access to equipment for convenient visual inspection and maintenance. Boiler-steam humidifiers contain devices (such as a control valve, a steam trap, and a strainer) that require periodic maintenance. While these devices can operate for long periods of time without attention, they should be accessible for inspection.

Self-generating humidifiers are either cleanable or have disposable cylinders. Location should allow for easy access with ample space for servicing.

3. Protect areas surrounding humidifier from water damage. The potential for water damage is always present with any steam or water appliance, but a properly planned installation virtually eliminates this risk.

Valuable equipment and stored materials can be protected from water damage by locating humidifiers away from these areas or, when necessary, installing drip pans under humidifiers to contain water leaks.

4. Consider rigid pipe for the steam conductor. When self-generating humidifiers are being used, rigid pipe (stainless steel or copper tubing, or steel pipe), though initially more expensive, offers several advantages:

- **Longer service life.** Flexible hose will need replacing and may be more expensive in the long term.
- **Neater appearance.** In large capacity installations where several humidifiers and dispersers are required, a single rigid pipe, between the dispersers and the humidifiers and connected with the proper fittings, consumes less space and eliminates clutter.
- **Easy to install at a uniform slope for condensate drainage.** Rigid pipe won't sag and create pockets, which can cause condensate to pool, resulting in spitting at the disperser.
- **Easy to insulate.** Insulating rigid pipe reduces steam loss due to condensation and can yield considerable energy savings.

5. Design for proper condensate drainage. For self-generating humidifiers, condensate continually forms in dispersion tubes as well as in the steam conductors. This water must be drained to prevent it from being discharged into the duct. For reasons of energy economy, it should drain back into the evaporator. When this is impossible due to obstructions or elevation problems, condensate may be wasted to a drain.

There are two ways to return condensate to the evaporator. One method is to pitch the duct disperser and steam piping continuously back to the evaporator. When this is done, condensate flows counter to steam flow. This method works satisfactorily only when steam piping is adequately sized for humidifier capacity and when a given minimum recommended pitch can be maintained. Otherwise, the velocity of the steam will carry condensate with it into the duct. Usually, humidifier manufacturers will recommend a maximum steam flow rate and a minimum pitch.

The other method, used with higher capacity systems, involves returning condensate through a separate line. With this method, the duct disperser has a drain connected to a condensate return line, and both are pitched so that condensate returns to the humidifier. This installation requires an air vent in the return line.

When wasting condensate to an open drain, a P-trap is required to prevent steam from escaping into the room. The trap is usually constructed of metal tubing. Water column height in the P-trap must be sufficient to withstand the operating pressure inside the humidifier. Again, consult the manufacturer's recommendations.

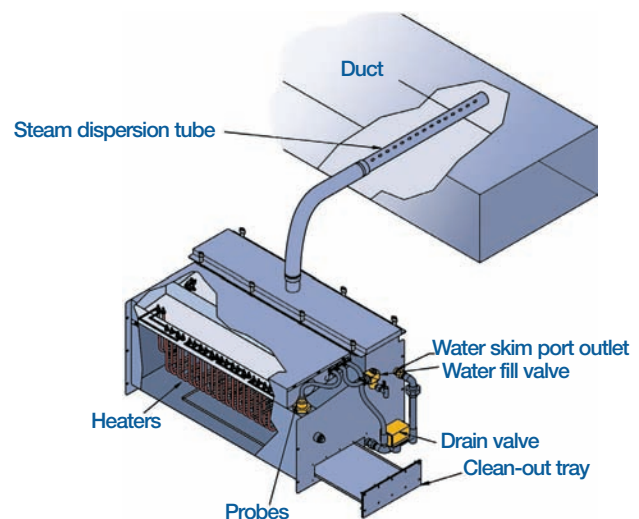


Figure 2. An electric hot element self-generating steam humidifier is illustrated above.

6. If required, cool down discharged water. Many humidifiers have periodic drain and flush cycles, or have automated skimming, where a portion of water in the tank is drained off to remove precipitated minerals. This water is typically 212 °F (100 °C) which, according to municipal codes, may not be discharged to a sanitary system. In this situation, add a water tempering device to cool discharged water.

7. Install a duct high limit humidistat. This device is a must for practically all installations and is mounted in the duct downstream of the steam disperser. It is usually set at 90 percent relative humidity (RH). If the duct RH rises above that setting, it will shut down the humidifier.

To ensure proper operation, the sensor must be located far enough downstream of the disperser to allow steam to be fully absorbed and the humidity to equalize in the airstream. Otherwise, short cycling of the humidifier may occur, resulting in an unsatisfied humidification demand.

Most evaporative humidifiers can use an inexpensive on/off-type high-limit humidistat, except in variable air volume (VAV) systems. In this case, a modulating high-limit humidistat provides more satisfactory control.

8. Install an air flow proving switch. If duct air flow stops for any reason, the humidifier must be shut down immediately to prevent water damage. This can be accomplished by using a duct-mounted air flow proving switch. Use a switch that is activated by the movement of a shaft, which has a vane or sail attached to it (often called a sail switch).

Another type is a diaphragm-operated switch, in which the static pressure inside the duct actuates the switch. The latter type isn't a good choice for VAV systems, because when the VAV box modulates the air flow, the duct static pressure remains high and allows the humidifier to continue to operate without sufficient volume of steam-absorbing air flow. A sail-switch is the best choice for VAV applications.

9. Place humidity sensor in center of room or in return air duct. Humidity sensor or transmitter location has a significant impact on humidifier performance. Placing a sensor in the center of a room or inside a return air duct will give the best all-around control.

Do not place a sensor near a supply duct, on a perimeter wall, in sunlight or near a heat-producing object. The humidity sensor should be located where it can measure an average space temperature and humidity.

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