

***INSTALLATION
OF GAS PIPING***

Online Training Presented by

***Georgia Plumbers' Trade
Association for Continuing
Education Inc.***

In this Class we Cover:

- Codes that cover Fuel Gas Piping
- Approved Piping Materials and Joints
- Gas Piping Installation
- Sizing of Gas Lines
- Use of Sizing Tables
- Piping Example Problem

Georgia's Gas Codes

The installation of fuel gas piping systems in Georgia is covered by multiple standards or codes.

The **2000 Standard Gas Code with Georgia Amendments** is the Georgia State Minimum Standard Code covering Fuel Gas Piping Installation. This code is adopted by the Georgia Department of Community Affairs (DCA) as part of the State's Minimum Standard Codes for Construction. All questions included in the State's exam for a plumbing license that cover fuel gas piping installations are taken from this code. (See next page for scope of Gas Code).

The second code is the **National Fire Prevention Association (NFPA) 54 with State Amendments**. This standard is used by the State Fire Marshal's Office to cover installation of gas piping systems. Under State law, the State Fire Marshal's office only inspects commercial installations.

Liquefied Petroleum Gas (LP) piping must comply with National Fire Prevention Association (NFPA) 58. Although the Standard Gas Code covers sizing of LP gas systems, it refers installers to NFPA 58 for installation guidelines.

2000 Standard Gas Code and Georgia Amendments .

Scope of Standard Gas Code (Page 2 of Georgia Amendments)

The Standard Gas Code (International Fuel Gas Code), 2000 Edition, as published by the Southern Building Code Congress International, Inc., when used in conjunction with these Georgia Amendments, shall constitute the official *Georgia State Minimum Standard Gas Code (International Fuel Gas Code)*.

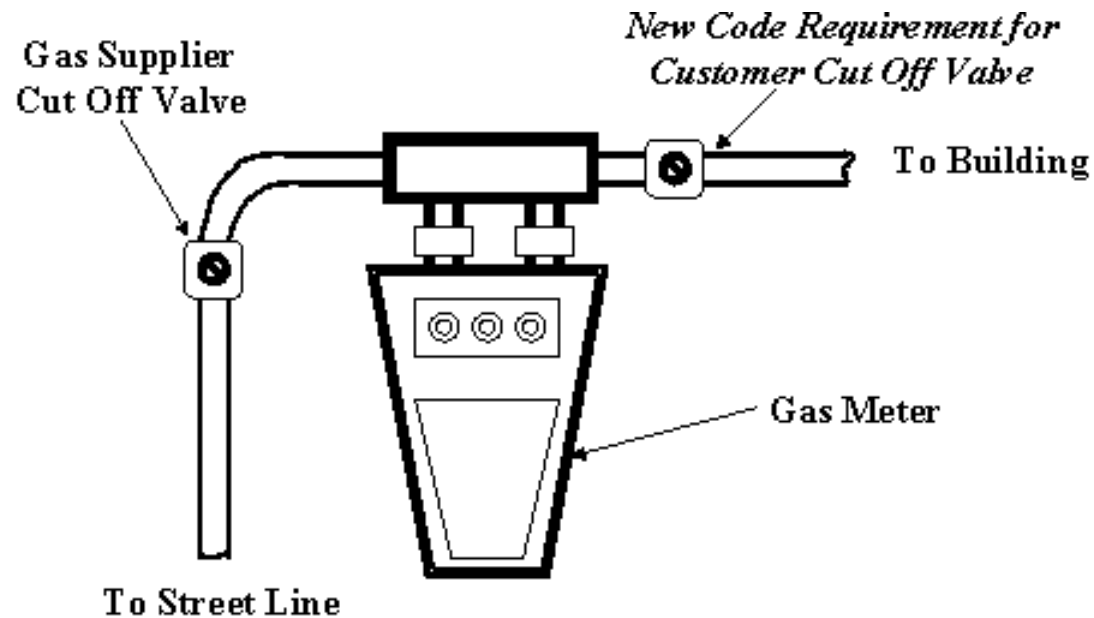
Appendices

Appendices are not enforceable unless they are specifically referenced in the body of the code or adopted for enforcement in the ordinance of the authority having jurisdiction.

What is Covered by the Codes

- * The codes covers the pipe system from the point of delivery to the appliance. The point of delivery is generally considered the gas meter.
- * The codes covers design, materials, component fabrication, assembly, installation, testing, inspection, operation and maintenance for these systems.
- * In applying this code, reference shall be made to the manufacturer's installation instructions and the serving gas supplier's regulations.
- * The class includes all requirements set forth by Georgia Amendments. The example on the next page show an amendment which requires a shut off valve to be installed on the customer's side of the meter so that gas can be shut off to the building without shutting off the meter. This became effective January 1, 2003 and applies to all new piping installations and retrofits.

