CHAPTER III
MATERIALS AND EQUIPMENT QUALIFIED FOR USE IN PROPANE GAS SYSTEMS

INTRODUCTION

The pipeline safety regulations refer to NFPA 58 for materials and equipment used in propane gas systems. Where the subject is not covered in NFPA 58, 49 CFR Part 192 is used. **In the event of a conflict between 49 CFR Part 192 and NFPA 58, NFPA 58 shall prevail**.

It is important for an operator to know the piping materials and propane storage tank sizes for all systems. The operator should develop, or have the system installer or consultant develop, a list of qualified materials for construction and repair of the system. This can be accomplished by referring to NFPA 58 and referencing equipment manufacturers' installation manuals.

When purchasing materials for use in a propane pipeline system, it is important to be sure that all materials conform with NFPA 58, and are recommended by the manufacturer for propane service. Of course, a propane pipeline system consists of storage tanks, valves, pressure regulators, pipe, fittings and meters.

TANKS

NFPA 58 permits only pressure vessels built in accordance with:

- The ASME Boiler and Pressure Vessel Code, "Rules for the Construction of Unfired Pressure Vessels," Section VIII, or
- The Regulations of the U.S. Department of Transportation (DOT) to be used in propane gas systems.

NFPA 58 does not contain the specific requirements for these pressure vessels.

ASME containers shall be marked in accordance with the following, per NFPA 58:

(a) The marking specified shall be on a stainless steel metal nameplate attached to the container, located to remain visible after the container is installed. The nameplate shall be attached in such a way as to minimize corrosion of the nameplate or its fastening means and not contribute to corrosion of the container. Exception: Where the container is buried, mounded, insulated or otherwise covered so the nameplate is obscured the information contained on the nameplate shall be duplicated and installed on adjacent piping or on a structure in a clearly visible location.

(b) Service for which the container is designed (for example, underground, aboveground or both)

(c) Name and address of container supplier or trade name of container

(d) Water capacity of container in pounds or U.S. gallons

(e) Design pressure in pounds per square inch

(f) The wording "This container shall not contain a product that has a vapor pressure in excess of psig at 100°F" (See NFPA 58, Table 2-2.2.2.)
(g) Outside surface area in square feet
(h) Year of manufacture
(i) Shell thickness and head thickness
(j) OL, OD, HD
(k) Manufacturer's serial number
(l) ASME Code symbol

NOTE: If the nameplate is not attached, the tank does not meet the ASME Code and cannot be used.

ASME tanks do not have to be retested or inspected after they are placed into service. Prior to the installation of a previously used container, it may be prudent to have the container inspected to assure that there is no corrosion or damage that could impair the integrity of the container. Welding repairs to ASME tanks can be made only by repair personnel who have been certified under the ASME Code and have been issued an "R" stamp. Repairs must be stamped with the "R" stamp and the work documented.

DOT cylinders are designed for transportation, so their weight is an important consideration. They use thinner walls than ASME tanks and must be periodically recertified and so marked. All DOT cylinders have one or more dates stamped on the cylinder, usually on the collar that protects the cylinder valve from damage. Cylinders cannot be filled if the date on the cylinder has passed. A filled cylinder can be used at any time after the date has expired.

The largest DOT cylinder for propane service has a water capacity of 1,000 pounds, about 420 pounds of propane. Cylinders are usually found only in smaller systems.

PIPE

NFPA 58 provides a list of pipe and tubing materials and fittings that can be used in propane systems. Be sure to check the latest edition of NFPA 58 referenced in 49 CFR Part 192 for any materials that may have been added or deleted.

Pipe meeting the following specifications can be used:

Wrought-iron pipe ANSI B36.10M, Welded and Seamless Wrought Steel Pipe.

Steel pipe	ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
Steel pipe	ASTM A106, Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
Brass pipe	ASTM B43, Specification for Seamless Red Brass Pipe, Standard Sizes.
Copper pipe	ASTM B42, Specification for Seamless Copper Pipe, Standard Sizes.
Polyethylene pipe	ASTM D2513, Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

Note that pipe must be recommended by the manufacturer for use with LP gas. Polyethylene pipe must be marked in compliance with the product marking requirements of ASTM D2513, and must include:

- The manufacturer's name or trademark,
- The Standard Dimensional Ratio (SDR) of the pipe,
- The size of the pipe,
- The designation polyethylene (PE), the date manufactured and the designation ASTM D2513.

TUBING

Tubing meeting the following specifications can be used:

Steel tubing	ASTM A539, Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas Fuel Oil Lines.
Brass tubing	ASTM B135, Specification for Seamless Brass Tube.
Copper tubing	ASTM B88, Type K or L, Specification for Seamless Copper Water Tube. ASTM B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
Polyethylene tubing	ASTM D2513, Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

FITTINGS

Fittings used with Metallic Pipe - Fittings in metallic pipe and tubing must be steel, brass, copper, malleable iron, ductile (nodular) iron or plastic. No cast iron can be used. Pipe joints in wrought iron, steel, brass or copper pipe can only be flanged, threaded, welded or brazed. Brazed fittings must be made using a brazing filler material and must have a melting point exceeding 1,000º F. (All commercially available brazes meet this requirement.) This eliminates solder as a tubing joining material. When a flange is opened, the gasket must be replaced.

Joining Polyethylene Pipe and Tubing - Joints in polyethylene pipe and tubing must be made using the following procedures:

a. Heat fusion.

