

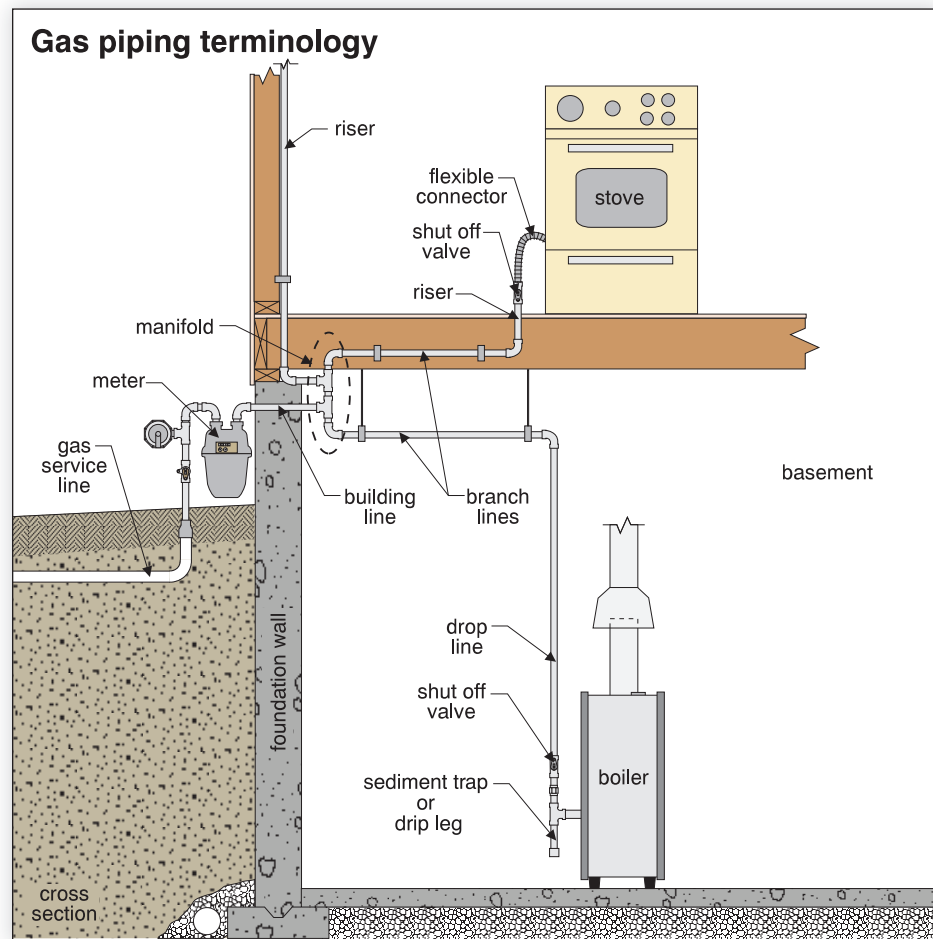
3.2 Gas piping

CURB BOX Gas mains run underground typically, along the streets. A gas service line feeds each house. In some cases, the gas service line has a **curb box** in the front lawn (often about 25 feet from the house). This box allows the utility to shut off the gas. The valve is located in the gas line underground. The curb box at grade level allows operation of the valve with a key without digging.

The gas service line may either enter the building through the exterior wall below grade, or extend above grade through a service riser just outside the house. There is usually a shutoff valve and then the meter. Sometimes there is a regulator upstream of the meter, depending on the gas main pressure.

SUPPLY, BRANCH AND DROP LINES OR RISERS

The pipe then goes into the house. The piping inside the house is called the **gas supply line** or **building line**. **Branch lines** run to individual appliances. The branch line terminates in a **drop line** which is a vertical pipe dropping down to the appliance from an overhead branch line. This drop line is called a **riser** if it carries gas up to an appliance from a branch line below the appliance.



SEDIMENT TRAP, DIRT POCKET, OR DRIP LEG At the appliance connection point, there is usually a **sediment trap** or **dirt pocket**, sometimes called a drip leg, that includes a nipple and a cap. This pipe extension is usually at least 3 inches long and is intended to catch any water or foreign material that may be in the gas, before the material gets into the appliance itself. This is simply a gravity system, with the solids and liquids falling into the pocket.

PIPE DOWNSTREAM OF METER IS HOMEOWNER'S The piping downstream of the gas meter is usually the responsibility of the homeowner. The piping upstream of the gas meter and the meter itself are usually the responsibility of the gas company. We will focus on the portions of gas piping that are the homeowner's responsibility and are visible to home inspectors.

PIPING MATERIALS

STEEL, COPPER, BRASS The most common gas piping is black steel. Galvanized steel, copper, brass or CSST (Corrugated Stainless Steel Tubing) can also be used in some areas but some utilities specifically prohibit the use of copper and CSST. In other areas, the use of copper is widespread. You should know what is acceptable in your area.

