PRELIMINARY DRAFT

NATIONAL BUILDING CODE OF INDIA

PART 9 PLUMBING SERVICES (INCLUDING SOLID WASTE MANAGEMENT)

Section 4 Gas Supply

BUREAU OF INDIAN STANDARDS

C O N T E N T S

National Building Code Sectional Committee, CED 46

FOREWORD

This Code (Part 9/Section 4) covers the safe use of gases for purposes like fuel, lighting and medical in buildings.

The use of gases for fuel and lighting purposes in buildings is becoming more and more common in different parts of the country, and with the advent of new petroleum complexes and piped gas system, community gas supply is bound to become one of the important services like electricity and water supply in buildings.

The use of liquefied petroleum gas supplied in containers and cylinders is already quite popular. On release of pressure, by opening the valve, they readily convert into the gaseous phase. In this state they present a hazard comparable to any inflammable natural or manufactured gas, except that being heavier than air, low level ventilation is necessary to avoid inflammable concentration of gas. Similarly, a series of precautions and regulations are necessary for laying of natural gas pipelines from city gas distribution entity to building premises and finally in the use location. Of late, the use of medical gases in hospitals through pipelines has become quite prevalent due to associated advantages; however, this needs to be supplemented with required care and precautions.

A minimum set of safety provisions are, therefore, laid down to safeguard the gas piping installation and the mode of operation in the interest of public safety.

In the first version of the Code formulated in 1970, three separate Sections of Part 9 Plumbing services, were brought out, namely, Section 1 Water supply, Section 2 Drainage and sanitation, and Section 3 Gas supply. These Sections were subsequently revised in 1983.

In the first revision, in 1983, the safe distance between gas piping and electrical wiring system was modified as well as between gas piping and steam piping was incorporated. Additional information regarding the handling, use, storage and transportation of LPG in cylinders exceeding 500 ml water capacity were included. Provisions relating to LPG cylinders, installations regarding some aspects, such as jointing compound used at joints, painting of gas piping, details of fire extinguishers, total quantity of LPG at stationary and portable installations in proportion to the floor area were added. Also, some provisions of LPG bulk storage installations were introduced.

In the second revision in 2005, the Part 9 was renamed as ‘Plumbing Services (Including Solid Waste Management)’ and provisions on solid waste management were included for the first time under Section 1 which contained in it, Water Supply, Drainage and Sanitation. Gas Supply was covered in Section 2 of Part 9 of the Code. In this second revision, provisions with regard to pressure regulations were modified; in the provision of service shut-off valves, number of additional shut-off

valves were specified; in the provision of installation of gas pipe, new materials for pipes were mentioned; the minimum diameter for gas pipe was reduced to 8 mm; the colour for pipe line for supplying natural gas was specified; the provisions regarding protection against the corrosion were modified; the process of installation of meters were clarified; and additional method for detection of leakage of gas was recommended.

In this fourth revision of the Code, to comprehensively address the various and distinct features related to the plumbing aspects, this Part 9 has been rearranged as follows:

Section 1 Water supply
Section 2 Drainage and sanitation
Section 3 Solid waste management
Section 4 Gas supply

In the third revision in 2016, several key updates were made to enhance the safety and clarity of the guidelines. Certain terminologies were included and updated to reflect current practices, while a provision for the use of fire stops/sleeves at openings was introduced to ensure better fire safety. The clause on the use of liquefied petroleum gas was completely revised for improved accuracy, and a new detailed clause on the use of piped natural gas was added to address emerging needs. Additionally, a new clause on the medical gas pipeline system was included to ensure proper installation and safety measures in healthcare facilities. Furthermore, cross-referenced standards were updated to align with the latest industry practices and regulations.

Based on the experience gained in the use of this Section, the provisions have been modified in this revision. The significant changes incorporated in this revision include the following:

a) New provisions have been introduced for the installation of sloped piping and drips to prevent gas system blockages, ensure proper condensate drainage, and facilitate cleaning, especially in systems handling wet gas.
b) Comprehensive guidelines for the installation of shutoff valves have been added to ensure proper control, easy accessibility, and maintenance, with specific provisions for individual shutoff valves for each meter and tenant in multi-tenant buildings.
c) The inclusion of overpressure protection devices for gas systems has been mandated to ensure safe operation and prevent appliance damage due to excessive pressure.
d) Detailed provisions for the installation and safe operation of equipment powered by internal combustion engines and gas turbines have been added, with guidelines for flexible gas supply connections to prevent system stress from equipment movement.
e) A general emphasis on proper installation practices for gas-powered equipment, ensuring systems are set up according to manufacturer instructions and safety standards, has been incorporated to minimize risks and enhance operational reliability.

It may also be noted that the following Indian Standards have also been formulated on design and installation of natural gas pipelines:

IS 15663 (Part 1):2006	Code of practice for design and installation of natural gas pipelines: Part 1 Laying of pipelines
IS 15663 (Part 2):2006	Code of practice for design and installation of natural gas pipelines: Part 2 Laying of pipelines in crossings
IS 15663 (Part 3):2006	Code of practice for design and installation of natural gas pipelines: Part 3 Pre-commissioning and commissioning of pipelines

While implementing this standard, compliance with statutory regulations shall be ensured.

The information regarding the use of liquefied petroleum gas has been largely based on the following Indian Standards:

IS 6044 (Part 1):2018	Liquefied petroleum gas storage installations — Code of practice: Part 1 Residential, commercial and industrial cylinder installations (*third revision*)
IS 6044 (Part 2):2021	Liquefied petroleum gas storage installations Code of practice: Part 2 Commercial, industrial and domestic bulk storage installations (*second revision*)

All standards, whether given herein above or cross-referred to in the main text of this Section, are subject to revision. The parties to agreement based on this Section are encouraged to investigate the possibility of applying the most recent editions of the standards.

For the purpose of deciding whether a particular requirement of this Section is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this Section.

Members are requested to share their inputs/comments on the draft particularly w.r.t the changes listed above in the foreword; and especially on those text highlighted in yellow in this draft.

Important Explanatory Note for Users of the Code

In any Part/Section of this Code, where reference is made to **'good practice'** in relation to design, constructional procedures or other related information, and where reference is made to **"accepted standard"** in relation to material specification, testing, or other related information, the Indian

Standards listed at the end of the Part/Section shall be used as a guide to the interpretation.

At the time of publication, the editions indicated in the standards were valid. All standards are subject to revision and parties to agreements based on any Part/ Section are encouraged to investigate the possibility of applying the most recent editions of the standards.

