

CHECKING THE OPERATION OF PRESSURE REGULATORS

Pressure regulators are used to reduce a high inlet pressure (as in a tank or cylinder) to a lower preset pressure. The pressure at the propane storage container can be in excess of 100 psi. The appliances require an input pressure of 11 inches water column which is less than one-half psig.{2} Therefore, pressure regulators may be thought of as automatic valves which continuously monitor downstream pressure. These valves open and close as needed to maintain the required pressure at the appliance input.

When checking a pressure regulator consideration must be given to the following: (1) installation practice, (2) location, and (3) operation.

- (1) Checking Installation Practices.** Propane pressure regulators must be covered by a hood, or must be installed so the vent opening terminates downward. Freezing rain could form a coating of ice on the protective screen of a vent opening, blocking airflow.

- (a) **Uncovered Pressure Regulators.** Uncovered pressure regulators should have a vent opening with the proper size drip lip, or a drip lip adaptor of the required size, as illustrated in Figure 1. Also, the vent opening should be covered with a screen to keep insects out of the regulator vent air passage and the vent should be clear of any obstructions.

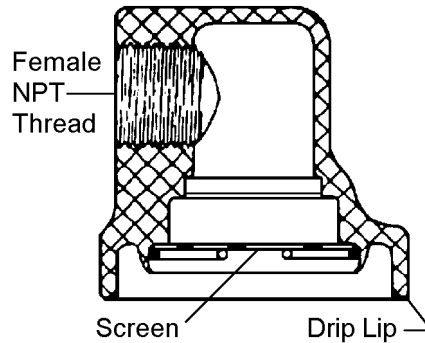


Figure 1. Vent Assembly on a Pressure Regulator

- (b) **Underground Pressure Regulator Installations.** The vent on underground regulator installations should be piped above the water table, as illustrated in Figure 2. The open end of the vent extension tube should be pointed downward.

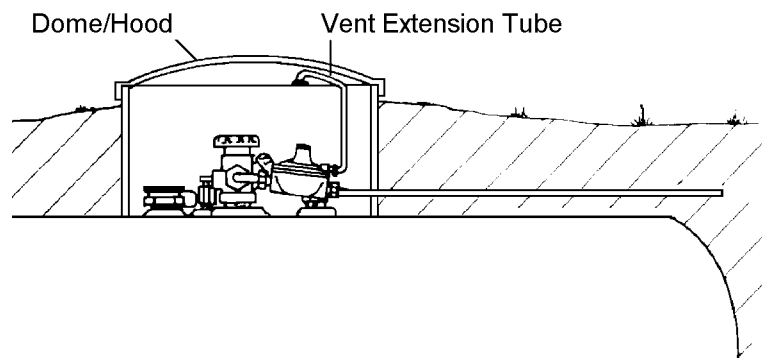


Figure 2. Underground Propane Storage Installation

- (c) **Pressure Regulators Installed in Buildings.** Pressure regulators installed inside of buildings should be vented outside of the buildings with tubing or pipe at least the same size as the thread size of the regulator vent. The open end of the vent extension tube must be pointed downward, as illustrated in Figure 3, on the next page.

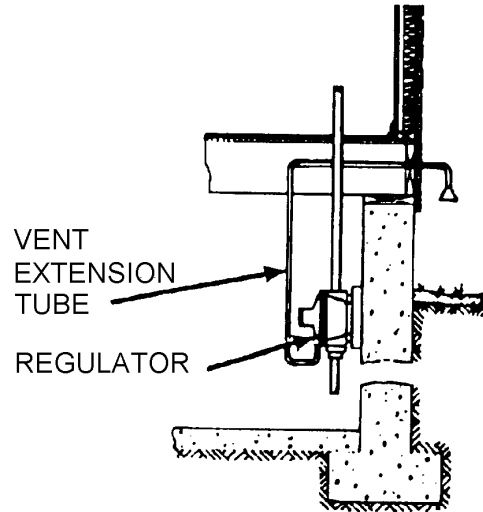


Figure 3. Pressure Regulator Installed Indoors

The open end of the vent tube must be protected from foreign material and ice by an auxiliary vent assembly or suppressor, as illustrated in Figure 4.