Steel piping is typically black with malleable iron or steel fittings. Galvanized steel is used in some areas as well. Cast iron piping is not permitted.

COPPER TUBING Copper tubing used above ground has to be type K or L (these are heavier wall than typical plumbing pipe) or type GP. Underground copper tubing must be type K. In some areas, type L tubing can be used underground if it's been coated with PVC during the manufacturing process. In most localities, if pipe or tubing is installed under a concrete slab, it must be sealed in conduit which must be vented to the exterior.

PLASTIC OUTDOORS UNDERGROUND Outdoor underground piping can be plastic (typically polyethylene – PE), but we won't often see this. Plastic piping used outside underground should have a metal riser or chase coming up above grade to protect the piping. You shouldn't see any plastic piping above grade. Metal tracing wires are often wrapped around buried plastic pipe, so it's easier to find.

STEEL UNDERGROUND NEEDS RUST PROTECTION Steel piping used underground should be protected with a rust inhibiting coating. Again, we won't often be able to see it.

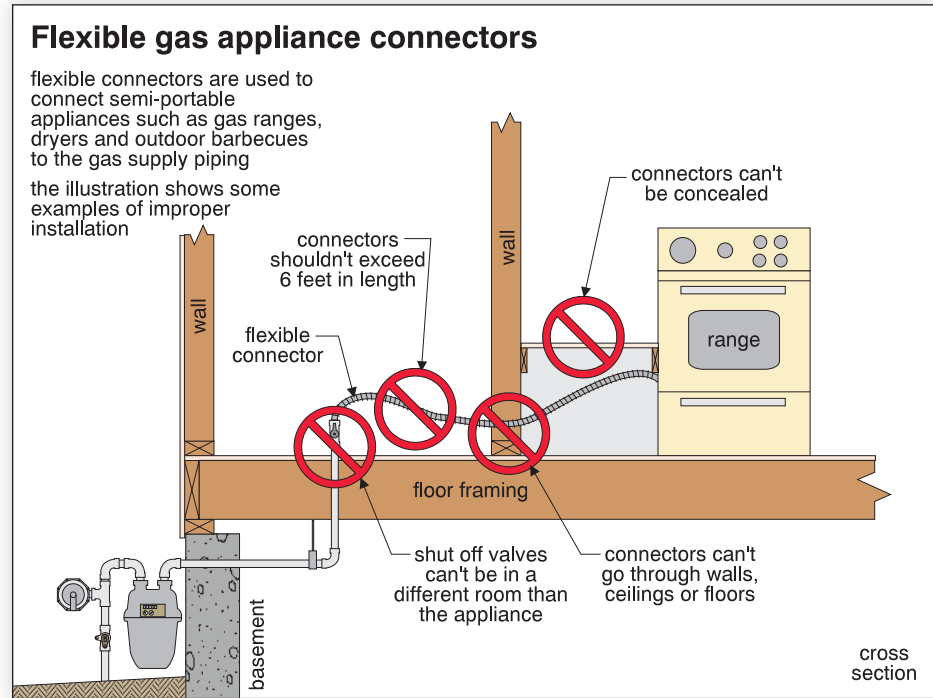
CONNECTORS

FLEX CONNECTORS Flexible connectors are permitted to connect appliances to the gas piping. There should be a shutoff valve at the connection to the rigid piping or tubing. This valve should be in the same room as the appliance.

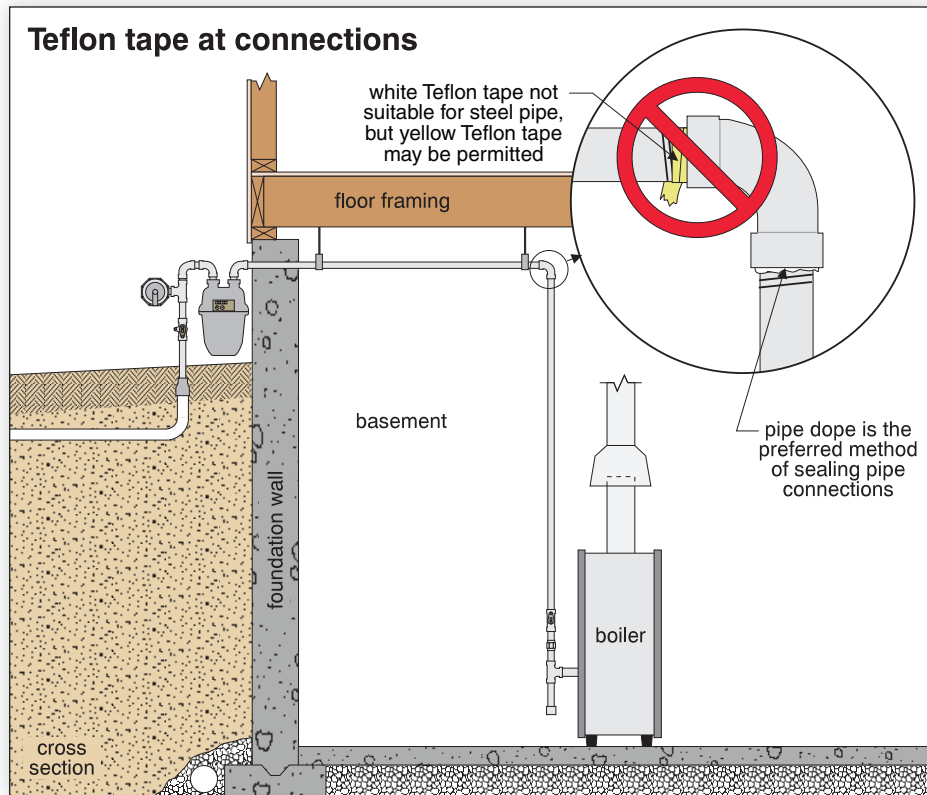
Uncoated brass connectors have not been permitted in many jurisdictions since the mid-1990s.