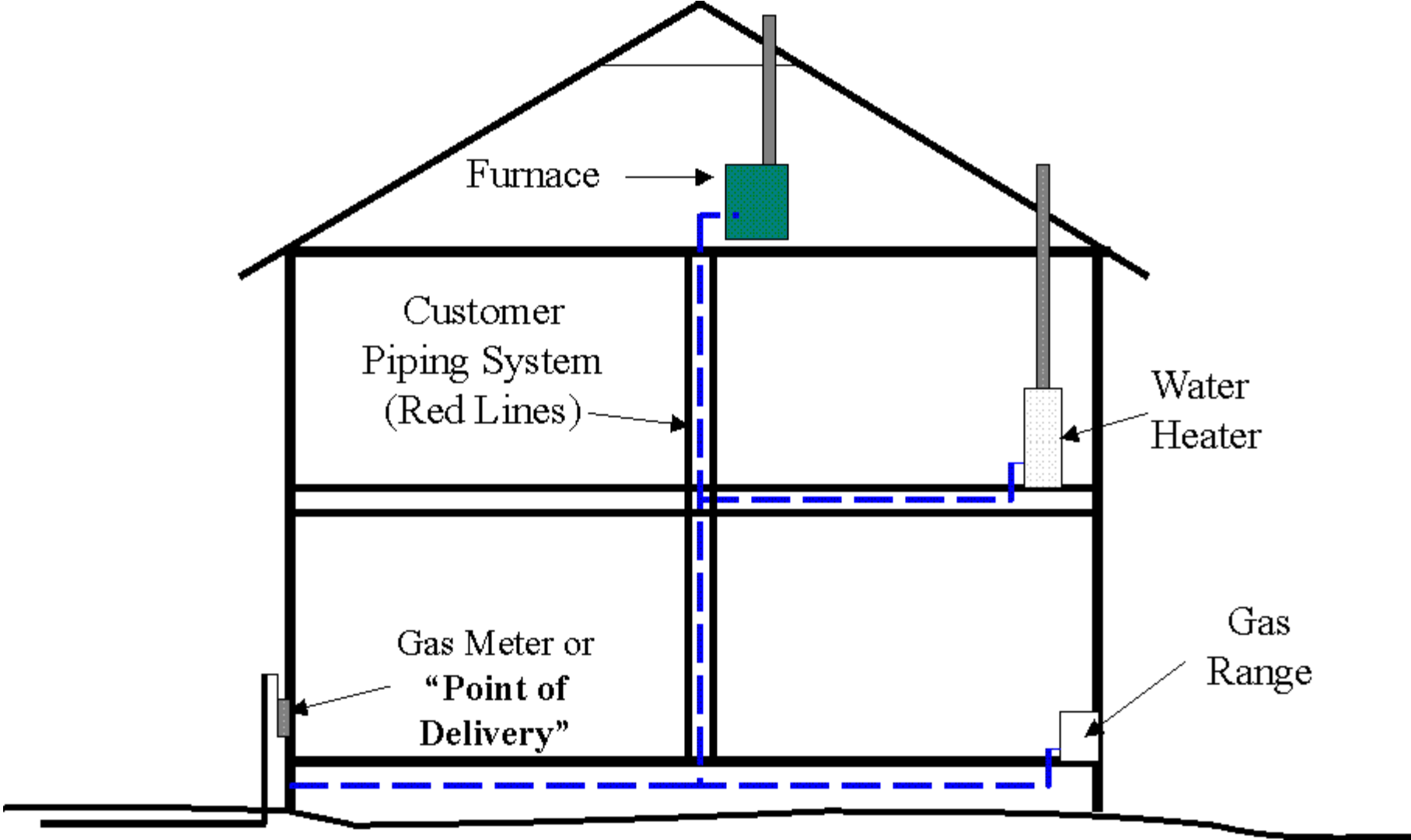
Typical Natural Gas Meter Assembly



New Code Requirements on Connections Natural Gas Meters

**Georgia requirement for shut off installed
on the customer's side of the meter. (January 1, 2003)**

All Gas Piping Marked In Blue Covered by the Codes



Required Inspections of Fuel Gas Systems

- ✿ Inspections on Gas Piping Systems in Georgia are generally performed by local inspectors. In some cases where inspectors are limited, local gas company personnel and fire officials make the inspections. In areas of the state where there are no inspections by local officials, the installer must still comply with all requirements set forth in the state codes (State law).
- ✿ Inspections generally consist of a rough-in and final inspection. Most inspection departments require a pressure test to be installed on the piping system at the rough-in stage. This is to insure no leakage in the system. Test pressure must be one and one half ($1\frac{1}{2}$) times the working pressure of the system and in no case less than 3 pounds per sq. In. (psi). Test for 30 minutes for each 500 feet of pipe, or 10 minutes minimum for small systems
- ✿ The local AHJ can require a piping diagram for any gas piping installation, and will almost always require an engineer (P.E.) to design and stamp larger jobs.