In the list of standards given at the end of a Part/Section, the number appearing within parentheses in the first column indicates the number of the reference of the standard in the Part/Section. For example:

a) Good practices [9-4(1)] refers to the Indian Standard(s) give at serial number (1) of the list of standards given at the end of this Part/Section, that is, IS 14885:2022 ‘Specification for polyethylene pipe for the supply of gaseous fuel’ (*first revision*)

PRELIMINARY DRAFT

NATIONAL BUILDING CODE OF INDIA

PART 9 PLUMBING SERVICES (INCLUDING SOLID WASTE MANAGEMENT)

Section 4 Gas Supply

1 SCOPE

1.1 This Code (Part 9/Section 4) covers the requirements regarding safety of persons and property for all piping uses and for all types of gases for purposes like fuel, lighting and medical in buildings.

1.2 This Section does not cover safety rules for gas burning appliances.

2 TERMINOLOGY

For the purpose of this Section, the following definitions shall apply.

2.1 Appliance Valve – A device that will shut-off the gas supply to the burner(s).

2.2 Approved Agency – Person or agency or a corporate body approved by competent authority or distribution company to execute the job of designing, erection and maintenance of multi cylinder installation.

2.3 Authority Having Jurisdiction – The authority which has been created by a statute and which, for the purpose of administering the Code/Part, may authorize a committee or an official to act on its behalf; hereinafter called the `Authority'.

2.4 Competent Authority – The Authority designated or otherwise recognized under *Gas Cylinder Rules*, 2004 for approving LPG cylinders, valves and regulators.

2.5 Customer's/Consumer's Connection – Piping tapped on riser to supply each individual customer/consumer.

2.6 Distribution /Distributing Company – The company which is in the field of marketing LPG and PNG, and is the owner of LPG cylinders.

2.7 Gas Fitter – A qualified personnel of the authorized gas supplying organization.

2.8 Installation – A designated premises in an establishment where the complete multi-cylinder-system comprising cylinder, piping manifold, vaporizers, etc, is installed.

2.9 Manifold – A pipe header provided with several opening to which the cylinders are connected by using suitable pipe fittings.

2.10 Pilot – A small flame which is utilized to ignite the gas at the main burner(s).

2.11 Pressure Regulator – A device designed to lower the pressure of gas coming from the distribution main and to maintain it practically constants downstream. This normal operation pressure shall be practically in all cases that of the gas appliances used.

2.12 Purge – To free a gas conduit of air or gas or a mixture of gas and air.

2.13 Qualified Installing Agency – An individual, firm or agency which either in person or through a representative is engaged in and is responsible for the installation or replacement of gas piping on the outlet side of the gas meter, or the connection, installation or repair of gas supply piping and appliances within a building, and who is experienced in such work, familiar with all precautions required, and who has complied with all the requirements as to qualification, registration, licensing, etc, of the Authority.

2.14 Riser – Piping usually vertical on most of its length that supplies gas from the service to the various storeys of the building.

2.15 Service Pipe – Pipe that runs between the distribution main in the street and the riser in the case of multi-storeyed building or the meter in the case of an individual house.

2.16 Service Shut-Off Valve (Isolation Valve) – A device installed outside the premises to cut-off the main supply of gas from pipeline by the supplier.

2.17 Vent Pipe – A safety device to which certain regulators are connected to evacuate outside gas that may escape from the normal circuit when some part of system gets damaged or malfunctions or a safety valve is open.

3 PRESSURE REGULATIONS

3.1 Pressure regulation is required to economize the sizing of piping system. Where the pressure of gas supplied to domestic system or other low pressure gas piping system in buildings is in excess of the pressure to be used in the appliance, a gas pressure regulator of suitable specification shall be installed in service pipe of each system to prevent excess pressure reaching the appliance. The pressure regulators to be used can be from 400 kN/m^2 upstream pressure to 2.1 kN/m^2 for domestic consumers and 10 kN/m^2, 30 kN/m^2, 200 kN/m^2 for commercial consumers, as the case may be.

3.1.1 In some place the reduction of pressure from main distribution source of 400 kN/m^2 to intermediate pressure (say 7 kN/m^2) and then to operating pressure of 2.1 kN/m^2 is achieved.

3.1.2 Whereas in most of the other places the reduction of pressure from main distribution source of 400 kN/m^2 to directly operating pressure (say 2.1 kN/m^2, 10 kN/m^2, 30 kN/m^2, 200 kN/m^2) is achieved in single stage pressure reduction.

3.2 If located inside a building, the required regulator shall comply with the following:

a) If any of the diaphragms of the regulator ruptures, the gas shall be sent to an outlet vent pipe made of brass or plastic in order to ventilate or drain the gas out of the building. The vent pipe will, however, lead to outer air about 1 m above the topmost storey of the building. Means shall be employed to prevent water from entering this pipe and also to prevent stoppage of it by insects or other foreign bodies.
b) If the gas pressure at the outlet of the regulator falls below 50 percent of the operating gas pressure or rises above twice the operating gas pressure, the gas input to the pressure regulator shall be cut off.
c) In the event of malfunctioning of this safety device, a supplementary device shall connect the low pressure circuit to the outlet circuit (vent pipe) as soon as the exit pressure reaches 7 kN/m^2.

3.3 It shall also be ensured by the supply authority that the calorific value and supply pressure of gas shall not exceed the values for the type of gas used.

4 SERVICE SHUT-OFF VALVES

4.1 Service shut-off valves shall be installed on all new services including replacements in a readily accessible location.

4.2 Service shut-off valves shall be located upstream of the meter if there is no regulator or upstream of the regulator, if there is one.

4.2.1 Service shut-off valves shall be located in the upstream of the meter, if a single regulator is supplying more than one consumer and each such stream shall have one additional shut-off valve upstream of regulator.

4.3 All gas services operating at pressure greater than 7 kN/m^2 shall be equipped with an approved service shut-off valve located on the service pipe outside the building.

4.4 Underground shut-off valves shall be located in a covered durable curb box, manhole, vault or stand pipe which is designed to permit ready operation of the valve and the covers of which shall be clearly marked 'Gas'.

5 EXISTING WORK

Nothing herein shall prohibit the continued use of existing system of the gas piping without further inspection or test, unless the Authority has reason to believe that defects which make the system dangerous to life or property exist.

6 RULES FOR TURNING GAS ON

6.1 No person, unless is the employ of the gas company or having permission from the gas company, shall turn on the gas at a service shut-off valve or at any valve that controls the supply of gas to more than one consumer.

6.2 Gas shall not be turned on at any meter valve without specific permission from the gas company or other authority if any of the following conditions exists:

a) If the gas piping appliances or meter supply through the meter valve are known to leak or otherwise to be defective (*see* **10**).
b) If required inspection of the piping or appliance has not been made.
c) If the gas company or other authority has requested that the gas be left turned off.
d) If the meter valve is found shut-off for some reason not known to the gas fitter.

The gas shall not be turned on in the event of fire.