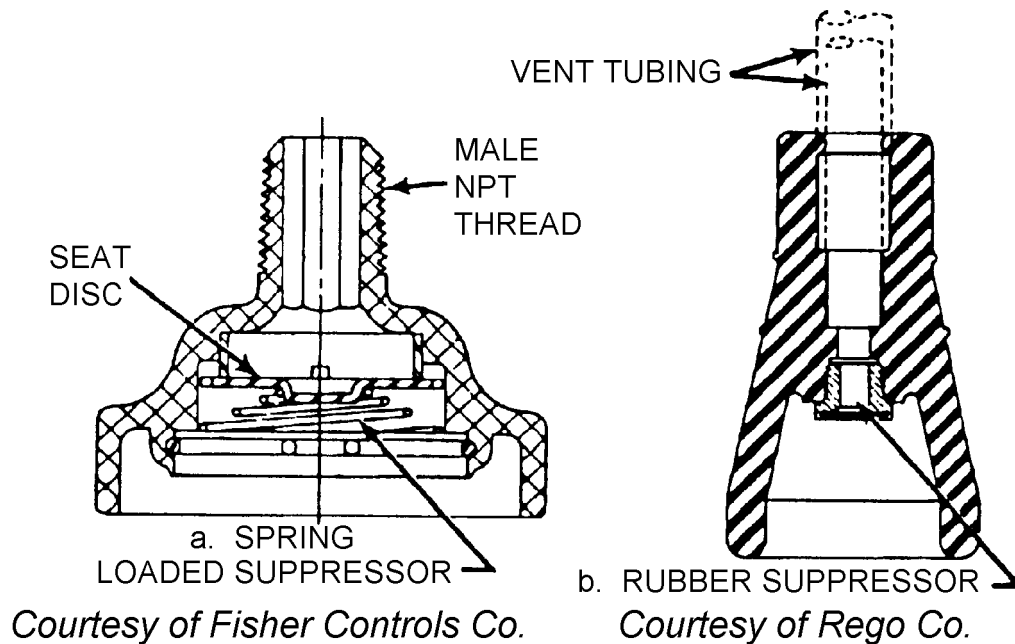


Figure 4. Vent Suppressors

- (2) **Checking the Location of Pressure Regulators.** Pressure regulators must not be covered by room additions, flower gardens, etc. Pressure regulators should not be positioned under downspouts. Pressure regulators should be mounted securely in a location which provides protection against regulator

damage. According to NFPA #54 line pressure regulators must be vented to the open atmosphere. If there is a question concerning the safe location of a pressure regulator vent, refer to the *National Fuel Gas Code*, NFPA #54 and local codes and company procedures for accepted standards.

(3) Checking the Operation of Pressure Regulators. An operational test is required to evaluate the performance of the entire piping system, with emphasis on the pressure regulator and piping. The regulator pressure tests include: (a) "delivery pressure" of the propane at the appliances, as well as (b) the "lock-up pressure" at the regulator, and (c) full operating pressure.

(a) Checking Delivery Pressure. The term "delivery pressure" refers to the outlet pressure adjustment on the regulator that is made to adjust the gas flow through the regulator to at least the minimum downstream load requirement. For integral 2-stage regulators and second stage regulators, the downstream pressure should be 11 inches water column (W.C.) at a flow rate of 1/2 the total Btu load. (4)

Appliance pressure should be measured with a manometer. Make sure the manometer is mounted upstream of the appliance regulator in order to obtain the proper delivered pressure rating. A convenient location is the test tap on an appliance shutoff, above any appliance regulator. Operate the appliance at the setting flow rate of the regulator as specified by the regulator manufacturer, usually 1/2 the total load. The flow rate may be established by lighting enough burners to reach an approximate load of 75,000 Btu's per hour or more. The manometer is read by adding the reading at one end of the U-tube to the reading at the other end of the U-tube. The reading should be 11 inches W.C. (5) If a low pressure gauge is used instead of a manometer, it should be checked with a master gauge before and after the regulator delivery pressure test to prove its accuracy.

(b) Checking Lock-up Pressure. In connection with determining the pressure downstream of the pressure regulator, the "lock-up" or "lock-off" pressure should be checked. The lock-up pressure is determined after the delivery pressure has been set. With the manometer connected to a burner orifice, read the pressure indicated. A procedure for determining the lock-up pressure of a pressure regulator is as follows:

- Make sure the controls of all the appliances connected to the propane piping system are shut off. Be sure all pilots are shut off and pilot adjusting screws are closed.

- Make sure the service valve of the propane storage container supplying the piping system is left open to maintain pressure on the system.
 - Read the inches water column measured on the manometer. The lock-up pressure should not exceed flow pressure more than 30 percent{3}. If the flow pressure was 11 inches water column, the lock-up pressure should not exceed 14.3 inches water column. Observe the pressure reading for one minute.
 - If the pressure increases beyond 30% of the flow pressure and the regulator **fails** to lock up, the regulator is malfunctioning. This problem indicates the regulator must be replaced. (6)
- (c) **Checking the Pressure at Full Operating Capacity.** Relight all pilots and operate all appliances at full capacity. With the manometer connected to a burner orifice, read the pressure indicated. The pressure delivered should normally not be less than 10 inches water column for conventional appliances. However, the setting should satisfy the manufacturer's recommendations..{4} It is preferred that the delivered pressure be maintained at least ten inches water column. Regulators failing to meet any of these standards should be replaced, only after the proper line sizing has been determined. Field repair of regulators is not recommended since care and comprehensive testing is required before regulators can be put back in service.

References:

1. Rego, LP-Gas Serviceman's Manual.
2. National Fire Protection Association, *National Fuel Gas Code*, NFPA #54.
3. Rego, LP-Gas Serviceman's Manual.
4. NPGA, Gas Appliance System Check, LP-Gas Equipment and Systems, p. 14.
5. Ibid., page 13 of Service Technician's Overview.
6. Ibid., page 14 of Service Technician's Overview.