Piping Materials

- ✱ The most common material used for gas piping is a **Metallic or metal pipe**. These consist of steel, iron, copper, brass and aluminum.
- ✱ **Pipe and Tubing.** Pipe and tubing are common terms in gas systems. Pipe is defined as a rigid conduit of iron, steel, copper brass or plastic. Tubing is defined as a semi-rigid conduit of copper, aluminum, plastic or steel. For the purpose of simplifying the code, the term pipe is used to describe both pipe and tubing in a system. On the permissible joints listed, only those listed for pipe shall be used on pipe and those listed for tubing shall be used for tubing.

Piping Materials

Metallic Pipe

- ✿ Black iron and hot dipped galvanized iron used for fuel gas piping must be Standard Weight (schedule 40) minimum of listed materials. These type piping can be used for all type fuel gases and is approved for interior, exterior or underground use.
- ✿ Other metals approved for fuel gas piping include copper, brass and aluminum. Copper and brass are approved for interior, exterior or underground use. It is important to remember to use copper and brass only where gas contains less than an average of 0.3 grains of hydrogen sulfide per 100 SCF. Amounts greater than this can cause scaling or deterioration's of the pipe. Nearly all gas delivered to customers today contain hydrogen sulfide levels far below this amount.
- ✿ Because of it's nature, aluminum pipe is approved only for use indoors.

Piping Materials

Metallic Tubing

- ✱ Tubing is made of the same materials as piping. Seamless copper and aluminum alloy tubing can be used with non corrosive gases. Aluminum tubing cannot is not approved for underground or exterior use.
- ✱ The newest metallic piping for fuel gas systems **Corrugated stainless steel tubing (CSST)**. This pipe is quickly becoming the product used by more installers because of the ease of installation.
- ✱ The corrugated steel tubing is covered with a vinyl coating to make the pipe move smoothly through penetrations in walls and floor joist. Connections are made with special self flaring fittings
- ✱ Sizing and installation follow the same requirements as other materials but the main difference with this product is *you must be certified by the piping manufacturer to install CSST,*

Piping Materials

Plastic Piping

Plastic fuel gas piping is made of a polyethylene material. This is the same material used to manufacture pex plumbing piping. Because of the nature of this product it is only approved for exterior underground use. Because of its cost and flexibility this product is mainly used as gas mains and supply line by the local gas suppliers. It can be installed as part of the customers piping system but is limited to supplying gas to outdoor grills and lighting fixtures.

Fuel Gas Piping Standards

All piping used in fuel gas systems must be tested and comply to the appropriate standards. Listed below are piping materials and the correct listed standard.

MATERIAL	STANDARDS
Welded and Seamless Wrought- Steel Pipe.	ANSI/ASME B36.10
Steel, Black and Hot Dipped. Zinc Coated Welded and Seamless Pipe	ASTM A 53
Seamless Carbon Steel Pipe for High Temperature Service.	ASTM 106
Ductile-Iron Pipe, Centrifugally Cast, In Metal Molds or Sand Lined Molds for Gas	ANSI A21.52
Ductile Iron pressure Pipe	ASTM A377
Electric Resistance-Welded Coil Steel Tubing for Gas and Fuel Oil Lines	ASTM A 539
Copper Brazed Tubing	ASTM A 254
Type K, L Seamless Copper Water Tube	ASTM B 88
Seamless Copper Tube for Air Conditioning and Refrigerate Field Service	ASTM B 280
Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube	ASTM B 241
Corrugated Stainless Steel Tubing	ANSI/AGA LC 1
Thermoplastic Gas Pressure Pipe, Tubing and Fittings	ASTM D 2513 (Gas)

Joints and Fittings of Gas Piping

Metallic Piping

The code considers all possible forces natural and man made that may affect the integrity of metallic piping joints and fittings. It stipulates that the type of piping joint used shall be suitable for the pressure-temperature conditions and shall be selected giving consideration to joint tightness and mechanical strength under the service conditions. The joint shall be able to sustain the maximum end force due to the internal pressure and any additional forces due to temperature expansion or contraction, vibration, fatigue, or to the weight of the pipe and its contents.

As you will see in the code requirements, fittings should always be of the same or similar type material as pipes. This is because connecting two different types of metal together causes a *galvanic action (electrical discharge)* which causes the pipes to corrode at the joint. For this reason you are required to install dielectric fittings if you are connect dissimilar metal piping. These type fitting have an insulator so the electric current cannot travel between pipes.

Joints and Fittings

Metallic Piping

Pipe and tubing joints are limited to those described in the code book. The following are some of those listed in Chapter 4 of the Gas Code.

