

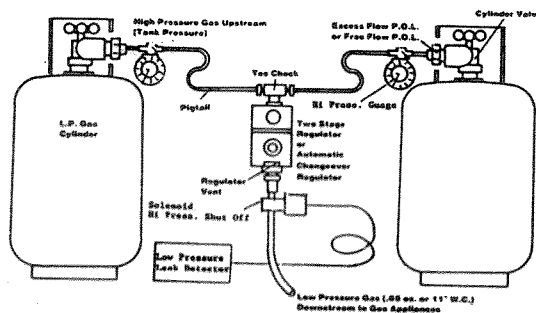


TRIDENT RUBBER, INC.
 R.D. 2 • BOX 250 • CANONSBURG, PA 15317
 412/745-9311

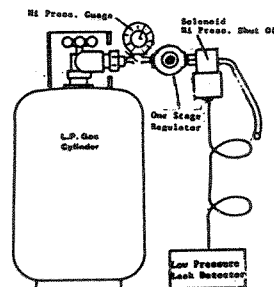
What You Should Know About Your L.P. Gas System and It's Proper Care

Typical L.P. Gas Hook Ups

Two Cylinder Hook Up.



Single Tank Hook Up.



The P.O.L.



P.O.L. Adapter

The P.O.L. (presto-lite) adapter, sometimes called a spud and nut, is required to convey the L.P. gas to the regulator. With a single tank the P.O.L. is inserted directly into the regulator inlet. With a two tank hookup, two pigtails of rubber or copper, with a P.O.L. on one end and an appropriate fitting on the other end, are used.

The P.O.L. has a left-hand (counter-clockwise) thread. Turn it to the left to tighten, to the right to loosen. Since it is a brass-to-brass seal, it is not necessary to use pipe dope. However, be sure to test all connections with a soapy solution before lighting any appliance.

The excess flow and orifice P.O.L.'s are intended to restrict the flow of escaping gas in the event the regulator is broken off at the P.O.L. However, it is not designed to detect a leak or totally shut off the system in the event of leak or failure of the regulator.

An excess flow P.O.L. can cause a restriction in the supply of fuel to appliances. To eliminate this problem; and to help prevent dangerous gas leakage the following procedure and test should be conducted after any emergency or restriction in fuel flow, and everytime the cylinder valve is opened for use:

1. Be sure all appliances, including their pilot lights, are off and no gas is flowing from the system.
2. Open valve of L.P. tank slowly. DO NOT SNAP OPEN
3. If a high pressure gauge is installed on the cylinder side of the regulator as per ABYC A-1.8.b., close cylinder supply valve. Observe the pressure needle. The pressure indicated on the gauge should remain constant for at least 15 minutes. If any leakage is indicated by a pressure drop, check the entire system with a soapy water or detergent solution. If no high pressure gauge is installed, then check all system connections with soapy solution or portable leak detector.
4. NO LEAKAGE SHALL BE TOLERATED, REPAIR BEFORE OPERATING SYSTEM.
5. After opening valve again - wait 15 seconds before lighting appliances.



1300-1411 — Pressure Gauge
 As per ABYC A-1.8.b. it shall be installed on the cylinder pressure side of all regulators to test for system leakage. It is preassembled with a brass street "T" and is to be installed between regulator and P.O.L. using L.P.G. pipe dope or teflon tape.

NEVER USE FLAME TO CHECK FOR LEAKS.

