

How the **Bottom Line** is Changing Residential Gas Systems

Part 2 of 2



By KENNY HART, ACI and ALAN CARSON, ASHI past-president

In the last issue, we talked about how installers are saving time and money by using copper tubing and CSST (Corrugated Stainless Steel Tubing) rather than conventional threaded steel pipe. Although not available in all areas, 2-psig (pounds per square inch gauge) natural gas systems are another cost-saving option. They have been available in some areas for more than 40 years.

Advantages of 2-psig systems

Conventional gas systems operate at roughly $\frac{1}{4}$ -psig (7-inch water column or 7" w.c.). The pressure in 2-psig systems can be 8 times higher ($\frac{1}{4}$ -psig x 8 = 2-psig). This higher pressure allows for smaller distribution lines, reducing installation costs whether using conventional steel piping, semi-rigid copper tubing or CSST. As we discussed last month, copper tubing and CSST have cost

advantages relative to steel, and copper tubing is very common on 2-psig systems.

A 2-psig system also makes great sense when converting a home piped for LP (Liquefied Petroleum Propane) to natural gas. The LP gas lines often are too small to carry enough natural gas at $\frac{1}{4}$ -psig, but are large enough for 2-psig systems.

There also are safety advantages to 2-psig systems. According to the American Gas Asso-

ciation, a break in a $\frac{3}{8}$ -inch diameter copper tube at a pressure of 2-psig will release only about one-third the amount of natural gas compared to a break in a $\frac{3}{4}$ -inch diameter gas pipe at 6 inches water column.

The ability of copper to move without breaking offsets the lower wall strength of copper compared to steel. 2-psig systems have fewer connections than conventional systems, which means fewer potential leaks.

Disadvantages of 2-psig systems

The price of regulators for each appliance or zone can increase the cost. However, on balance, the total installation cost typically is lower than conventional lower pressure systems.

Piping configurations

It's common to use 3/8-inch outside diameter (O.D.) copper tubing as the main distribution line on 2-psig systems. They typically have several lines originating from a manifold just downstream of the meter (see photo of a manifold next page). The gas shut-off valves at the beginning of each line facilitate repairs, improvements and leak testing.

Copper tubing typically is Type K or L. Type M copper tubing is not acceptable for 2-psig systems. The color codes for copper tubing are Type K – green, Type L – blue and Type M – red.

What happens at appliances? Household appliances expect to see gas at roughly 1/4-psig, so a special line regulator is added just before each appliance to reduce the pressure.

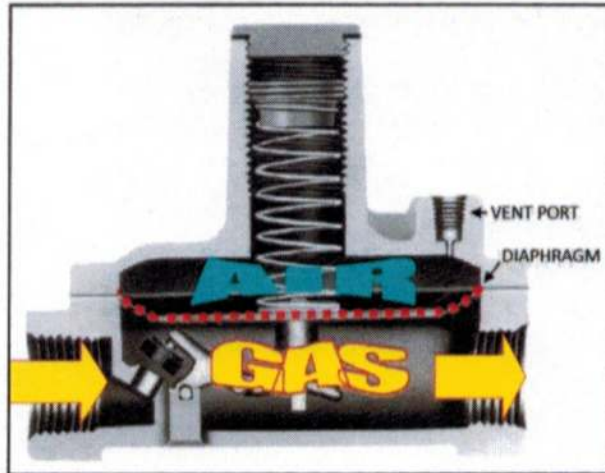
A sediment trap typically is installed just before the regulator, often between the gas valve and the regulator, for easy servicing. A plugged tee or second sediment trap may be installed between the regulator and the appliance for technician access and troubleshooting.

While some regulator manufacturers recommend one regulator per appliance, it's common and widely accepted to see one regulator for two side-by-side appliances such as a furnace and water heater.