✱ **Pipe Joints** shall be threaded, flanged, or welded, and nonferrous pipe shall be permitted to also be brazed with materials having a melting point in excess of 1,000°F (538°C). Brazing alloys shall not contain more than 0.05 percent phosphorus.

✱ **Tubing joints.** Tubing joints shall be either made with approved gas tubing fittings or brazed with a material having a melting point in excess of 1,000°F (538°C). Brazing alloys shall not contain more than 0.05 percent phosphorus.

✱ **Flared joints.** Flared joints shall be used only in systems constructed from nonferrous pipe and tubing where experience or tests have demonstrated that the joint is suitable for the conditions and where provisions are made in the design to prevent separation of the joints.

Joints and Fittings

Metallic Piping Fittings

The code places many different restrictions on piping materials fitting and joints on piping systems. The following are just some of these restrictions. It is always best to refer to the Gas code when installing a system.

✱ **Brass**, bronze, or copper fittings. Fittings, if exposed to soil, shall have a minimum 80 percent copper content. Copper alloy fitting generally have 60%

✱ **Aluminum alloy** fittings. Threads shall not form the joint seal.8. Zinc-aluminum alloy fittings. Fittings shall not be used in systems containing flammable gas-air mixtures.

✱ **Special fittings**. Fittings such as couplings, proprietary type joints, saddle tees, gland-type compression fittings, flared, flareless, or compression type tubing fittings shall be permitted to be used provided they are used within the fitting manufacturers' pressure-temperature recommendations; used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction; installed or braced to prevent separation of the joint by gas pressure or external physical damage; and approved

Joints and Fittings

Plastic Piping

✱ **Plastic piping**, joints, and fittings. Plastic pipe, tubing, and fittings shall be joined in accordance with the manufacturers' instructions. Such joint shall comply with the following:

1. The joint shall be designed and installed so that the longitudinal pull-out resistance of the joint will be at least equal to the tensile strength of the plastic piping material.
2. Heat-fusion joints shall be made in accordance with qualified procedures that have been established and proven by test to produce gas tight joints at least as strong as the pipe or tubing being joined. Joints shall be made with the joining method recommended by the pipe manufacturer. Heat fusion fittings shall be marked "ASTM D2513."

Joints and Fittings

Plastic Piping Joints

3. Where compression type mechanical joints are used, the gasket material in the fitting shall be compatible with the plastic piping and with the gas distributed by the system. An internal tubular rigid stiffener shall be used in conjunction with the fitting. The stiffener shall be flush with the end of the pipe or tubing and shall extend at least to the outside end of the pipe or tubing and shall extend at least to the outside end of the compression fitting when installed. The stiffener shall be free of rough or sharp edges and shall not be a force fit in the plastic. Split tubular stiffeners shall not be used.

4. Plastic piping joints and fittings for use in liquefied petroleum gas piping systems shall be in accordance with NFPA 58.

Installation of Fuel Gas Piping Systems

The Gas Code gives instructions and requirements for fuel gas piping installed outside and inside the building. There are limitations to placement, protection of pipes, burial depth, and limitations of materials.

Piping Installation

Underground Piping

- ✱ **Underground gas piping** must be installed so that a clearance is maintained for the safety of the pipe. Currently fuel gas piping should be buried 18” deep (recommended), but 12” is the absolute minimum depth. If this depth is not possible then a protective sleeve of material such as iron shall be installed to protect plastic pipe. If the pipe is plastic a tracer wire must be buried with the pipe.
- ✱ **Protection against corrosion.** Metallic pipe or tubing exposed to corrosive action, such as soil condition or moisture, shall be protected in an approved manner. Zinc coatings (galvanizing) shall not be deemed adequate protection for gas piping underground. *(GA Amendment allows Zinc coating as protection for piping installed underground).* Where dissimilar metals are joined underground, an insulating coupling or dielectric fitting shall be used. Piping shall not be laid in contact with cinders (concrete block). All threaded joints shall be protected by a non-corrosive agent.