6.3 Gas shall not be turned on at any branch line valve if any of the conditions specified in **6.2** prevails. Where a branch line valve is found closed, a gas fitter shall again turn the gas on at such valve only if proper precautions to prevent leakage are taken and no other unsafe conditions are created thereby.

6.4 Gas shall not be turned on at either the meter valve or service line unless all gas keys or valves provided on all outlets in the piping system are closed or all outlets in the piping system are capped or plugged.

7 RULES FOR SHUTTING OFF THE GAS

7.1 The gas fitter shall put the gas off to any appliance, pipe or piping system and shall leave the gas turned off, until the causes for interrupting the supply has been removed in any one of the following cases:

a) If ordered to do so by the Authority.
b) If leakage of gas is noted, which appears to be sufficient to cause fire, explosion or asphyxiation.
c) If an installation of some gas appliance is found to be such as to cause a serious hazard to persons or property.
d) If any condition exists which threatens interruption of gas supply which may cause burner outage or otherwise prove dangerous.

7.2 It shall be the duty of the installing agency when the gas supply is to be turned off to notify all affected consumers.

7.3 Before turning off the gas at the meter, for the purpose of installation, repair, replacement or maintenance of piping or appliance, all burner and pilot valves on the premises supplied with gas through the meter shall be turned off and the meter test hand observed for a sufficient length of time to ascertain that there is no gas passing through the meter. Where there is more than one meter on the premises, precaution shall be exercised to ensure that the concerned meter is turned off.

8 INSTALLATION OF GAS PIPES

8.1 Installation, repair and replacement of gas piping or appliances shall be performed only by a qualified installing agency.

8.2 Piping

8.2.1 Piping shall be of wrought iron, steel, copper, stainless steel or cast iron when the gas pressure is less than 7 kN/m^2; with higher gas pressure use of cast iron shall be prohibited.

8.2.1.1 SS 316/304/321 and flexible PE coated flexible pipe in rolls shall be permitted in low pressure system provided the pipe meets the required standard, to avoid the bends, fittings and leakages from the joint which are potential leakage points. Also, reference may be made to accepted standard [9-4(1)]. Heavy rubber flexible tube shall be permitted only as direct connection to burner from appliance valve.

8.2.1.2 For details regarding medical gas pipeline systems, a reference may be made to good practice [9-4(2)].

8.2.2 *Size of Gas Piping*

Gas piping shall be of such size and so installed as to provide supply of gas sufficient to meet the maximum demand without undue loss of pressure between the meter or service regulator when a meter is not provided, and the appliance(s).

8.2.2.1 The size of gas piping depends upon the following factors:

a) Allowable loss in pressure from meter or service regulator, when a meter is not provided, to appliance;
b) Maximum consumption to be provided;
c) Length of piping and number of fittings; and
d) Specific gravity of gas.

8.2.2.2 No gas pipe smaller than 8 mm shall be used.

8.2.3 As far as possible, straight lengths of piping should be used. Where there are bends in the pipe line, these should have a radius of at least five times the diameter of the pipe.

8.2.4 For any thread joint proper sealant shall be used on male threads only.

8.3 The gas piping shall be of the colour stipulated by explosive authority to distinguish it from other piping and the piping shall be painted silver grey with red band of 150 mm width. The gas pipeline shall be painted canary yellow in case of natural gas.

8.4 Piping Underground

8.4.1 *Protection of Piping*

Piping shall be buried to a minimum depth of 1 m or covered in a manner so as to protect the piping from physical damage.

8.4.2 *Protection Against Corrosion*

Generally all the piping within the premises where it has to run on the wall shall be exposed and should not be in contact with wall to ensure that no corrosion takes place. Epoxy sealant or polyethylene conduit shall be used to ensure no contact of pipe with the wall in the situation of pipe crossing the wall. Underground or concealed gas pipeline in contact with earth or other materials which may corrode the piping shall be protected against corrosion by application of adequate corrosion resistant coating backed up by cathodic protection system.

8.5 The building shall not be weakened by the installation of any gas piping.

8.6 Gas piping in building shall be supported with pipe hooks, metal pipe straps, bonds or hangers suitable for the size of piping and of adequate strength and quality and located at proper intervals so that the piping may not be moved accidentally from the installed position.

8.7 Pipe Entrance to Buildings

Where gas pipe enters a building through a wall or floor of masonry or concrete, any gas piping or other piping entering the walls or floors shall be suitably sealed against the entrance of water/moisture or gas.

The openings or imperfection of fit or design are also source of possible fire and smoke passing through them. Fire stops shall be provided to fill the openings around penetrating items such as gas pipes, etc, through the wall or floor openings. Non-combustible sleeving may also be used as an alternative to proprietary seals for penetration of pipes of lead, aluminium, aluminium alloy, fibre cement or uPVC up to a specified nominal internal diameter. Proprietary fire stopping and sealing systems which have been shown by test to maintain the fire resistance of the wall or other elements, are available and may be used. Other fire stopping materials include cement mortar; gypsum-based plaster; cement or gypsum vermiculite/perlite mixes; glass fibre, crushed rock, blast furnace slag, or ceramic based products (with or without resin binders), and intumescent mastics. These may be used in situations appropriate to the particular material. Not all of them will be suitable in every situation. When sleeving is used, its length should be greater than the thickness of wall or floor. The sleeve shall be properly grouted to maintain fire/smoke separation.

Regarding protection of openings in walls or floors, from fire, reference shall be made to Part 4 ‘Fire and Life Safety’ of the Code.

8.7.1 *Piping in Floors*

Piping in solid floors, such as concrete, shall be laid in channels in the floor suitably covered to permit access to the piping with a minimum damage to the building.

8.7.2 Single pipe without joint shall be used for wall crossing in any building.

8.8 Gas pipe shall not be bent. Fittings shall be used when making turns in gas pipe.

8.9 Generally concealed piping shall not be allowed. However, if it is necessary then it shall be under the **8.4** of underground piping and all protection such as coating, cathodic protection shall be done.

8.10 A drip shall be provided in the gas distribution system, if the moisture contents in the gas is likely to reach saturation point at any stretch of pipe line in the system; a drip shall, however, be provided at any suitable point in the line of the pipe where condensate may collect and from where it can be easily removed. This drip should be so installed as to constitute a trap where in an accumulation of condensate will shut-off the flow of gas before it will run back into the meter.

8.10.1 Drip has to be provided in the case of gas consisting moisture content.

8.11 Prohibited Devices

No device shall be placed inside the gas piping or fittings that will reduce the cross-sectional area or otherwise obstruct the free flow of gas.

8.12 Piping shall be electrically continuous throughout its length and properly earthed except in stretches where cathodic protection system is used for protection against corrosion. It shall not, however, be used to earth any electrical equipment.