The Hoses



L.P.G. Hoses are manufactured to strict standards and are listed by Underwriters Laboratories and Canadian Gas Assoc. PIGTAILS are High Pressure Hoses used in pairs between two tanks and a two stage regulator. They are assembled from hose which has a rating of 350 PSI working pressure and a burst rating of 1750 PSI. Solid brass, seven barbed P.O.L. and end fittings are crimped on each end and they must withstand a 400 lb. pull test. FUEL SUPPLY LINES and FLEXIBLE CONNECTORS may be Low Pressure Hose assemblies, rated at 1 PSI with a 125 PSI working pressure and a 600 PSI burst strength, and a 200 lb. pull test strength. For additional safety we recommend and provide High Pressure Hose and Fittings on all Marine L.P.G. Hose Assemblies. EXTREME CAUTION should be used when installing Fuel Supply Lines in the heat and when connecting them to appliances, regulator or solinoid. All connections should be wrench tight and pressure tested. The Male Pipe Thread which connects to the regulator must have L.P.G. pipe dope or Teflon tape applied to its threads before connection. Fuel Supply Lines should be installed so that they can be periodically inspected for leaks, damage or aging; and so they are not vulnerable to damage from abrasion, traffic, nails, heat (route away from engine room if possible), etc. The presence of a U.L. label on the hose assembly indicates it has been individually inspected, tested and U.L. listed

FIRE RESISTANT SLEEVE

The Fire Resistant sleeve is a specially formulated conduit designed to provide additional fire resistance to the Flexible L.P.G. Fuel Supply Lines so that they will be capable of withstanding the ABYC A-1.9.b. 2 1/2 minute fire test. It also provides additional protection from abrasion and the elements. To be effective the sleeve should slide over and completely cover the hose assembly. After insuring that each end fitting is connected wrench tight and leak tested, secure each end of the sleeve with a stainless steel clamp.

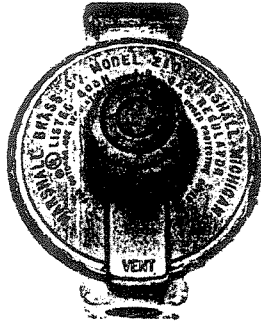
IMPORTANT: We recommend that you read and comply with the attached ABYC "MARINE L.P.G. SYSTEMS"

The Regulator

Two Stage Regulator

Automatic Changeover Regulator

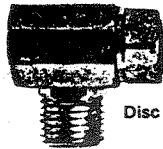
Low Pressure Regulator



The regulator is the heart of your L.P. gas system. It is an automatic device with working parts which move continuously. Consequently, it requires more care, protection and attention than any other part of the system.

The basic function of the regulator is to take a high and varied inlet pressure from the gas cylinder and reduce it to a safe and consistent low outlet pressure to the gas appliances. For example, normal cylinder pressure can vary depending on the outside temperature from a high of 250 pounds per square inch (PSI) to a low of 7 PSI. Whatever the pressure, the regulator's job is to reduce it to 6.35 ounces, or 11 inches water column (WC) outlet pressure, and supply fuel downstream at this pressure in whatever volume required to efficiently operate each appliance as the demand is made.

The Tee Check



Disc Check Tee

HOW TO KEEP YOUR REGULATOR OPERATING EFFICIENTLY & SAFELY

Your regulator is equipped with a vent because it is constantly "breathing." That is, the diaphragm of the regulator moves down and draws air into the bonnet or adjustment spring housing. When the diaphragm moves up, air is expelled through the vent. In the event that excess pressure builds up in the lower housing or body of the regulator, a relief mechanism vents it to the atmosphere. So, it is imperative to check the vent frequently to be sure it is clean and free of water, corrosion or obstructions as clogging is the most common cause of regulator malfunction. Great care has been taken in

the manufacture of your regulator and it has been thoroughly tested and U.L. listed. However, even a small piece of dirt, corrosion, pipe dope or other foreign matter which finds its way into the inlet can result in higher than normal pressure (high lock-up) and/or loss of fuel.

If the vent does become clogged it can easily be cleaned with a toothbrush. In addition, your regulator should be checked periodically by a competent L.P. serviceman to be sure it is properly adjusted and in safe working condition. By following these simple precautions your regulator will give you years of trouble-free service.

HOW SHOULD YOUR REGULATOR BE MOUNTED?

The regulator will function regardless of the position in which it is mounted. However, the recommended mounting position is with the vent vertically down or in a direct line opposite the inlet. If for any reason this is not possible, bear in mind that it is extremely important that the vent be pointed

in a direction which results in the least likelihood of dirt, water or other foreign material getting into the regulator. It is also important to install the regulator in a position in which the cover cannot possibly become a receptacle for water or other foreign material.