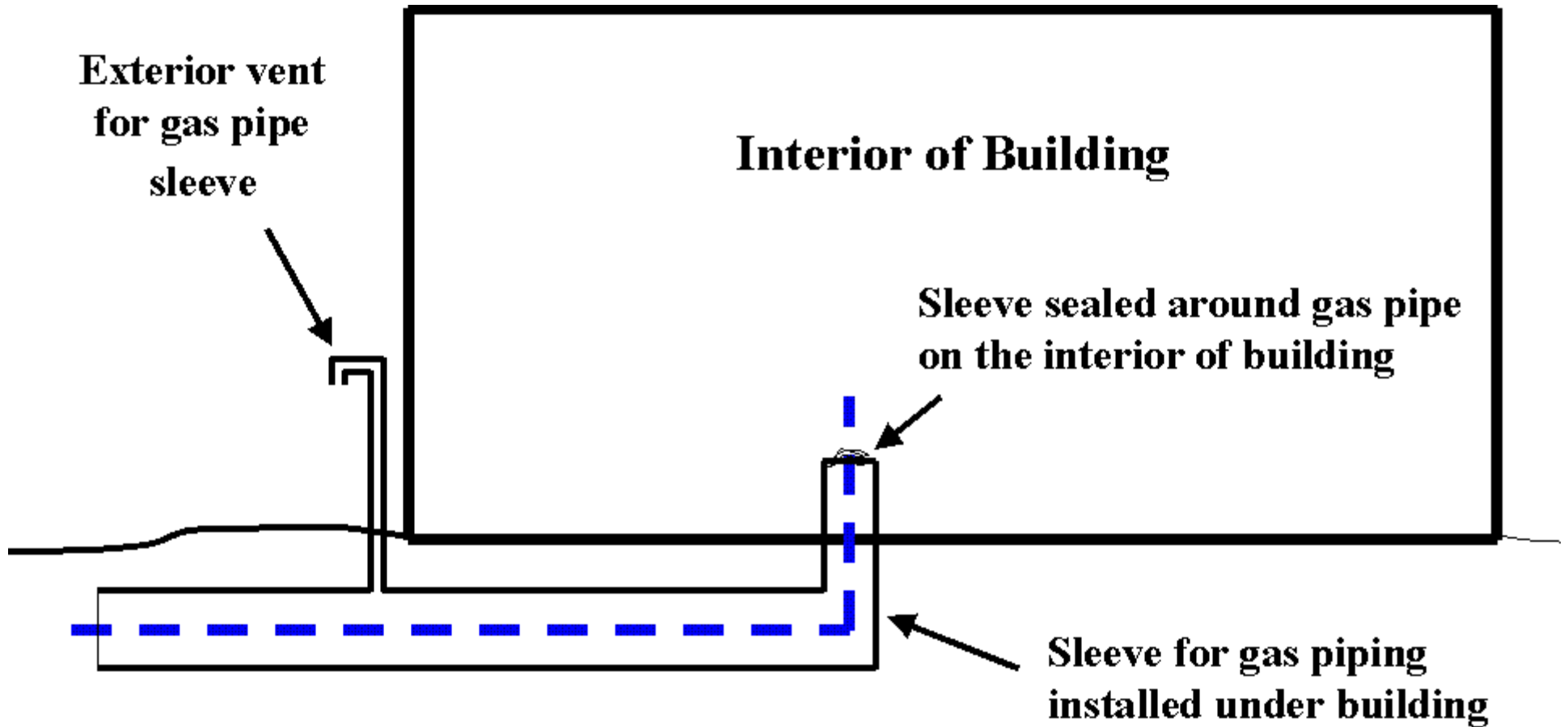
Piping Installation

Underground Piping

Piping underground beneath buildings. Piping installed underground beneath buildings is prohibited except where the piping is encased in a conduit of wrought iron, plastic pipe, or steel pipe designed to withstand the superimposed loads. Such conduit shall extend into an interior portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. Where the end sealing is capable of withstanding the full pressure of the gas pipe, the conduit shall be designed for the same pressure as the pipe. Such conduit shall extend not less than 4 inches (102 mm) outside the building, shall be vented above grade to the outdoors, and shall be installed so as to prevent the entrance of water and insects. The conduit shall be protected from corrosion in accordance with 404.8.

Piping Installation

Piping Installed Under a Building



Piping Installation

Piping Inside Buildings

- ✱ **Fuel gas piping** installed inside a building is prohibited in circulating air duct, clothes chutes, chimney or gas vents, ventilating duct, dumbwaiters or elevator shafts. No gas valves shall be located above suspended ceilings except for Appliance Shut off Valves.
- ✱ **Piping installed in walls**, floors or ceilings that is not schedule 40 iron or steel is required to be protected by metal nail guards. Anywhere damage is possible from nail or screw penetration you must protect the pipe.
- ✱ **Piping** shall not be installed in contact with other metal piping or electrical wiring.
- ✱ **Concealed Piping** Inside Buildings shall not have compound fittings used in that part of the system including unions and fittings containing bushings. Listed fittings are permitted to be concealed, including tees, couplings and nipples

Piping Installation

Shut Off Valves

- ✱ **A shut off valve** is required on every fuel gas system and gas appliances. These valves shall be located in places so as to provide access for operation and shall be installed so as to be protected from damage. Locations where shut off valves are required are:
 - ✱ **Meter valve.** Every meter shall be equipped with a shutoff valve located on the supply side of the meter..
 - ✱ **A listed shutoff** valve shall be installed immediately ahead of each MP (Medium Pressure) regulator.
 - ✱ **Equipment shutoff valve.** Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6-feet from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves. Such shutoff valves shall be provided with ready access.