Regulators and vent limiters

Gas regulators have a diaphragm, and air pressure that builds up above the diaphragm typically is allowed to escape through a vent at the top of the regulator. Most codes require that these vents discharge outdoors because natural gas could escape into the home, creating an explosion hazard if the diaphragm ruptures. If the regulator has an approved vent-limiting device, piping to the outdoors is not necessary. Vent limiters work by allowing small amounts of air to escape during normal operation, but restrict the release of gas if the diaphragm ruptures.

Vent limiters are common with 2-psig systems to avoid the time and cost of piping the regulator vent outdoors. Regulators with vent limiters must be installed upright >>



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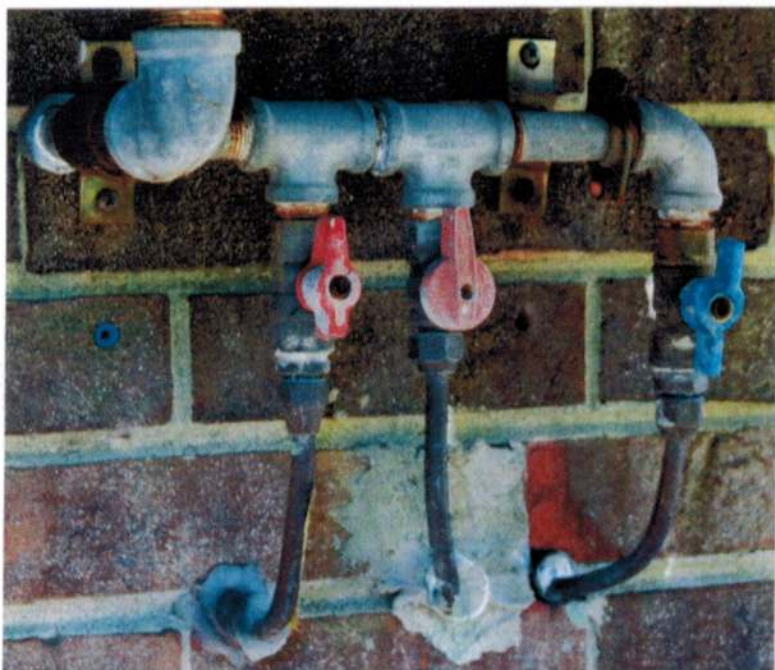
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Regulator with vent limiter



Regulator with vent protector



Left: A manifold system

Above: A red faceplate on the gas meter sometimes is an indicator of a 2-psig system.

PHOTOS © KENNY HART

and in a horizontal position. This should be checked during a home inspection. Vent limiters are delicate and, for example, may fail if swabbed with leak-detection fluids. Inspectors should not apply these fluids to regulators with vent limiters.

Outdoor 2-psig regulators – Regulators for 2-psig systems typically are sold with the vent limiter installed. Since vent limiters can easily be blocked by rain, ice or debris when installed outdoors, they need to be replaced with vent protectors or other approved devices. Vent protectors should be installed upright.

An alternative in some localities, but not all, is a 180° site-built vent tube. Tradesmen shape copper tubing or combine steel nipples and elbows to create a fitting shaped like a small candy cane and then thread it into the vent opening on top of the regulator. Both vent protectors and vent tubes allow the regulator to breathe and expel the air that can build up on top of the regulator diaphragm. If the diaphragm fails, the gas will leak outside.

Identifying and inspecting 2-psig systems

Check with your local authority/utility/natural gas supplier, if needed, to learn whether 2-psig systems are permitted in your area.

Look for small-diameter gas piping, often (but not always) a semi-rigid copper tubing on a manifold (home run) system.

Hybrid systems – From a single meter, some homes have a 2-psig system serving part of the house, and a conventional system serving the rest of the home. This is common where additional gas lines have been provided on an existing system.

Look for a red face or a red dial on the main gas meter (not always present) indicating a 2-psig system.

Missing or improperly installed components can cause a system failure or malfunction.