WHAT IS REGULATOR FREEZE UP?

A regulator does not freeze, nor will L.P. gas. However, as the gas passes through the regulator it expands and cools and moisture in the gas or in the regulator will turn into ice. This ice can build up and totally or partially block the orifice and thus partially or totally block the fuel supply. There are a number of things you can do to prevent this type of freeze up:

1. Be sure your L.P. cylinder is totally free of moisture before it is filled.

2. Be sure your cylinder is not over-filled. This is particularly important if you have a permanently mounted A.S.M.E. Tank.
3. Keep the valves on empty cylinders closed.
4. Have your L.P. dealer purge the cylinder if freeze up occurs.
5. Have your L.P. dealer inject methyl alcohol in your cylinder.
6. Install a two-stage regulator if your system has only a single-stage regulator.

WHAT IS A TWO-STAGE REGULATOR?

A two-stage regulator performs the same pressure-reducing function previously explained except that it does it in two stages. A two-stage regulation system uses two regulators, either separate ones or, in the case pictured above, both contained in one body. The first stage, or high pressure regulator, reduces the cylinder pressure to approximately 10 to 13 PSI and sends it along to the second stage low pressure regulator which then reduces it to 11 inches W.C. or 6.35 ounces per square inch.

Because cylinder pressure is reduced in two stages and because the second stage receives a consistent rather than varied inlet pressure, the regulator does not have to work as hard. The result is a more efficient, safer system with less chance of irksome problems such as pilot outage, freeze up, etc.

The tee check allows you to run two L.P. gas cylinders through one regulator by using a pigtail from each cylinder valve to the tee check. This converts your regulator to a manual changeover. That is, you open the valve on the cylinder and use it until empty or almost empty, then open the valve on the reserve cylinder, close the valve on the first cylinder, disconnect it and have it refilled. A disc check built into the tee will prevent gas from escaping when the empty cylinder is disconnected.

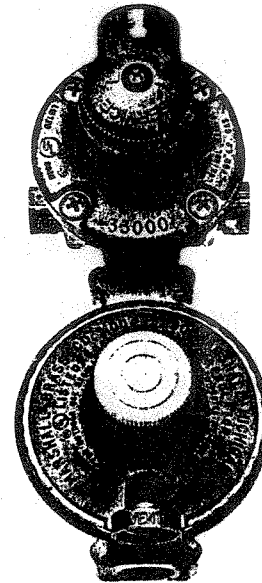
The tee check allows you to run two L.P. gas cylinders through one regulator by using a pigtail from each cylinder valve to the tee check. This converts your regulator to a manual changeover. That is, you open the valve on the cylinder and use it until empty or almost empty, then open the valve on the reserve cylinder, close the valve on the first cylinder, disconnect it and have it refilled. A disc check built into the tee will prevent gas from escaping when the empty cylinder is disconnected.

If the vent does become clogged it can easily be cleaned with a toothbrush. In addition, your regulator should be checked periodically by a competent L.P. serviceman to be sure it is properly adjusted and in safe working condition. By following these simple precautions your regulator will give you years of trouble-free service.

In a direction which results in the least likelihood of dirt, water or other foreign material getting into the regulator. It is also important to install the regulator in a position in which the cover cannot possibly become a receptacle for water or other foreign material.

2. Be sure your cylinder is not over-filled. This is particularly important if you have a permanently mounted A.S.M.E. Tank.
3. Keep the valves on empty cylinders closed.
4. Have your L.P. dealer purge the cylinder if freeze up occurs.
5. Have your L.P. dealer inject methyl alcohol in your cylinder.
6. Install a two-stage regulator if your system has only a single-stage regulator.

1. Be sure your L.P. cylinder is totally free of moisture before it is filled.



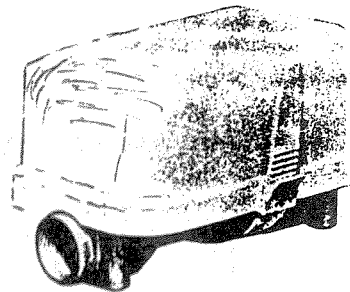
WHAT IS AN AUTOMATIC CHANGEOVER REGULATOR?