Piping Installation

Sediment Traps

What is a sediment trap and what purpose does serve?

Sediment traps are identical to drip legs that were installed in the piping system to collect any moisture and trash and keep it from reaching the appliance. Since gas delivered today is refined through a drying process and contains almost no moisture drip legs are no longer necessary. To collect any trash or dust that can be inside the pipe that could cause problems for the gas appliance. sediment traps are now required to be installed at the appliance. Appliances requiring a sediment trap is one that operates automatically. These would include furnaces and water heaters. Gas lights, ranges, clothes dryers, and outdoor grills do not need a sediment trap

The Standard Gas Code 2000 edition addresses sediment traps in Section 408.4 and states: Where a sediment trap is not incorporated as a part of the gas utilization equipment, a sediment trap shall be installed as close to the inlet of the equipment as practical. The sediment trap shall be either a tee fitting with a capped nipple in the bottom opening of the run of the tee or

Sediment Traps

The Standard Gas Code, 2000 Edition)

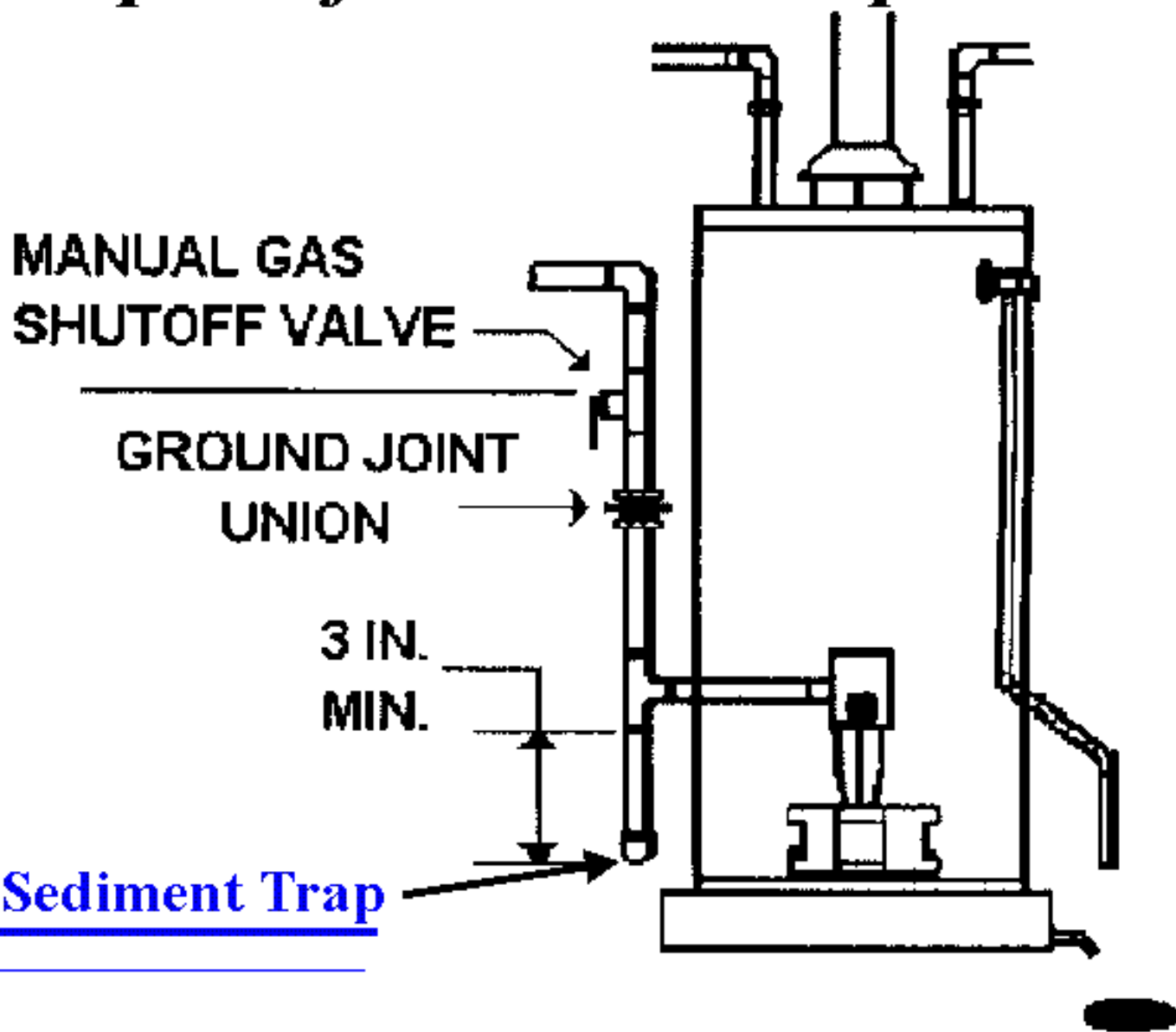
Sediment traps

Manufacturer's Installation Instructions

✱ All **Codes** include the following wording regarding manufacturer's instructions: "Regardless of any installation requirements in this or other chapters, all listed appliances and accessories shall be installed according to the terms of their listing. Compliance with this requirement by the installing agency is fulfilled by following the instructions on the appliance rating plates and other marking requirements on all gas appliances and equipment together with the manufacturers' detailed installation and operating instructions."