THREE FEET OR SIX FEET LONG AND ACCESSIBLE The flexible connectors can't go through walls, floors or ceilings, nor can they be concealed. The flexible connector length is usually limited to 3 feet except for gas ranges and clothes dryers. For these appliances 6 feet is generally allowed. Splicing or joining connectors with nipples is often prohibited.

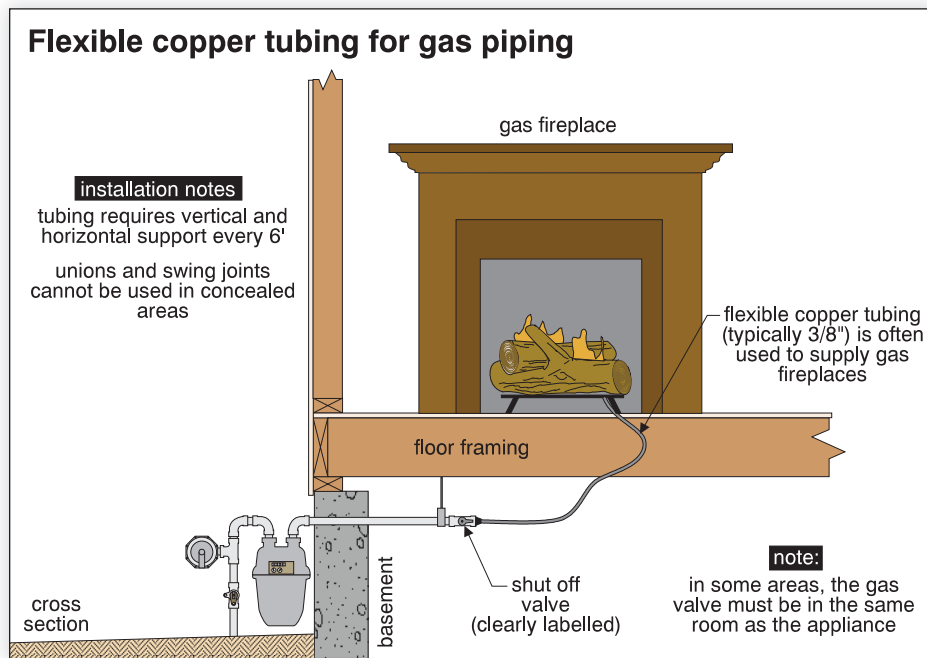
In some jurisdictions, flexible connectors are allowed only for gas ranges, dryers, outdoor barbecues and other semi-portable appliances. Flexible connectors may not be permitted on gas furnaces, water heaters, space heaters, etc. In areas prone to earthquake, flexible connectors are more likely to be used on all appliances, since they provide some measure of protection against gas piping leakage or rupture during an earthquake.



TEFLON TAPE White **Teflon tape** is not recommended as a joining compound for steel gas piping. Cutting oils that remain on the pipe threads from manufacture may prevent the Teflon tape from sealing. In some areas, yellow Teflon tape is allowed. **Pipe dope** is preferred in many areas, and may be all that is allowed. You may want to ask your gas utility whether you should be reporting any piping installations with Teflon tape.



NOT IN DUCTS Gas piping can't be run through chimneys or duct systems.