An automatic changeover regulator is a two-stage regulator designed for use with two L.P. gas cylinders connected to the regulator with two pigtails in the same manner as with a tee check. With the automatic changeover regulator, both cylinder valves should be open. automatic changeover regulators (such as Model 134-00 pictured) have a changeover knob with an arrow. The cylinder to which the arrow points is the "service" cylinder. The other is the "reserve" cylinder. As long as there is fuel in the service cylinder, an indicator on the top of the regulator will show white. When the service cylinder is empty, the regulator will automatically change to the reserve cylinder and the indicator will change to red.

At this point you should turn off the valve of the service cylinder and turn the changeover knob so that the arrow points to the reserve cylinder, thereby making it the "service" cylinder. The red indicator will change back to white as soon as you turn the knob. You may now disconnect the empty cylinder and have it refilled. When you reconnect it, it then becomes the "reserve" cylinder.

The Cover

A cover is required for certain types of regulators but it is a good idea for all regulators to be protected by some sort of cover whether it is required or not.



Regulator Cover for Control 2 Regulator

Based on ABYC's assessment of the state of existing technology and the problems associated with the requirements of this standard, ABYC recommends compliance with this standard by December 15, 1978.

A-1.1. PURPOSE

These practices and standards are recommended as guides for the design, construction and installation of LPG, Liquefied Petroleum Gas Systems on boats.

A-1.2. SCOPE

These standards and recommended practices apply to all LPG, Liquefied Petroleum Gas Systems on all boats.

NOTE: Attention is directed to the U.S. Coast Guard Regulations which prohibit the use of LPG, Liquefied Petroleum Gas on certain vessels.

A-1.3. DEFINITIONS

- a. ASME - AMERICAN SOCIETY OF MECHANICAL ENGINEERS - An association which has developed, among other standards, a Boiler and Pressure Vessel Code, which specifies design criteria for cylinders.

American Society of Mechanical Engineers
345 E. 47th Street
New York, NY 10017

- b. ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS - ASTM develops and publishes standards on finished products and on materials used in manufacturing and construction.

American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

- c. CERTIFIED - Attested to by documentation as complying with specific regulations or recognized standards as indicated.

- d. CGA - COMPRESSED GAS ASSOCIATION - An industry sponsored association promoting standardization of cylinders and cylinder valves and connections.

Compressed Gas Association
500 Fifth Avenue
New York, NY 10036

- e. CNG - COMPRESSED NATURAL GAS - Consists principally of methane in gaseous form and includes naturally occurring mixtures of hydrocarbon gases. CNG is natural gas that is normally supplied as a fuel by a gas utility and is stored under pressure in cylinders. A CNG mixture of at least 85 percent methane contains over 1000 BTU's per standard cubic foot in calorific value and conforms to other physical properties as further set forth in ABYC A-1.4.

© 1978 American Boat and Yacht Council, Inc.

1

(A-1.4.d.)

A-1 (4)
6-5-80

In its gaseous state LPG presents a fire and explosion hazard comparable to any flammable natural or manufactured gas, except that LPG is heavier than air. Released from their liquid state if unignited, the gases tend to sink to the bottom of an enclosed compartment into which they are released, and though they will diffuse throughout the compartment they are not readily dispelled by overhead ventilation. Mixed with air in certain proportions and confined they will explode if ignited.