✱ **Water heater and furnace manufacturers'** installation instructions requires a Dirt Leg /Sediment trap to be installed as close as practical to the fuel inlet of the appliance at the time of installation unless the appliance has a built-in trap. All of the following examples of sediment traps have been approved by manufactures.

Examples of Sediment Traps



Examples of Sediment Traps

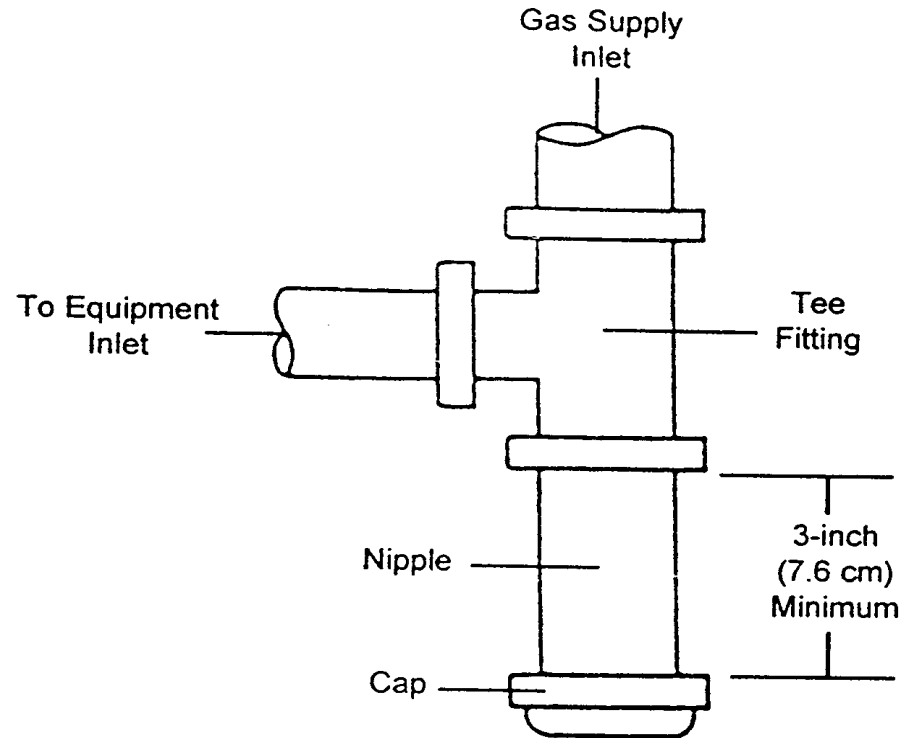


Figure 5.9a
