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## SELECTING AND INSTALLING PRESSURE REGULATORS

# 6 Gas-Pressure Regulator Questions, Part 1

**G**as pressure regulation is an important part of the overall safety for gas-fired equipment. Too much or too little gas pressure to the burner can result in an unstable burner or even an oven explosion. To help avoid this potential hazard, the National Fire Protection Association developed NFPA Standard 86 to address specific control requirements that all gas trains must have.

There are three requirements that help provide the safety needed to properly and safely control the gas pressure to the burner. One requirement is an overpressure protection device, which helps prevent the gas train components from being exposed to excessive gas pressure in case the upstream service regulator fails. Excessive gas pressure can cause external gas leakage, prevent the proper operation of safety components, or cause a dangerously unstable burner. A second requirement is high and low gas pressure switches. The high and low gas switches monitor the gas line for too high or too low a pressure, respectively. If the gas pressure falls outside of the operating range for the burner, the switch sensing the fault will shutdown the oven, preventing an unstable condition. A third requirement is an equipment gas pressure regulator, which is a device that supplies the burner with a constant gas pressure in the event that the pressure upstream of the regulator fluctuates. Variation of the inlet pressure is normal under standard operating conditions, and it can occur for various reasons. One common cause occurs simply when other fuel equipment starts up, which causes a short term pressure drop in the gas piping system. A gas pressure regulator will help accommodate this short-term pressure drop so that the pressure variations do not reach the burner.

In order to control gas pressure within operating parameters, regulators must be properly selected, installed and set to meet NFPA 86. Here are six questions to ask:

### 1. When Is a Regulator Required?

NFPA 86 requires a pressure regulator “wherever the plant supply pressure exceeds the burner operating or design parameters, or wherever the plant supply pressure is subject to excessive fluctuations” (NFPA 86-2003, paragraph 6.2.5.4.1). Generally speaking, most applications would require a pressure regulator because most supply pressures to any building are subject to variation. However, NFPA 86 allows for other means to safely control gas pressure to the burner without using a gas-pressure regulator. For example, if an automatic control valve can properly supply a constant outlet pressure over all expected inlet pressures, then an equipment pressure regulator is not required (see exception in 6.2.5.4.1).

### 2. Is a Lockup-Type Regulator Required?

A lockup regulator is designed to close under no-flow conditions so that the outlet pressure does not exceed

more than 30 percent above the regulator’s setpoint. For example, if the inlet pressure to the regulator is 5 psi and the outlet is set to 1 psi, during no-flow conditions, the outlet pressure of the regulator should not exceed 1.3 psi. Non-lockup regulators may or may not close under no-flow conditions, but when in the no-flow condition, the inlet pressure may leak through the regulating seat, resulting in an outlet pressure that exceeds 30 percent above the regulator’s setpoint. In fact, the pressure downstream of the regulator could equal the supply pressure to the upstream side of the regulator, a situation that often is undesirable.

NFPA 86 does not differentiate between lockup regulators or non-lockup regulators, nor does NFPA 86 use the term; therefore, either type would be allowed. When determining which type to use, the oven designer simply should use the type of regulator that best provides the safety desired for proper oven operation (see sidebar “Lockup Regulator Advantages”).

### 3. What Are the Venting Requirements for Regulators?

When a pressure regulator is used, NFPA 86, paragraph 6.2.5.4.2, requires

#### LOCKUP REGULATOR ADVANTAGES

##### A lockup-type regulator offers two safety advantages on most types of equipment:

- It reduces the pressure on the upstream safety-valve seat during the off-cycle. The lower the pressure on the valve seat, the smaller the potential for leakage through the valve.
- It helps reduce a pressure pocket that builds up between the gas-pressure regulator and the upstream safety-shutoff valve during shutdown. A pressure pocket between the gas-pressure regulator and the upstream safety-shutoff valve may not be desirable during light off. Furthermore, the pressure pocket sometimes can trip the high gas-pressure switch on initial startup.

that all regulators be vented to a location acceptable to the “authority having jurisdiction,” which typically means to an outside location. However, per NPFA 86, a pressure regulator need not be vented if one of the following three alternatives is employed (see paragraph 6.2.5.4.3 and 6.2.5.4.4).

- If a vent-limiting device is used, the combination of the regulator and vent limiter must be listed.
- If the regulator is backloaded from combustion air lines, air-gas mixture lines or combustion chambers, provided that gas leakage through the backload connection does not create a hazard.
- If there is an upstream shutoff device that will shut off gas pressure to the regulator if the system goes into overpressurization.

If one of the above alternatives is not employed, NFPA 86 requires that the regulator be vented.

There are installation, safety and cost considerations associated with the decision whether to vent the regulator or to employ one of the exceptions. For an outdoor installation, the regulator is inherently vented to an outside location, unless the regulator is inside an outdoor enclosure. If the installation is inside a building, employing one of the exceptions often is desirable to avoid running costly vent piping through the building’s structure. From a safety perspective, this helps reduce risk in case the required vent piping is installed incorrectly or is not installed at all. Not having to run vent lines is often a lower cost solution.

#### 4. Is a Listed Regulator Required?

The “listing” of regulators is an ambiguous subject with a few nuances, but it can be stated that for standard applications, NPFA 86 does not require a listed pressure regulator on the equipment gas train. The requirements for listed gas-train components are covered in Section 7 of NPFA 86-2003, which deals with safety devices. The requirements for gas-pressure regulators are located in Section 6, which

does not deal with safety devices. However, if the installation is using a vent-limiting device on the regulator, the regulator and vent limiter combination must be listed by a nationally recognized testing laboratory. **PH**

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