8.12.1 The distance between gas piping and electrical wiring system shall be at least 60 mm and, where necessary, they shall be securely fixed to prevent contact due to movement. The gas piping should run above the electrical wiring. In this type of installation in the event of any leakage of natural gas, the gas would move up (natural gas being lighter than air) and would not come directly in contact with the electrical wiring. If the gas to be supplied is heavier than the air then the gas piping should run below the electrical wiring.

8.13 The distance between the gas piping and steam piping, if running parallel, shall be at least 150 mm. The gas piping should preferably run below the steam piping.

8.14 Piping installation shall be thoroughly gastight.

8.15 Smoking shall not be permitted when working on piping which contains or has contaminated gas.

8.16 Meters shall be installed in such a way that there shall be no load transfer from the pipeline to the inlet/outlet of the meter and shall be easily accessible.

8.17 Drips and Sloped Piping

Piping systems designed for gas flow, particularly those handling wet gas, should include provisions to ensure the smooth and safe operation of the system by adhering to following guidelines:

8.17.1 *Slopes*

Pipes shall be installed with a slope of not less than 1/6.3 mm per 4572 mm to prevent the formation of traps.

8.17.2 *Drips*

Where conditions involve wet gas, drips shall be installed at points where condensate may accumulate, such as the outlet of meters, to act as traps. These traps should allow for the collection of condensate and prevent its backflow into the meter or other critical components. Drips shall be located in accessible areas to facilitate cleaning or removal of condensate, and they must be positioned to avoid freezing conditions that may compromise functionality. For appliances without built-in sediment traps, a sediment trap should be installed downstream of the appliance shutoff valve and as close to the appliance inlet as possible. This can be achieved using a capped nipple in a vertical position or an alternative approved device. Appliances such as illuminating devices, ranges, clothes dryers, decorative vented appliances, gas fireplaces, and outdoor grills are generally exempt from sediment trap requirements.

8.17.3 *Sediment Trap*

Where a sediment trap is not incorporated as part of the appliance, a sediment trap shall be installed down-stream of the appliance shutoff valve as close to the inlet of the appliance as practical. The sediment trap shall be either a tee fitting having a capped nipple of any length installed vertically in the bottommost opening of the tee as illustrated in Figure 1 or other device approved as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces and outdoor grills need not be so equipped.

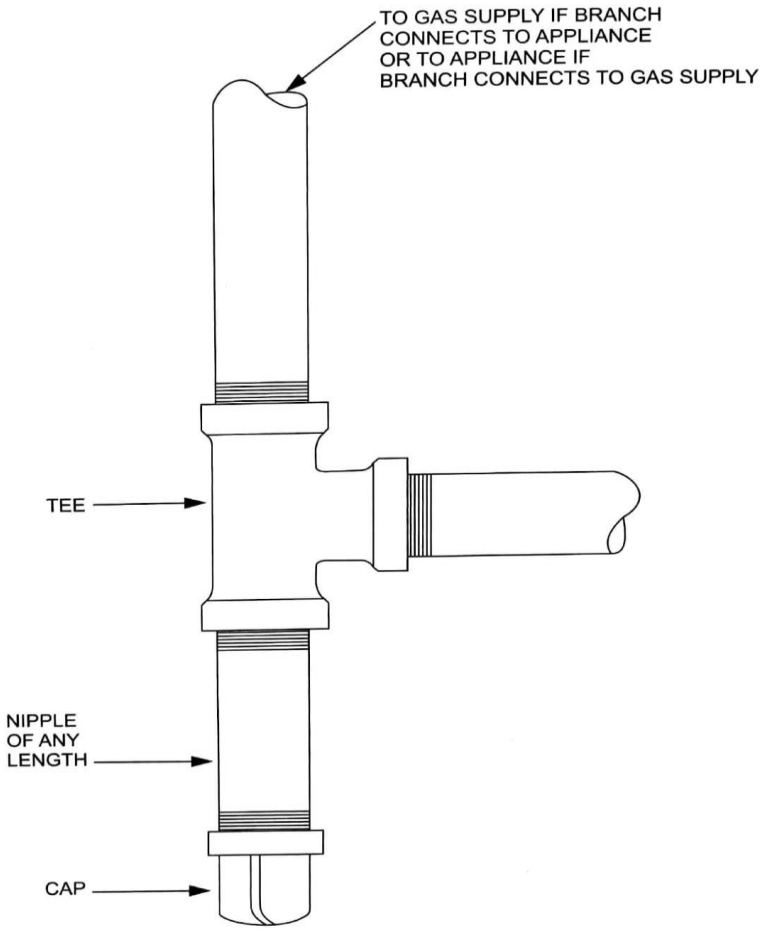

FIG. 1 METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP

8.18 Shutoff Valves

Piping systems shall be equipped with shutoff valves to ensure proper control and isolation of the system as required. The following guidelines shall be followed for the installation and use of shutoff valves in piping systems:

a) Shutoff valves shall be of a suitable type and constructed from materials that are compatible with the piping system. They must meet the necessary standards for the pressure and specific application of the system.
b) Shutoff valves shall not be installed in concealed spaces, furnace plenums, or locations where access may be hindered.
c) Shutoff valves must be installed in locations that allow easy access for operation. They should also be protected from potential damage.
d) Each meter installation must include a shutoff valve on the supply side of the meter to allow isolation of the gas supply.
e) For systems supplying gas to multiple buildings or tenants from a single meter, each building or tenant shall have an individual shutoff valve.
f) In buildings with multiple tenants, a shutoff valve must be provided for each tenant, ensuring they have access to the valve controlling their space.

g) Each shutoff valve serving a house line shall be clearly marked with an identification tag to facilitate easy identification of the systems it controls.
h) Each appliance shall be equipped with a shutoff valve installed in close proximity, allowing easy isolation of the appliance.
i) Laboratories with multiple fuel gas outlets shall be provided with a dedicated shutoff valve. This valve must be readily accessible, located within the laboratory, and clearly identified with signage.
j) Valves installed in tubing systems must be securely supported independently of the tubing to maintain system integrity.

8.19 Overpressure Protection Devices

Overpressure Protection Devices are essential for ensuring the safe operation of gas systems by preventing excessive pressure that could damage appliances or pose safety risks. The guidelines cover when and where these devices are required, their pressure limitation capabilities, and the materials and construction standards to ensure reliable performance. Proper installation and maintenance of overpressure protection devices are critical to ensure compliance with safety standards and protect both equipment and personnel.