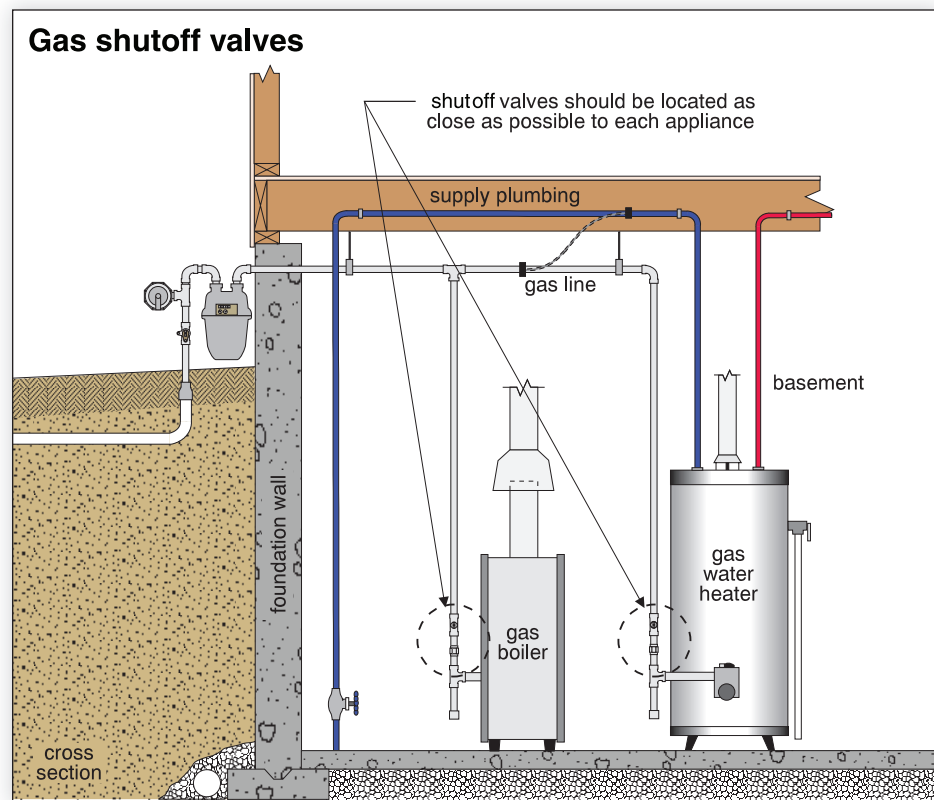
**DON'T CONCEAL
SMALL PIPING**

Gas piping smaller than ½ inch diameter usually cannot be concealed in walls, floors or ceilings in some jurisdictions. Some jurisdictions will allow ¾ inch copper tubing to be concealed if it is being used on a 2 PSIG system. Several rules must be followed. Metal shields (striker plates) must be installed to protect copper tubing or CSST from nails and screws. Holes drilled in the structure so that tubing can be pulled through walls and flooring are required to be many times larger than the tubing itself. This allows for free movement of the tubing in case a nail or screw should penetrate the hole.

Unions or swing joints cannot be used in concealed areas.

SHUTOFF VALVE

Every appliance should have a shutoff valve adjacent to the appliance, with some exceptions.

**GAS PRESSURE**

A 7 inch WC (water column), which equals ¼ PSI, gas pressure in the house line is typical. Appliance regulators often reduce the pressure to the appliance to 3½ inches WC (PSI). Home inspectors do not normally check the gas pressure.

Some localities employ a 2 PSIG system. The pressure is often reduced to working pressure through a regulator near the appliance. In some cases two or more appliances can be regulated by one regulator.