TABLE I
PROPERTIES OF CNG AND LPG

PROPERTIES	COMPONENTS OF CNG		COMPONENTS OF LPG	
	Methane		Propane	Butane
Formula	C ₁ H ₄		C ₃ H ₈	C ₄ H ₁₀
Specific Gravity of Gas (Air = 1.0)	0.55		1.55	2.07
Flammable Limits in Air (Explosive Range), Percent by volume,	LOWER	5.0	2.1	1.8
	UPPER	15.0	9.5	8.4
Calorific Value - Net BTU per cubic foot 14.7 psia	1025 (approx.)		2353	3101
Ignition Temperature	1300°F		800°F	750°F
Flame Propagation Rate Feet per second	750		2800	3000

A-1.5. REQUIREMENTS - IN GENERAL

- Comprehensive printed instructions and a labeled diagram covering details of proper installation and operation shall be furnished with each LPG system installed on a boat and it is recommended these be kept on board for ready reference.
- Only systems using LPG cylinders of the vapor withdrawal type are permitted. Cylinders designed or installed so as to admit liquefied gas into any other part of the system are prohibited.
- The use of or storage of stoves, heating devices, lanterns or similar equipment with attached LPG containers is prohibited.
- All liquefied petroleum gases shall be effectively odorized by an agent of such character that the presence of the gas is detectable by the distinct odor, to a concentration in air of not over one-fifth of the lower limit of flammability. It should be recognized that no odorant will be completely effective as a warning agent in every circumstance.
- Components of the LPG system shall be SUITABLE for marine use.

© 1978 American Boat and Yacht Council, Inc.

3

(A-1.3.)

- CYLINDER - Any vessel or container used to transport or store LPG.
- DOT - DEPARTMENT OF TRANSPORTATION - The U.S. Government agency which promulgates rules and regulations for the construction, periodic inspection, and shipment through interstate commerce of portable gas cylinders.
U. S. Department of Transportation
400 Seventh St., S. W.
Washington, D.C. 20590
- LPG - LIQUEFIED PETROLEUM GAS - Includes any products predominately composed of any of the following hydrocarbons: propane, propylene, butanes (normal butane or isobutane), butylenes, or a mixture thereof and conforms to other physical properties as further set forth in ABYC A-1.4.
- SUITABLE - Appropriate for intended purpose and reasonably foreseeable use in the marine environment without necessity of being CERTIFIED.
- SYSTEM - The arrangement of cylinders, safety devices, regulators, connections, valves, piping, tubing, hose, fittings and devices intended to store, supply, monitor or control the flow of fuel gas to appliances, and the appliances.

A-1.4. PROPERTIES OF GASES

NOTE: In the interest of safety, it is important that the properties of LPG, Liquefied Petroleum Gas, must be understood and that safe practices for its use be followed. It is also important that the difference in properties between LPG, Liquefied Petroleum Gas, and CNG, Compressed Natural Gas, as covered in ABYC A-22 "Marine CNG-Compressed Natural Gas Systems", be compared to distinguish between these two types of fuel and their respective hazards.

- LPG - Liquefied Petroleum Gas is a two-phased (liquid/vapor) fuel with a higher calorific value than CNG, Compressed Natural Gas, and is stored at a lower cylinder pressure than CNG.
- LPG is heavier than air and will fall or settle if released. CNG, natural gas, is lighter than air and if released will rise and dissipate into the atmosphere if adequate means of overhead ventilation is provided, and it shall be provided.
- LPG and CNG in their natural state, are non-toxic and invisible.
- Commercially available LPG and CNG, by law, have an odorant added to facilitate leak detection.
 - LPG is a two-phased (liquid/vapor) fuel, having an odor concentration which can vary depending on the volume of fuel remaining in the cylinder.
 - CNG is always in the vapor phase and has an odor concentration which will not change.

The properties of LPG, liquefied petroleum gases must be understood. They are gases at normal room temperature and atmospheric pressure. Under moderate pressure they liquefy, readily vaporizing upon release of the pressure. It is this property which permits the convenience of transporting and storing these hydrocarbons in concentrated form while normally using them in a vapor form.

© 1978 American Boat and Yacht Council, Inc.

2

(A-1.5.)

A-1(4)
12-15-78

- All components of LPG systems subject to cylinder pressures shall have a rated pressure of at least 250 pounds per square inch gauge.
- With each LPG system installed on a boat a sign shall be provided. It shall be located in the immediate vicinity of the cylinder enclosure and plainly visible.