Recommended Sediment Trap

Examples of Sediment Traps

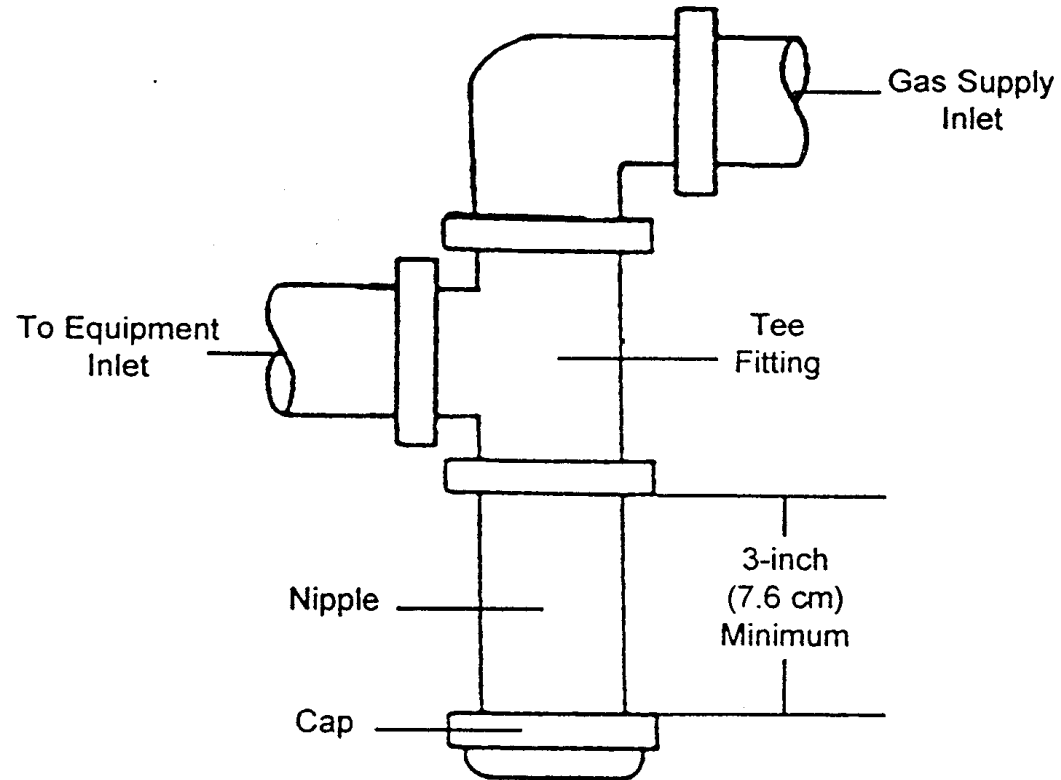


Figure 5.9c
Recommended Sediment Trap

Examples of Sediment Traps

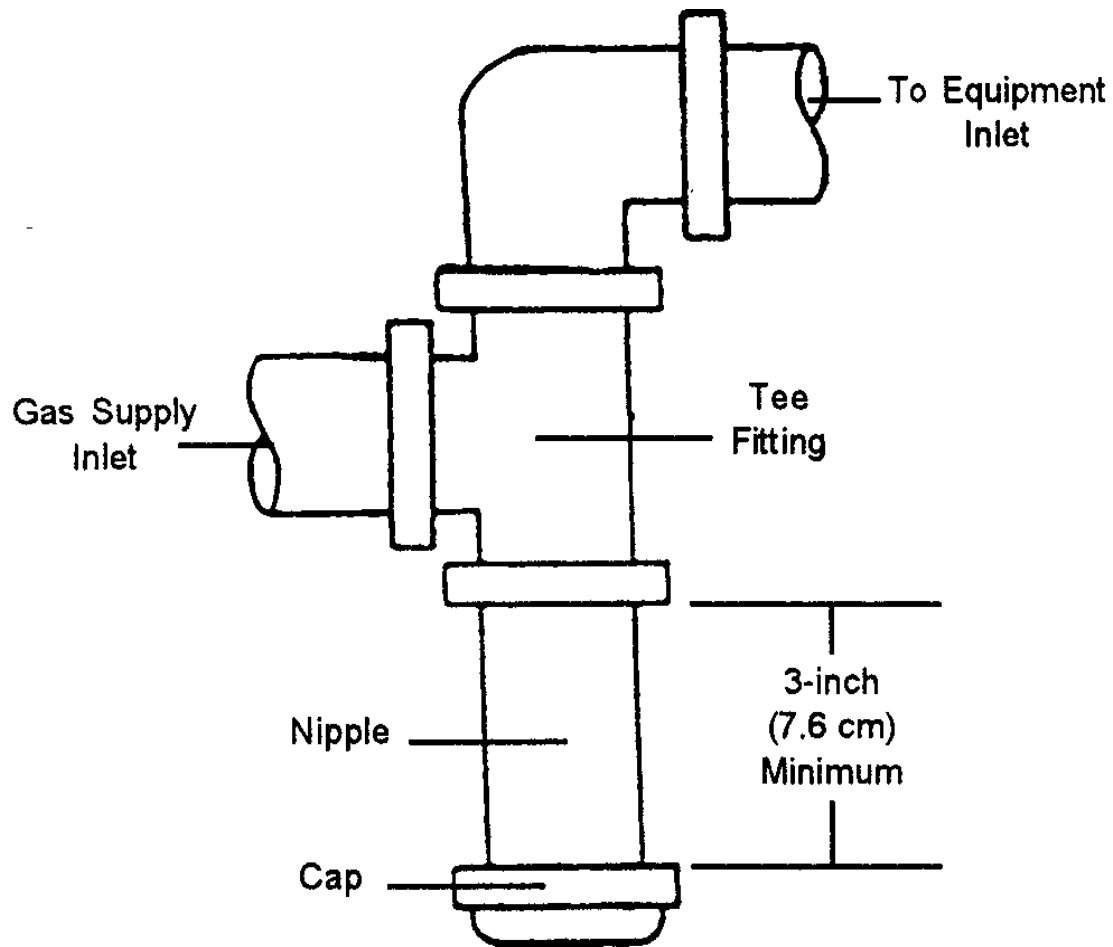


Figure 5.9b
Recommended Sediment Trap

Course Complete

****Congratulations, You have completed this course. Make sure you complete the next page. It certifies the completion of this course and one (1) hours of credit.

[Click Here](#)