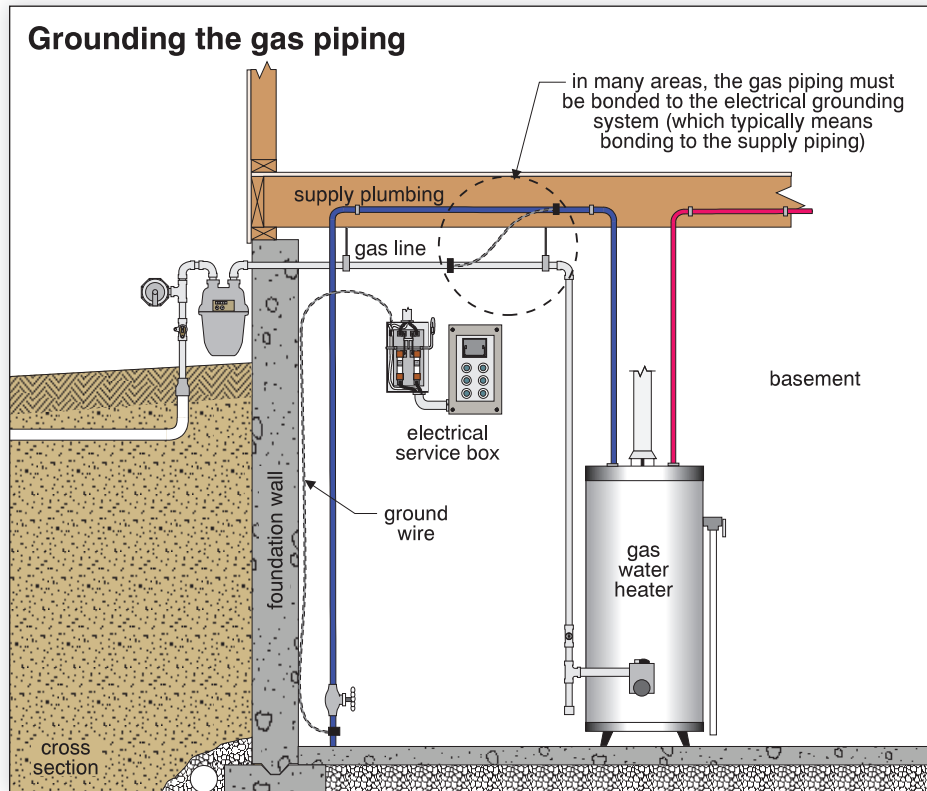
**VENTING INDOOR
REGULATORS**

Indoor regulators should be vented to the outside. Each regulator should be vented separately. The vents should terminate at least 3 feet from ignition sources. Vent limiting devices (vent limiters) can eliminate the need for venting to the exterior, although the regulator has to be in a horizontal upright position to use a vent limiting device.

BONDING GAS PIPING

Most authorities do not allow the use of gas piping as a grounding means for the electrical service. Bonding the gas piping to the electrical grounding system is typically a requirement, however. This is often done by attaching the gas piping to the supply water piping (assuming it is metal and grounded) often near the water heater.

Bonding the gas piping to the grounded plumbing system helps prevent arcing, which might ignite gas.



DON'T GROUND THROUGH GAS PIPING

However we don't want to rely on the gas piping for grounding the electrical system because –

- appliances may be disconnected for servicing
- gasket material interrupts electrical continuity through the ground
- the underground piping may be plastic, which is not a suitable grounding conductor

CORRUGATED STAINLESS STEEL TUBING

Corrugated Stainless Steel Tubing (CSST) is controversial and there are class-action lawsuits due to the risk of damage and fires from indirect lightning strikes. This material is a thin, flexible stainless steel tubing typically wrapped in yellow or black plastic. CSST was introduced in the 1980s and widely used since the 1990s. It's a lower cost alternative to conventional steel piping, where a fitting is required for every change in direction of the pipe. CSST is flexible, lightweight and installation is faster than with traditional piping. The concern is that during electrical storms, the metallic systems in the building can become highly energized. In the case of CSST, this increased energy can create holes in the thin steel walls. This can allow natural gas to escape and result in a fire.

Because of this risk, the product is banned in some areas. CSST can be identified by its flexibility and yellow or black exterior sheathing. Bonding the piping to the electrical grounding system reduces the chances of a lightning related problem.

STRATEGY CSST installations are typically completed by professionals certified by the manufacturer to work with this product. However, certain brands may be sold in hardware stores, so there are no guarantees that all CSST work is performed by a certified professional.

Look for proper bonding including an approved grounding clamp attached to a CSST fitting (brass nut) or to a section of steel pipe attached to the CSST system where it enters the building. From the clamp a #6 AWG wire is used to connect the CSST system to the electrical grounding system through the electrical panel, grounding rod or grounded metal supply piping, for example.

Additionally, where it is used in gas fireplaces with a masonry veneer, watch for pitted or spotted CSST, since the acid wash used by the mason can attack the CSST.

It is important to know the rules surrounding the use of CSST in your area.

3.2.1 Conditions

The following problems are typical on gas piping:

1. Leaks
2. Inappropriate materials
3. Inadequate support
4. Rusting
5. No sediment trap
6. Missing shutoff valve
7. Improper connections
8. Plastic pipe exposed above grade
9. Piping in chimneys or duct systems
10. Copper tubing not properly labeled

IMPLICATIONS The implications of all of these problems are possible gas leaks and explosions.

3.2.1.1 LEAKS

CAUSES Gas leaks are usually caused by poor connections or mechanical damage.

STRATEGIES Natural gas is perfumed so you can smell it. Some inspectors use combustible gas analyzers to test for leaks, which goes beyond standards. These devices can sense leaks that are so small that the gas company has trouble detecting them. This can cause problems with your relationship with the gas company. You might want to talk to them about what kind of leaks they look for.

SOME LEAKS ARE
TOO SMALL TO
WORRY ABOUT

MARK THE LEAK If you do find a leak with a piece of testing equipment (beyond standards), you may want to mark the location of the leak with a business card or marker so the gas company knows what you have found. While no gas leaks should exist, in reality, many small leaks are never detected.

Any gas leak that is detectable without equipment is a serious one, and the gas company should be notified immediately.

3.2.1.2 INAPPROPRIATE MATERIALS

Inside the house plastic piping is not allowed, but you may find black steel, copper or CSST. Copper and CSST are not allowed in all areas. Check with your utility to find out what is acceptable.