The sign shall withstand the effects of exposure to water, oil, salt spray, direct sunlight, heat, cold and wear expected in normal operation of a boat without loss of legibility, and shall include:

(1)	CAUTION
	THIS SYSTEM IS DESIGNED FOR USE WITH LPG, LIQUEFIED PETROLEUM GAS ONLY. DO NOT CONNECT CNG, COMPRESSED NATURAL GAS TO THIS SYSTEM.
(2)	Keep cylinder valves closed when boat is unattended. Close them immediately in any emergency. It is recommended that cylinder valves be closed when appliances are not in use.
(3)	Be sure all appliance valves are closed before opening cylinder valve.
(4)	Test for system leakage each time the cylinder supply valve is opened for appliance use. Close all appliance valves. Open, then close cylinder supply valve. Observe pressure gauge at the regulating device and see that it remains constant for at least 15 minutes before any appliance is used. If any leakage is evidenced by a pressure drop check system with a soapy water or detergent solution and repair before operating system.
(5)	Test system for leakage at least every two weeks and after any emergency in accordance with paragraph (4) above. Repeat the test for a multi-cylinder system.
	NEVER USE FLAME TO CHECK FOR LEAKS
	NOTE: This sign shall be installed in the vicinity of cylinder and shall be plainly visible.

- The system and all its components shall be capable of operation within an ambient temperature range of, from 0°F (-18°C) to 140°F (60°C).
- In accordance with ABYC Standards ABYC E-8, "Alternating Current AC Systems on Boats", and ABYC E-9, "Direct Current Systems on Boats", if LPG is provided on a boat unattended potential sources of ignition of an electrical nature, below the main deck, shall be external ignition-protected.

A-1.6. CYLINDERS

- Cylinders used in LPG systems shall be constructed, tested, marked, maintained and requalified for continued service in accordance with DOT or ASME regulations.
- LPG cylinders shall be permanently and legibly marked in a conspicuous manner on the outside to show the correct mounting position. The method of mounting in place shall be such as to prevent the possibility of an incorrect positioning of the cylinder.
- Cylinders that have been subject to fire or physical damage shall not be returned to service unless requalified.

© 1978 American Boat and Yacht Council, Inc.

4

A-1.7. CYLINDER VALVES AND SAFETY DEVICES

- a. Each LPG cylinder shall have a manually operated shut-off valve threaded directly into the cylinder outlet, the valve outlet conforming to CGA connection number 510. The valve shall be equipped with a securely attached hand wheel for convenient operation without the use of a separate wrench.
- b. All LPG cylinders shall be provided with a safety relief device specifically designed for LPG as required by DOT regulations.
- c. Cylinder valves and safety relief devices shall be installed in, or have a direct connection with the vapor space of the cylinder.
- d. In addition to the valve required at the cylinder, a dual cylinder system shall be provided with a two-way positive shut-off valve at the cylinder manifold.
- e. Discharge of the safety relief valves shall be vented away from the cylinder into the open atmosphere so as to prevent impingement of escaping gas onto the container.

A-1.8. REGULATING SYSTEM

- a. Each LPG system shall be provided with a regulating device, specifically designed for use with LPG, and so adjusted as to deliver gas at any or each appliance, under varying appliance loads, at a pressure not in excess of 12 inches water column, approximately 0.433 pounds per square inch gauge.
- b. Each regulating device shall be fitted with a pressure gauge. The gauge shall be on the cylinder pressure side of the regulating device. The purpose of the gauge is to provide a quick and easy way to test the system for leakage.

It is recommended that this test be made after any emergency every time the cylinder supply valve is opened for use, and at least every two weeks.

With the appliance valves off, open the cylinder supply valve. Close the cylinder supply valve. Observe the pressure gauge needle. The pressure indicated should remain constant for at least 15 minutes. If any leakage is indicated by a pressure drop, check the entire system with a soapy water or detergent solution. No leakage shall be tolerated, repair before operating system.