The following steps and guidelines shall be followed for the installation and use of overpressure protection devices in gas piping systems:

a) Overpressure protection devices shall be installed in piping systems serving appliances designed to operate at a gas pressure of 3.5 kPa or less, when the serving gas supplier delivers gas at a pressure greater than 13.8 kPa. Piping systems serving equipment with higher inlet pressures shall also be equipped with overpressure protection devices as specified by the appliance manufacturer.

b) The pressure limitation for overpressure protection devices shall comply with the relevant guidelines for systems designed to operate at specific gas supply pressures.

    1) Pressure Under 3.5 kPa – Overpressure protection devices shall limit the gas pressure to 13.8 kPa or less when the line pressure regulator fails.
    2) Pressure Over 3.5 kPa – Overpressure protection devices must limit the gas pressure to the requirements specified by the appliance manufacturer's installation instructions when the system operates with pressures above 3.5 kPa.
    3) Device Capability – Overpressure protection devices must be capable of independently limiting the gas pressure to the appliances as required, without relying on other pressure control equipment in the system.
    4) Failure Detection – Systems requiring overpressure protection shall be designed so that any failure of the primary pressure control device is easily detectable. If a relief valve is used for overpressure protection, it must maintain pressure within safe limits under all failure conditions, including the failure of the line pressure regulator.

c) Types of Overpressure Protection Devices – The overpressure protection device shall be one of the following:

1) Pressure relief valve
2) Monitoring regulator
3) Series regulator
4) Automatic shutoff device

These devices shall either be integrated with the service or line pressure regulator or installed separately, in compliance with the relevant guidelines.

i) Construction and Installation – Overpressure protection devices shall be constructed from materials that prevent impairment due to corrosion and shall be designed for easy operation, testing, and examination for leakage when closed.

ii) External Control Piping – Control piping shall be installed to avoid damage that could render both the regulator and the overpressure protection device inoperative.

iii) Setting – The overpressure protection devices shall be set to ensure the gas pressure supplied to connected appliances does not exceed the limits established by the relevant pressure guidelines.

iv) Unauthorized Operation – Measures must be taken to prevent unauthorized operation of shutoff valves that could disable the overpressure protection device. This may include locking the valve in the open position or installing duplicate relief valves.

v) Vents – Discharge stacks, vents, and outlets of overpressure protection devices shall be directed outdoors, designed to prevent blockages, and sized to match the outlet of the relieving device.

vi) Size of Fittings, Pipe, and Openings – All fittings, pipes, and openings between the protected system and the overpressure device shall be properly sized to prevent hammering and ensure adequate relief capacity.

8.20 Engine and Gas Turbine Powered Equipment

This section outlines the requirements for the installation and operation of equipment powered by internal combustion engines and gas turbines. Proper installation is essential to ensure safe operation, minimize risks, and enhance the equipment's performance and longevity. The following guidelines cover the installation practices and considerations necessary for integrating these systems safely into the overall setup.

8.21 Powered Equipment

Permanently installed equipment powered by internal combustion engines and turbines shall be installed according to the manufacturer's instructions. This ensures that the equipment operates as intended, with all safety and operational specifications followed.

8.22 Gas Supply Connection

Equipment powered by internal combustion engines and turbines shall not be rigidly connected to the gas supply piping. Flexible connections shall be used to prevent stress or strain on the piping system caused by movement or vibration of the equipment, ensuring safe and reliable operation.

9 INSPECTION OF SERVICES

9.1 No person shall use or permit the use of a new system or an extension of an old system of gas piping in a building or structure before the same has been inspected and tested to ensure the tightness of the system, and a certificate has been issued by the Authority.

9.1.1 *Test of Piping for Tightness*

Before any system of gas piping is finally put in service, it shall be carefully tested to ensure that it is gastight. Where any part of the system is to be enclosed or concealed, this test should precede the work of closing in. To test for tightness the piping may be filled with city gas, air or inert gas but not with any other gas or liquid. In no case shall oxygen be used. The piping shall stand a pressure of at least 20 kN/m^2 measured with a manometer or slope gauge, for a period of not less than 10 min without showing any drop in pressure.

9.1.2 When the gas pressure exceeds 7 kN/m^2, the piping shall withstand a pressure of 0.6 MN/m^2 for 4 h (this test is for piping designed for working pressure less than 0.4 MN/m^2).

9.2 The Authority shall, within a reasonable time after being requested to do so, inspect and test a system of gas piping that is ready for such inspection and test, and if the work is found satisfactory and test requirements are complied with, it shall issue the certificate.

10 LEAKAGE CHECK

10.1 Before turning gas under pressure into any piping, all openings from which gas may escape shall be closed.

10.2 Checking for Gas Leakage

No matches, flame or other sources of ignition shall be employed to check for gas leakage from meters, piping or appliances. Checking for gas leakage with soap and water solution is recommended.

10.3 Use of Lights

Artificial illumination used in connection with a search of gas leakage shall be restricted to electric hand flash lights (preferably of the safety type) or approved safety lamps. In searching for leaks, electric switches should not be operated. If electric lights are already turned on, they should not be turned off.

10.4 Checking for Leakage With Meter

Immediately after turning gas into the piping, the system shall be checked to ascertain that no gas is escaping. This may be done by carefully watching the test dial of the meter to determine whether gas is passing through the meter. In no case should a leakage test be made using a gas meter unless immediately prior to the test it has been determined that the meter is in operating condition.

10.5 Checking of Leakage Without Using a Meter

This may be done by attaching to an appliance, orifice or a manometer or equivalent device and momentarily turning on the gas supply and deserving the gauging device for pressure drop with the gas supply shut-off. No discernible drop in pressure shall occur during a period of 3 min.

10.6 After piping has been checked, all gas piping shall be fully purged. Piping shall not be purged into the combustion chamber of an appliance. A suggested method for purging the gas piping to an appliance is to disconnect the pilot piping at the outlet of the pilot valve.

10.7 After the gas piping has been effectively purged, all appliances shall be purged and the pilots lighted.

10.8 In addition to the checking of gas leakage with soap and water solution, a suitable gas detector is also recommended for use.

11 USE OF LIQUEFIED PETROLEUM GAS (LPG)

11.1 The cylinders used for the storage and transportation of liquefied petroleum gas (LPG) shall conform to accepted standards [9-4(3)] approved by the statutory authority.

11.2 The handing, use, storage and transportation of liquefied petroleum gas in cylinders exceeding 500 ml water capacity shall be done in accordance with good practice [9-4(4)].

11.3 LPG Cylinder Installation

The following recommendations apply to installation in commercial, industrial, educational and institutional premises.

11.3.1 *General Recommendations*

11.3.1.1 Those responsible for the installation of cylinders, equipment and piping should understand the characteristics of LPG and be trained in good practice of handling, installing and maintaining installations.

11.3.1.2 The jointing compound used at different joints in the system shall be decided by the Qualified Installing Agency. Hemp and similar materials shall not be used at the joint. In any joint in which the thread provides a gastight seal, jointing compound shall be used only on the male thread.