CAUSES The presence of inappropriate materials is an installation issue.

STRATEGIES **Black steel** is not painted black; it means unfinished or not galvanized. **Galvanized steel** is not used in some areas because of the concern that the zinc coating may flake off and obstruct gas valves or burners. In other areas, galvanized piping is routinely used. Gas piping has thick walls, and is threaded at its connection points.

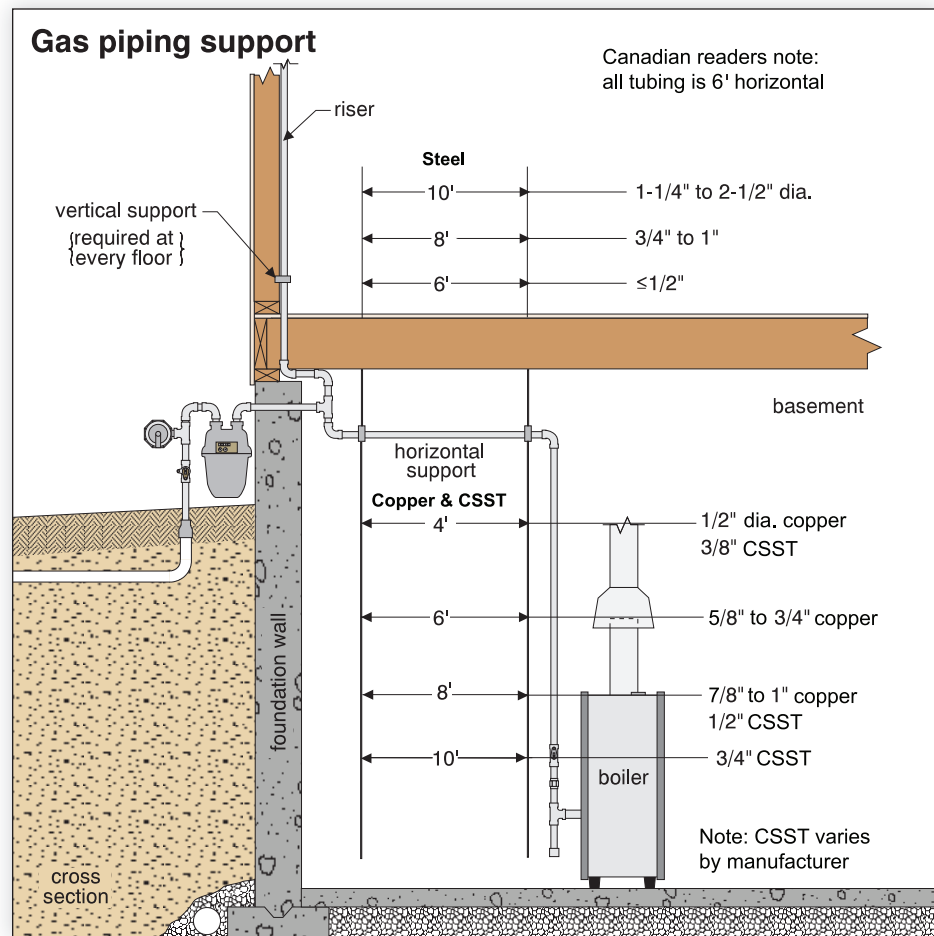
LOOKS LIKE PLUMBING PIPE Gas piping can easily be mistaken for water supply piping or distribution piping on water heating systems. This is especially true if the piping has been painted. You'll have to follow piping from source to destination to know for sure what it's carrying.

Copper tubing for gas can be confused with flexible copper piping for water. Special identification of the gas piping may be necessary. If copper is permitted in your area, it may require yellow labels indicating 'gas' every few feet.

3.2.1.3 INADEQUATE SUPPORT

Horizontal steel piping should be supported as follows:

- ½ inch diameter piping or less should be supported every 6 feet
- ¾ inch and one inch piping should be supported every 8 feet
- 1¼ to 2½ inch piping should be supported every 10 feet



Steel piping should be supported vertically at every floor level.

TUBING Copper and CSST tubing should be supported as shown in the illustration above.

Piping cannot be supported on other piping. (Supports designed for piping are required.)

CAUSES Inadequate support may be poor original installation, or brackets may have been damaged or removed.

IMPLICATIONS Poorly supported pipe may have weakened connections, resulting in leakage.

STRATEGY As you examine the pipe, look for missing, too few, broken or ineffective support brackets. Also look for storage of materials on top of or hanging from pipes. Gas piping should not be used to support storage, appliances or any other fixtures.

3.2.1.4 RUSTING

CAUSES Gas piping in houses is not usually susceptible to rusting. Rust may be found on exterior piping for barbecues, fireplaces, outdoor gas ranges, etc. Rust may develop where piping contacts soil, or if chronically wet owing to a damp environment such as a very wet basement or crawl space.