NEVER USE FLAME TO CHECK FOR LEAKS

- c. In addition to, but not substituting for the pressure gauge in ABYC A-1.8.b., a leak detector may be installed in the system.
- d. A low-side pressure relief device shall be integral with each regulating system. It shall discharge at between two times and three times the delivery pressure of the regulator.
- e. All relief valve outlets shall discharge to the open atmosphere. The point of discharge shall be at least 2 feet distant from any opening to a cabin or the hull interior or from an engine exhaust which is below the level of the vent discharge.
- f. The relief valve vent discharge outlet shall be located and designed to prevent water from entering the relief valve port.

A-1.9. FUEL SUPPLY LINE

- a. The fuel line system and its components, as installed, shall be designed to be compatible with LPG and to withstand the stresses and exposure to the marine environment.
- b. The LPG fuel supply line and all its fittings, as installed in a boat, shall be capable of withstanding exposure to 2 - 1/2 minutes of free burning heptane externally, while the supply line is pressurized internally with LPG at the system's designed delivery pressure, without failure resulting in a leakage of LPG. The surface of the heptane must be eight to ten inches below the component being tested and the heptane must be in a container large enough to permit the surface of the heptane to extend beyond the vertical projection of the perimeter of the component being tested.
- c. A flexible section can be used to allow the free swing of gimballed stoves. The flexible section must be SUITABLE for marine use with LPG and comply with ABYC A-1.9.a. and ABYC A-1.9.b.
- d. All low pressure distribution tubing, hose or piping between the regulator or leak detector and the appliance shall be SUITABLE for LPG in marine use. One type is:
Annealed copper, tubing, standard type, Grade K or L, conforming to Specifications for Seamless Copper Water Tube (ASTM B88-75a).
- e. All tubing, hose or piping connecting fittings shall be SUITABLE for LPG in Marine use and capable of withstanding the test in ABYC A-1.9.b. and the pressure for which the system is designed.
- f. LPG fuel supply lines shall not be used for an electrical ground.

A-1.10. APPLIANCE AND CYLINDER PRECAUTIONS

- a. All LPG consuming appliances shall be CERTIFIED for marine use.
- b. A cooking stove is considered to be an attended appliance however, a cooking stove with an oven shall incorporate an oven flame failure safety device that will prevent gas from flowing to the oven burner if flame is not present at the oven burner.
- c. Appliances designed for unattended operation such as service water heaters and cabin heaters which operate with a continuously lighted pilot light or a continuously energized glow plug shall have them protected to prevent ignition of external vapors and addition of further combustible material to those vapors.
- d. Cabin space heaters, service water heaters and other appliances designed for unattended operation shall be of the sealed combustion chamber type, designed to provide complete separation of the combustion system from the atmosphere in the boat. Combustion air inlet and flue outlet shall be provided as integral parts of the appliance.
- e. With each LPG appliance installed in a boat a sign shall be provided, in addition to the sign in ABYC A-1.5.g., which shall be located on, or in the immediate vicinity of the appliance, so as to be plainly visible and it shall include:

- (1) THIS APPLIANCE IS DESIGNED FOR USE WITH LPG, LIQUEFIED PETROLEUM GAS ONLY.
- (2) Keep cylinder valves closed when boat is unattended. Close them immediately in any emergency. It is recommended that cylinder valves be closed when appliances are not in use.
- (3) Be sure appliance valves are closed before opening cylinder valve.
- (4) Be sure to apply ignition source to burner before opening appliance valve.
- (5) Test LPG system as recommended in sign posted in vicinity of LPG cylinder.

NEVER USE FLAME TO TEST FOR LEAKS

NOTE: This sign shall be installed in the vicinity or on each LPG appliance so as to be plainly visible.

- f. Cylinders shipped by land or air freight must be packed and marked in accordance with DOT regulations.
- g. The cylinder shall be returned to an authorized fuel distributor for refilling.
- h. Since most stove ovens or ranges are not vented to the outside atmosphere, they consume the cabin oxygen and release the products of combustion into the boat interior. Therefore, a permanent, legible warning label shall be affixed in a conspicuous manner, on or adjacent to fuel burning stoves or ranges which shall read:

WARNING: ALWAYS PROVIDE VENTILATION WHEN STOVE IS IN USE TO REPLACE OXYGEN AND TO VENT PRODUCTS OF COMBUSTION. DO NOT USE THIS APPLIANCE FOR COMFORT HEATING.