11.3.1.3 Fire extinguishers of dry powder type or carbon dioxide type conforming to accepted standards [9-4(5)] shall be provided in places where LPG cylinder installations are situated and shall be located near such installations. Two buckets filled with sand and two with water shall also be installed nearby. The number, type and size of the fire extinguishers shall be as follows:

		Number	*Type*	*Capacity*
a)	For installations with LPG 40 kg to 200 kg	2	Dry powder	9 kg
b)	For installations with LPG more than 200 kg and up to 320 kg	3	Dry powder	9 kg
c)	For installations with LPG more than 320 kg and up to 1 000 kg	4	Dry powder	9 kg
NOTE – For electrical installations, one number CO_2 fire extinguisher (4.5 kg capacity) shall be provided.				

11.3.1.4 Liquefied petroleum gas shall not be transferred from the cylinders in which it is received to any other container.

11.3.2 *Cylinder Location*

11.3.2.1 *Stationary installations*

a) Stationary installation not exceeding 50 kg of LPG may be installed indoors on any floor. It is recommended to have a minimum floor area of 5 m^2 for such an installation.
b) Stationary installations each not exceeding 50 kg of LPG may be installed indoors on any floor and within the same workspace provided the minimum distance between two such installations is 3 m, the proportion of such installations to floor area is one installation per 5 m^2 and the aggregate quantity of gas of all such installations does not exceed 200 kg.

c) Stationary installation not exceeding 100 kg of LPG may be installed indoors on any floor provided the floor area for such an installation is not less than 12 m^2.
d) Stationary installations each not exceeding 100 kg of LPG may be installed indoors on any floor and within the same workspace provided the minimum distance between two such installations is 3 m, the proportion of such installations to floor area is one installation per 12 m^2 and the aggregate quantity of gas of all such installations does not exceed 200 kg.
e) Stationary installation not exceeding 400 kg of LPG may be installed indoors in an enclosed section of a building or a room reserved exclusively for this purpose and ventilated at low level directly to the outside air.
f) Stationary installations above 400 kg [200 kg in case provision as in (e) is not possible] but not exceeding 1 000 kg shall be installed outdoors on ground floor level only. A minimum distance of 3 m shall be maintained between an installation and any building, public place, roadways, and other surroundings. The installation shall be protected from excessive weathering by sun, rain, etc, and from tampering by unauthorized persons. A lean-to roof with expanded metal on angle-iron framework on the sides is considered suitable for this purpose. In any case, adequate ventilation at ground level to the outside air shall be provided.
g) If the storage per installation is more than 1 000 kg, installations in multiples of 1 000 kg with manifold, safety devices, change over mechanism may be provided with minimum inter distance of 3 m from all sides. Total number of such installations shall not exceed 4 including stand by installation. If more than two installations are used, then number of cylinders per installations should not exceed 30.
h) For storage installations of 1 000 kg or installations in multiple of 1 000 kg the number of cylinders to be connected per manifold shall not exceed 15 and for each 1 000 kg installation two such manifolds shall be provided.
j) Cylinders shall be installed upright with the valves uppermost.
k) Cylinder containing more than 20 kg of gas shall not be located on floors above ground level.
m) Cylinders shall be located on a concrete or brick floor, preferably raised in case of outdoor installations.
n) In order to prevent the hazardous collection of gas, cylinders shall be placed at least 1 m away from culverts, depressions, or openings leading to below ground level compartment and drains.
p) Cylinders which have safety relief valves or similar devices incorporated in them shall be so positioned so that if the relief device operates, escaping gas is not hazardous.
q) Cylinder installation for commercial/industrial/domestic/residential complexes, etc, or at any public place shall meet the following requirements:

    1) For commercial and industrial cylinder installation for any public places like mall, buildings, industries, hotels, etc, the sum total of all stationery installations inside the building shall not exceed 400 kg of LPG in any case. In case sum total of net weight of all the cylinders installed indoors exceed 400 kg provision for outdoor installations shall be made. For installations where the sum total is less than 400 kg of LPG provisions of (b) to (e) shall apply.

2) For commercial and industrial cylinder installation for any public place, industry, etc, if the net weight of all the cylinders installed is more than 400 kg but less than 1 000 kg, than the installation shall be provided outdoors in line with (f). The cylinder installation shall be provided in a covered industrial shed but open from all sides for proper ventilation. In case the installed capacity increases more than 1 000 kg, than the installation shall be provided in line with (g). Two separate installations shall be provided and distance between each of the installations shall be minimum 3 m (this distance shall be between the outer edge of the two sheds).
3) For multi-storeyed buildings, flats housing society the reticulated installation of any capacity shall be provided at a safe place especially earmarked for this purpose. The installation shall not be provided by the side of road where there is continuous movement of vehicles or is approachable to residents especially children. The installation should be secured and should be provided in a covered shed open from all sides for ventilation. The area shall be demarcated by 1.5 m high chain link fencing having one gate. There should be minimum 3 m clear space all around the fencing and the space between the fencing and the edge of the shed should be minimum 2 m all around.
4) If the requirement is more than 1 000 kg, installations in multiples of 1 000 kg with manifold, safety devices, change over mechanism, not exceeding 4 such installations (including stand by) may be provided with minimum distance of 3 m from all sides. The number of cylinders per installations should not exceed 30.

5) Location of cylinder bank:

i) The site for LPG cylinder manifold shall be located away from the kitchen/LPG utility area/residential building. Installation shall be slightly raised minimum 100 mm from surrounding ground level.
ii) Cylinders installation should not be located in inaccessible location, under a stairway, basements, cellars, where air movement across cylinders is very low/not present, to prevent the cylinders from getting inadequate latent heat and unapproachable during emergency.
iii) Cylinders installation should not be close to steam pipes, boilers, transformers, DG sets, etc, to prevent cylinders from getting affected due to radiant heat.
iv) Cylinders shall not be installed at a place where they are likely to cause obstruction, suffer damage or be exposed to conditions likely to affect safety.
v) Cylinders installation should not be located along the drive way. Under unavoidable conditions, minimum distance of 3 m from drive way shall be maintained. Brick masonry (minimum 230 mm thick)/concrete (minimum 100 mm thick) walls or metallic shields/barriers (minimum 1.63 mm sheet) and of minimum 2 m height should be erected between drive way and cylinder installation for the safety and security of the installation.
vi) Cylinders shall be located on a concrete or brick floor that is firm, at level, smooth, drained in case of outdoor installation.
vii) The cylinder shall be installed in upright position with the valve pointing upwards and minimum 1 m away from any combustible materials.

r) Cylinder storage room:

1) The cylinder storage room shall be made out of non-flammable material that is concrete (minimum 100 mm thick) or brick masonry walls (minimum 230 mm thick) or steel structures made out of minimum 5 mm thick MS angle iron structure and 1.63 mm MS wire mesh of size minimum 11.
2) Since LPG is heavier than air, ventilation shall be provided at floor level, that is 100 mm above inside cylinder bank room, open to atmosphere. The ventilators shall be provided with 2 layers copper or non-corroding metal wire mesh not less than 11 to the linear centimetre. The size of the ventilators should be minimum 500 mm long and 300 mm height.
3) The storage room shall be well ventilated, that is openings/ventilators shall be provided in the walls of cylinder storage covering minimum 25 percent of wall area. It should also have adequate lighting. Both exteriors and interiors should be painted with weather proof paints. FLP fittings, approved by statutory authorities shall be provided for electrical use.
4) The doors of the room where cylinders are installed shall open outwards and shall have louvers/wire mesh to ensure visibility and ventilation.
5) Flammable materials like wood and plastic shall not be used. The cylinder bank storage room shall not used for storing any other materials.