Exposure to corrosive chemicals also causes rusting.

STRATEGY When you find rusted gas piping, recommend further investigation.

3.2.1.5 NO SEDIMENT TRAP

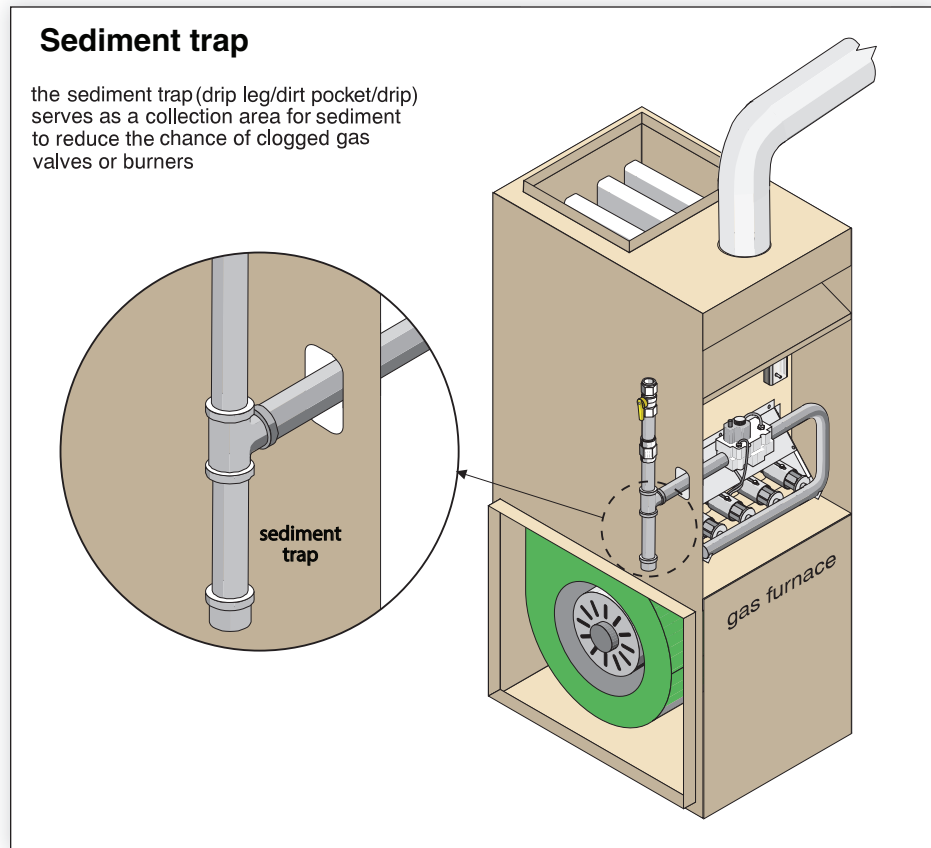
The sediment trap (dirt pocket/drip pocket/drip leg/drip tee) is intended to catch moisture or foreign material before it gets into gas valves, burners, etc. The first appliance downstream of the meter must have one, and in some areas every appliance needs one. In some areas, sediment traps are a code requirement but they are often omitted, and authorities may not enforce the requirement. Sediment traps are not required on ranges, gas lamps, outdoor grills and clothes dryers, but are required on heating appliances and water heaters.

The traps should be downstream of the appliance shutoff valve and as close to the appliance as possible. The gas should be forced to turn 90 degrees at the top of the trap.

CAUSES This is an installation issue.

IMPLICATIONS Implications include equipment malfunction because of foreign material entering the equipment. There is also a safety issue, as foreign material could block a valve, preventing it from closing completely.

STRATEGY Look for a sediment trap at the bottom of the vertical pipe going into the furnace. There should be a logical place for sediment to be trapped. There should be a cap that can be removed for cleaning. Sediment traps should not be installed where there is a risk of freezing. Sediment traps are not required on smaller appliances like ranges, clothes dryers, outdoor grills and fireplace logs.



**WHAT DOES GAS
COMPANY SAY**

Check with your utility. In some cases utilities relaxed the requirement for sediment traps for some time and then reinstated it. The reintroduction is not necessarily retroactive. Be careful about what you criticize here. Again, a conversation with your local gas company is a good idea.

3.2.1.6 MISSING SHUTOFF VALVES

A shutoff valve should be as close as possible to the appliance. The only exception would be the shutoff for a gas valve into a gas fireplace or wood-burning fireplace with a gas starter. In these cases, the valve should be outside the fireplace but in the same room (in some areas), within 6 feet of the fireplace. Where the valve is not adjacent to the appliance, it should be clearly labeled. In some areas, a valve for a first-floor fireplace can be located in the basement. Where the valve is not adjacent to the appliance, it should be clearly labeled.

Shutoff valves may be up to 50 feet from appliances where manifolds are used with CSST, for example. The valves have to be accessible and clearly labeled.