- Look for a sediment trap before each line regulator. Look for vents on indoor regulators to be piped outside or have a vent limiter installed in the upright position.
- Look for vent protectors (installed upright) or other approved devices on outdoor regulators for 2-psig systems.
- Incorrect load calculations or added appliances to existing gas lines sometimes can result in inadequate gas flow.
 - Inspectors can do a basic check for this by operating several gas appliances simultaneously and watching for proper combustion at each.
 - Problems include reduction of flame size at one appliance when the second starts up, delayed ignition or even appliance shut-down.
 - There are several things that may cause these symptoms, so don't speculate about

the cause, just report what's happening, and recommend further evaluation.

- Do not use soap solutions near vent limiters.
- Refer to Part 1 of this article for inspection tips on piping materials.

Where you see or suspect issues with the system, recommend further investigation by a specialist. ■



Kenny Hart is a second-generation Master Plumber and Mechanical Contractor with more than 35 years of experience in the mechanical fields.

He is a contributing editor to the ASHI@HOME Training Program, the president of the Hampton Roads Chapter and past chair of the ASHI Technical Committee. He currently chairs the Trades Division of the Alpha College of Real Estate located in Chesapeake, Virginia. He will be presenting at InspectionWorld Atlanta on plumbing and HVAC systems. To read more of Hart's articles or if you need a presenter at your next chapter event, go to www.thepumbingandhvacguy.com.



ASHI Past-President Alan Carson, Carson Dunlop Assoc., has been a pioneer in home inspection since 1978. His work includes home

and commercial building inspections, inspection training and the HORIZON report writing systems. He has developed many educational programs, most significantly the ASHI@HOME Training Program.



Look for a sediment trap before each line regulator.

PHOTO © KENNY HART

Gas Piping Article Authors Share Member's Comments

ASHI member Roger Hankey contacted us to share some great points about January's gas piping article.

We should have been clear that home inspectors should describe adverse conditions in reports without referring to code or local jurisdictions. Although reports are not required to cite any sources, alternatives include references to manufacturers' installation instructions or generally established practices. We do recommend that inspectors know what code and local jurisdictions say about common residential issues so that report comments are consistent with those, even though determining compliance with codes or manufacturers' requirements goes beyond the ASHI Standards.

For example: If gas copper tubing is not permitted in your area and you fail to identify it as an adverse condition when you find it, you may be in a difficult situation, especially if that information is considered common knowledge.

Home inspectors are generalists, and our knowledge is not as deep as specialists such as tradespeople or engineers. It is a significant challenge to determine how much knowledge is required in each of the many disciplines we touch during a home inspection.

Roger also points out that regional differences exist, even in things as closely controlled as gas piping installations.

For example: Approved flexible appliance connectors are not required in some areas, where a six-foot long loop of copper tubing is acceptable.

Roger advises watching for pitted or spotted CSST at a gas fireplace surrounded by masonry veneer. The acid wash used by the mason can attack the CSST.

In addition, we were asked to cite the authorities that indicate CSST is vulnerable to damage from lightning. The International Residential Code (IRC) and National Fuel Gas Code (NFGC) are two such authorities.

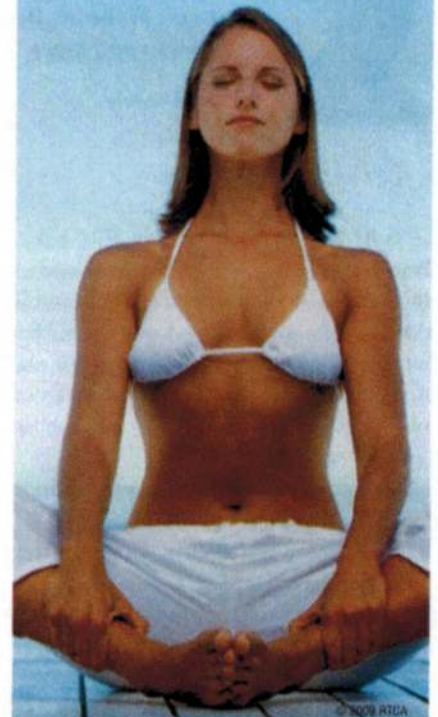
Our thanks to Roger for his thoughtful and valuable input.

*Alan Carson, ASHI past-president
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