11.3.2.2 *Portable installations*

When portability of cylinders is necessary, the following requirements shall be fulfilled:

a) The sum total of capacity of the cylinders connected to each manifold shall not exceed 100 kg of LPG. The total quantity of gas thus installed in a workspace shall not exceed 200 kg.
b) If cylinders are mounted on a trolley, the trolley shall be stable. Where necessary, the cylinders shall be secured to prevent them from falling.
c) The regulator shall be connected directly to the cylinder valve or to a manifold which shall be connected to the cylinder valves by means of rigid connections to give adequate support to the regulator. The only exception to this requirement is where cylinders are mounted on a trolley and the manifold is rigidly supported on the trolley. In such a case flexible or semi-flexible connections may be used between the cylinder valves and the manifold but not between the manifold and the regulator.
d) Anytime the total quantity of gas at portable installations shall be in proportion to the floor area as specified in **11.3.2.1** (a) to (f).
e) At any time the provisions at **11.3.2.1** (a) to (r) shall be ensured for all installations.

11.3.3 *Cylinder Manifolds*

11.3.3.1 All materials, fittings, etc, used in cylinder manifold systems shall comply with the statutory provisions or relevant Indian Standards. In absence of any such provisions or Indian Standards, equivalent international norms shall be followed.

11.3.3.2 The individual component parts of manifolds, that is piping, fittings, pigtails, etc, which are subject to cylinder pressure shall be capable of withstanding a test pressure without bursting of 2.5 N/mm^2 or one and a half times the developed pressure at 65 ^{o}C, whichever is more.

11.3.3.3 Where cylinder installations are made up with service and reserve batteries of cylinders, suitable change-over devices or valves shall be incorporated in the manifold header to prevent undue escape of the gas when cylinders are changed.

11.3.3.4 In case pressure regulators, manifold headers and automatic change-over devices are connected to cylinder by semi-flexible connectors, these shall be rigidly supported. Copper tube pigtails are considered to be semi-flexible for this purpose.

11.3.3.5 It is recommended that joints in manifold headers which do not have to be broken in normal use should be welded or brazed using a material which shall have a melting point of at least 540 ^{o}C.

11.3.3.6 All joints between manifold headers and cylinder connectors shall be readily accessible.

11.3.3.7 All joints in the manifold should be welded (except for valve fixation) and be easily accessible for inspection/repairs, etc.

11.3.3.8 Each manifold arm shall be fabricated in such a way that minimum joints are provided. Only seamless pipes are recommended for use in manifolds. There should be a minimum gap of 300 mm between the manifold and valve protection ring of the LPG cylinders.

11.3.3.9 The cylinders connected to a manifold shall be safely spaced for easy and safe replacement of cylinder when empty. A minimum distance of 400 mm shall be maintained between two nipples provided on the manifold for connecting the cylinders to the manifold. In case the diameter of the cylinder is higher than 400 mm then the distance between the two nipples shall be diameter of the cylinder plus 100 mm.

11.3.3.10 A pressure gauge of 100 mm dial shall be provided in the manifold to indicate the gas pressure in the manifold. The pressure gauge shall be suitable for a pressure range 0 to 1.0 N/mm^2 .

11.3.4 *Pressure Regulators*

11.3.4.1 Pressure regulators and other devices used to control the gas shall comply with the distributing company’s stipulations and accepted standards [9-4(6)].

11.3.4.2 Pressure regulator fitted with a safety valve shall be either,

a) Installed in the open air; or
b) Vented to the open by means of a metal vent pipe connected to the safety valve outlet.

11.3.4.3 Care shall be taken that safety valve outlets do not become choked with dust or other foreign matter.

11.3.4.4 If the regulator is fitted with a relief valve, care should be taken in positioning the regulator to avoid unnecessary hazards if the relief valve functions.

11.3.4.5 Pressure regulators and other control devices shall be adequately supported.

11.3.5 *Instructions to Consumers*

Consumers shall be instructed by the distribution company on the following, through appropriate written instructions:

a) Operation of the whole system;
b) How to recognize gas leaks;
c) Action to be taken in case of leakage;
d) Action to be taken in case of fire; and
e) Action to be taken in case of damage to, or failure of, any part of the installation.

11.3.6 For detailed information regarding installation of LPG cylinders in commercial, industrial, educational and institutional premises, reference may be made to good practice [9-4(7)].

11.4 LPG Bulk Storage Installations

The following recommendations apply to LPG bulk storage installations where storage tanks over 450 ℓ water capacity are used at industrial, commercial and domestic consumers' premises.

The maximum capacity of an individual tank and group of tanks at industrial, commercial and domestic premises shall be as follows:

Premises	*Maximum Water Capacity of an Individual Tank* ℓ	*Maximum Water Capacity of Group of Tanks* ℓ
Industrial	130 000	260 000
Commercial	40 000	80 000
Domestic	20 000	80 000

11.4.1 *Location and Spacing of Storage Tanks*

11.4.1.1 Storage tanks shall be located outside the buildings and shall not be installed one above the other.

11.4.1.2 Each individual tank shall be located with respect to the nearest important building or group of buildings or line of adjoining property which may be built in accordance with Table 1. The distances given refer to the horizontal distance in plan between the nearest point of the storage tank and building/property line.

11.4.1.3 In heavily populated or congested areas the authority may determine the need for other reasonable protective methods to be taken, such as provision of fire walls, etc. If fire walls are to be provided, the authority may determine the extent to which the safety distances for above ground tanks may be reduced.

11.4.1.4 No LPG tank(s) shall be located within the bunded enclosures of any petroleum installation. The minimum distance of separation between LPG storage tanks and any petroleum installation shall be as prescribed under the *Petroleum Rules*, 1976 or as specified in Table 1, whichever is more.