CAUSES Missing valves are an installation issue.

IMPLICATIONS Inability to shut equipment off in an emergency presents a safety hazard. Maintenance is also more difficult if you have to look for the valve.

STRATEGY Make sure there is a shutoff valve for each appliance. Where one is apparently missing, call for further investigation.

3.2.1.7 IMPROPER CONNECTIONS

Improper connections include bushings, thread projectors or running threads (close nipples). You want as few connections as possible in a gas piping system. These fittings are normally used where the appropriate length of pipe was not available, and the system is tied together.

Unions (fittings designed to allow pipes to be disconnected relatively easily) are permissible and required between shutoff valves and gas controls in rigid pipe systems. Do not confuse unions with the other connectors described.

RIGID
CONNECTIONS
WHERE FLEX IS
NEEDED

Rigid connectors should not be used when a flexible connector is called for by the local utility. This could be an issue in earthquake areas, or in areas where pulse-type heating systems require flexible connectors because of vibration. Again, this is area-specific and you need to know what is acceptable in your jurisdiction.

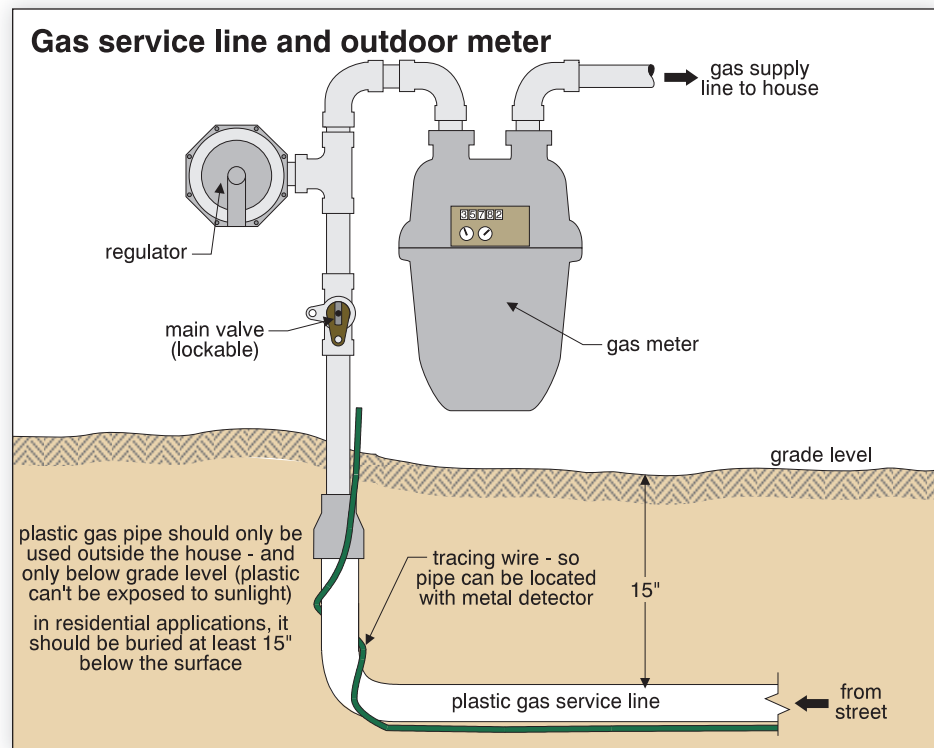
CAUSES These are workmanship issues.

IMPLICATIONS Extra connections present extra chances for leaks.

STRATEGY Look for connections in pipes that have no apparent function.

3.2.1.8 PLASTIC PIPE EXPOSED ABOVE GRADE

Plastic pipe should not be exposed above grade. Where it does extend above grade, it should be protected from mechanical damage by metal risers.



CAUSE This is an installation issue.

STRATEGY Where you see plastic gas piping coming out of the ground, you should report it.

3.2.1.9 PIPING IN CHIMNEYS OR DUCT SYSTEMS

Gas piping should not be in chimneys or in duct systems.

CAUSES This is an installation issue.

STRATEGY Watch for gas piping disappearing into or coming out of chimneys or duct systems. Where you see it, recommend further investigation and possible rearrangement.

These issues are within the judgment of the inspector having jurisdiction, and allowances may have been made for reasons that are not apparent to us. We should recommend that they be investigated, but let your client know that they may be acceptable.

3.2.1.10 COPPER TUBING NOT PROPERLY LABELED

CAUSES This is an installation issue.

IMPLICATION Gas tubing may be mistaken for water piping, with disastrous results.

STRATEGY Look for the word **gas**, or **natural gas** in black letters on yellow labels, every 5 feet along the pipe length or a yellow stripe (paint or tape) on the pipe. Where it is not visible, recommend further investigation. Labeling is not required where the tubing is in the same room as the appliance.