This label may be included in the sign described in ABYC A-1.10.c.

A-1.11. LOCATION AND INSTALLATION

- a. LPG gas cylinders, regulating equipment and safety equipment shall be substantially secured, readily accessible and so located that escaping vapor cannot reach the bilges, machinery spaces, accommodations or other enclosed spaces.
- b. Such locations shall be confined to open decks, cabin tops, outside of cockpits or semi-enclosures. Equipment shall be protected from climatic extremes by a housing vented and unrestricted to the open air, with at least two vents having an aggregate free area equal to one square inch for each 7 pounds of the total LPG capacity of the cylinders, the vent area being equally divided top and bottom. The bottom edge of the lower vent(s) if in the door or walls, shall be at the floor level.
- (1) Boat construction or design preventing the above, the cylinder, regulating equipment and safety equipment shall be mounted in a locker or housing, vapor tight to the hull interior, the locker or housing located above the waterline in an open cockpit, the locker or housing must be constructed of or lined with corrosion resistant materials; it must open only from the top and have a cover which seats on a gasket. The cover should latch tightly but be capable of being quickly and conveniently opened, without tools, for operation of the cylinder valves and for testing of the system for leakage and to permit viewing of the pressure gauge.

- (2) The locker or housing must be vented at the bottom by a pipe of at least 1/2 inch I.D., led outboard without pockets, through the hull sides to a point lower than the locker or housing bottom but above the waterline. The vent must be located at least two feet distant from any hull opening to the boat interior or an engine exhaust which is below the level of such discharge.
- (3) Installation of LPG equipment in lockers or housings shall be such that when means of access to the lockers or housings is open, the cylinder valves can be conveniently and quickly operated and the system pressure gauge dials are fully visible.
- (4) Lockers or housings shall not be used for storage of any other equipment, nor shall quick access to the gas system be obstructed in any way.
- (5) Storage provisions for unconnected reserve cylinders, filled or empty, shall be the same as for the cylinder in use. Valves to cylinders, even those considered empty, shall be kept tightly closed.
- c. Distribution lines shall be protected from physical damage and shall be accessible for inspection.
- (1) Fuel supply lines shall be supported by clips or straps or other means to prevent vibration damage. The clips or straps or other device shall be corrosion resistant and shall be designed to prevent cutting, abrading or damage to the lines and shall be compatible with fuel supply line material.
- (2) Fuel supply lines shall be protected by close-fitting ferrules or sealants of non-abrasive material wherever they pass through decks, weather-tight or waterproof bulkheads and the method used shall be vapor tight. Fuel supply lines passing through interior bulkheads that need not be watertight shall be installed so that the bulkheads will not cut, abrade or damage the line.
- (3) Fuel supply lines shall be continuous lengths of tubing, piping or hose passing the requirements in ABYC A-1.9.a. and b. from the regulating device, or from the leak detector in ABYC A-1.8.e., to the appliance manifold or to the flexible section in ABYC A-1.9.c., or to connections to other appliances.

- d. After installation, distribution tubing, piping or tube shall be tested prior to its connection to regulator and appliance by an air pressure of not less than 5 pounds per square inch gauge. The cylinder valve should be checked for leakage at its outlet and at its connection to the cylinder by application of a soapy water or detergent solution prior to connection to the system. After these tests and when appliances and high pressure equipment have been connected, the whole system shall be subjected to the following:

With the appliance valves closed, the cylinder shut-off valve should be opened and the pressure on the gauge noted. Close the cylinder valve. The pressure should remain constant for at least 15 minutes. If the pressure drops, locate leakage by application of a soapy water or detergent solution. No leakage shall be tolerated.

NEVER USE FLAME TO CHECK FOR LEAKS

- e. All devices and appliances using LPG shall be substantially secured so as to prevent upset or displacement that will place strain upon fuel distribution system or appliance connections, bearing in mind the great forces placed upon the appliances and devices by the operation of the boat in rough water conditions, or by the boat's motion while at anchor or moored.