ASTM D2683, Specification for Socket-type Polyethylene (PE) Fittings for Outside Diameter Controlled Polyethylene Pipe; or
ASTM D3261, Specification for Butt Heat Fusion Polyethylene (PE) Plastic Pipe and Tubing; or
ASTM F1055, Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing,

b. Compression-type mechanical fittings up to 2 inches.

Must comply with Category 1 of ASTM D2513 for mechanical joints and be tested and shown to be acceptable for use with polyethylene pipe and polyethylene tubing and meeting additional requirements in NFPA 58.

c. Factory-assembled transition fittings.

All fittings used to join polyethylene pipe or polyethylene tubing shall be tested and recommended by the manufacturer for use with polyethylene (PE) pipe and shall be installed according to the manufacturer's written procedure.

d. Anodeless risers.

Factory-assembled anodeless risers must be recommended for LP-Gas by the manufacturer. Field-assembled anodeless risers are design certified to meet the requirements of Category 1 of ASTM D2513 and the requirements of NFPA 58.

Anodeless risers are used to make the transition between underground PE pipe or tubing and metal pipe aboveground. As PE must be installed below ground, risers are commonly used to connect the underground PE to aboveground piping materials. Anodeless risers are available as factory assembled units and field assembled kits. Anodeless risers are made from PE pipe inside a protective metal sheath, usually schedule 40 steel pipe. The metal is protected from corrosion by a factory applied coating, and a separate anode is not required, hence the name, "anodeless". Factory assembled risers usually have a 90 degree bend at the PE connection end and come in several lengths depending on the depth of burial of the PE pipe or tubing.

Polyethylene pipe cannot be joined by a threaded or miter joint.

Installation - All PE fittings must be installed in accordance with the fitting manufactures' instructions by persons trained in the applicable joining procedure. The training must be documented.

Fittings for polyethylene pipe and tubing must be fabricated from materials listed in ASTM D2513, Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings and must be recommended for LP gas use by the manufacturer.

Operating Pressure	Fitting design pressure
Higher than container pressure	350 psig, min
Liquid propane or vapor over 125 psig	250 psig
Propane vapor less than 125 psig	125 psig

VALVES

All valves used in metallic piping systems must have pressure containing parts of steel, ductile (nodular) iron, malleable iron or brass. All materials used, including valve seat discs, packing, seals and diaphragms, must be resistant to the action of LP gas under service conditions. Many valves are listed by independent testing laboratories for use in LP gas service. These can be used as recommended by the manufacturer. Other valves can be used, but must comply with the requirements of NFPA 58 and should be recommended by the manufacturer for LP gas service to be sure that all the component parts of the valve are approved for LP gas service.

Valves used with polyethylene pipe and tubing must meet the requirements of ASTM D2513 and be so marked.

OVERPRESSURE PROTECTION EQUIPMENT

The requirements for two-stage pressure regulators in NFPA 58 incorporate overpressure protection. No additional equipment for overpressure protection is needed when residential systems complying with NFPA 58 are installed. Overpressure protection is accomplished by reference to the requirements of UL 144, Pressure Regulating Valve for LP-Gas, which requires integral pressure relief to limit the outlet pressure of the second stage regulator to 2 psig or less in the event of failure of either the first or second stage pressure regulator under failure conditions.

All first stage propane pressure regulators up to a capacity of 500,000 BTU/hr are designed to deliver a maximum of 10 psig to the second stage regulators. This type of regulator incorporates a pressure relief valve which is operated by over-travel of the diaphragm stem. This pressure relief feature actuates when the diaphragm has traveled as far as it can in an effort to maintain the desired 10 psig outlet pressure. Integral pressure relief is required on all first stage regulators of this size. Regulators larger than 500,000 BTU/hr either incorporate integral overpressure protection or can use a separate external pressure relief valve. When specifying regulators larger than 500,000 BTU/hr it is important to specify an integral or separate overpressure protection device. The overpressure protection device can be a pressure relief valve, a second regulator in series (monitor regulator) or an automatic shutdown device. Regulators incorporating an integral pressure regulator are available up to 2,500,000 BTU/hr. Larger regulators use separate pressure relief valves which must be sized to insure that the rated inlet pressure of the second stage regulator is not exceeded. Regulator manufacturers can provide assistance in sizing larger systems.

The second stage pressure regulator, located near each gas user in the system, is designed to reduce the 10 psig propane pressure to 11 inches of water column. This regulator incorporates a full capacity relief valve similar in design to the relief valve in the first stage which will limit the downstream pressure to less than 2 psig in the event of an emergency situation.

The limit of 2 psig was selected to correspond to requirements for appliance pressure controls. The standards for appliance pressure controls have been revised to test for overpressure of up to 2 psig with no leakage out of the appliance control. The control is not required to properly operate following an overpressure of 2 psig, but must not leak gas into the building.

It must be remembered that this means of accomplishing overpressure protection operates by releasing propane to the atmosphere instead of inside a building in the event of a failure. Operators of small propane systems may elect to advise their customers of the need to report any releases of propane which will be identified by an obvious hissing noise coming from either regulator.

NFPA 58 and UL 144 were revised in the 1995 edition to incorporate this overprotection system. The final date to produce regulators under the previous edition of UL 144 was June 1, 1998. Most manufacturers have revised their regulators to meet the new requirements in 1995. If in doubt, specify that all regulators meet the latest edition of UL 144.