11.4.1.5 The number of storage tanks in one storage installation shall not exceed six. In case there are more than one storage installations, the safety distance between two installations shall be the same as the distance between the tanks and the property line in accordance with Table 1.

Table 1 Minimum Safety Distances
(*Clauses* 11.4.1.2, 11.4.1.4 *and* 11.4.1.5)

Sl No.	**LPG Storage Water Capacity of Individual Tank**	**Distance from Building/ Property Line**		**Distance between Tanks**	
	ℓ	Above Ground m	Under Ground m	Above Ground m	Under Ground m
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 2 000	5	5	1	1.5
ii)	Above 2 000 and up to 10 000	10	7.5	1	1.5
iii)	Above 10 000 and up to 20 000	15	10	1.5	1.5
iv)	Above 20 000 and up to 40 000 adjacent	20	15	2	0.25 x diameter of vessel or 1.5 m (*Min*)
v)	Above 40 000 and above adjacent	30	15	2	0.25 x diameter of vessel or 1.5 m (*Min*)

NOTE – If the aggregate water capacity of a multi-tank installation is 40 000 l or greater, the above minimum safety distances shall apply to the aggregate storage capacity rather than the capacity per individual storage tank.

11.4.2 *Bunding*

Since LPG is heavier than air, storage tank shall not be enclosed within bund walls. The accumulation of flammable liquid under LPG tanks shall be prevented by suitably slopping the ground.

11.4.3 *Protection*

11.4.3.1 To prevent trespassing or tampering, the area which includes tanks, direct fired vapourisers, pumping equipment and loading and unloading facilities shall be enclosed by an industrial type fence at least 2 m high along the perimeter of the safety zone. Any fence shall have at least two means of exit. Gates shall open outwards and shall not be self-locking.

11.4.3.2 When damage to LPG systems from the LPG tank lorry is a possibility, precautions against such damage shall be taken.

11.4.3.3 Underground tanks shall be protected from above ground loading by providing a suitable curb to prevent a possible accidental damage to the tank and its fittings by LPG tank lorry.

11.4.4 *Grass and Weed Removal*

Road ignitable material, such as weeds, long grass or any combustible material shall be removed from an area within 3 m from the shell of any LPG tank of up to 2 000 ℓ water capacity, and within 6 m from the shell of larger tanks. If weed killers are used, chemicals which are a potential source of fire hazard shall not be selected for this purpose.

11.4.5 *Warning Signs*

No smoking or naked flames shall be permitted within the safety zone of the installation. Prominent notices to this effect shall be posted at access point. From accessibility point of view, the signs shall be in accordance with **13** of Part 3 ‘Development Control Rules and General Building Requirements’ of the Code.

11.4.6 *Fire Protection*

The possibility of a major fire outbreak, leading to direct flame impingement of the storage tank, shall be minimized by sound engineering in plant design and layout, good operating practice, and proper education and training of personnel on both routine operations and on action to be taken in an emergency.

11.4.6.1 *Water supply*

Provision shall be made for an adequate supply of water and fire protection in the storage area according to the local hoses and mobile equipment, fixed monitors or by fixed spray systems which may be automatic. Control of water flow should be possible from outside any danger area.

11.4.6.2 *Fire extinguishers*

At least two dry chemical powder type fire extinguishers of 9 kg capacity each, conforming to the quality requirements in accordance with the accepted standards [9-4(5)], shall be installed at points of access to the storage installations. The fire extinguishers shall be mounted keeping in view the ease of accessibility in accordance with good practice [9-4(8)] and Part 4 'Fire and Life Safety' of the Code.

11.4.7 For detailed information regarding LPG bulk storage installations reference may be made to good practice [9-4(9)].

12 USE OF PIPED NATURAL GAS (PNG)

12.1 The PNG infrastructure shall be in complete compliance with all the requirements of *Petroleum and Natural Gas Regulatory Board* (*Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Network) Regulations*, 2008.

12.1.1 The user-group/housing society concerned (referred hereinafter in these clauses as 'society') should contact the local city gas distribution (CGD) entity at the stage of the design of the building. This ensures that all the adequate provisions are incorporated in the design itself, as also the compliance with all the safety standards stipulated/required by the regulations/gas entities, as applicable from time-to-time. This ensures avoidance/mitigation of any rework at a later stage, or even situations where incorporation of any changes may become impractical or not possible, thereby rendering the building devoid of PNG infrastructure.

12.1.2 The entire gas pipeline infrastructure proposed to be laid in the premises of the society shall be easily accessible in future by the representatives of the CGD entity. Provision should be made by the builder for the same. Builder/society should ensure communication of the same to the future customer and should incorporate it in their agreements with the customer.

12.1.3 No permanent/temporary structure shall be erected on the ground along the paths where gas pipeline exists underground.

12.2 The PNG infrastructure inside the premises of societies primarily comprises the following:

a) Underground medium pressure (MP) pipeline networks, comprising mainly polyethylene pipes and fittings;
b) Underground low pressure (LP) pipeline networks, comprising mainly polyethylene (PE) pipes and fittings;
c) Service regulator modules;
d) Above ground riser and lateral system, comprising mainly ERW GI pipes and fittings; and
e) Pipeline inside premise and/or kitchen of individual customer, comprising various components like meter regulator, diaphragm gas meter, copper pipe, brass fittings, brass valves, etc.

The guidelines mentioned under **12.3** to **12.6** give the minimum requirements to be complied with.

12.3 Guidelines for MP and LP Pipeline Networks

12.3.1 Gas pipelines are required to be laid at a minimum top cover of 1 m from the finished surface level. Underground PE pipeline shall not be laid through the basement.

12.3.2 A minimum clearance of at least 300 mm is required to be maintained between the gas pipelines and any other obstacles/services.

12.3.3 Gas pipelines should not be laid closer to properties than as stipulated below:

Pressure	*Minimum Proximity*
Up to 0.01 N/mm^2	0.25 m
Up to 0.4 N/mm^2	3.00 m

12.3.4 If required, provision of underground ducts may be provided by the society within their premises at the time of construction of the building, to facilitate inserting of gas pipelines at a later stage. The duct through which gas pipeline is to be laid should not be shared with pipeline of any other utility, for safety reasons.

12.3.5 The ducts/sleeves should be 150 mm of PVC. The top cover of the sleeve should be at least 1 m below finish ground level. The material of ducts, sleeves and fittings to be used for construction shall be of high quality and in compliance with the concerned Indian Standards. In some cases, if applicable, there may be multiple number of ducts required to be laid.

12.3.6 Service chambers should be provided at 15 m to 20 m centre-to-centre (in case of straight sections) and also at bends, tees, and before and after slopes. Size of the service chamber shall be 1.0 m x 0.6 m (inside dimensions) and top of the cover of the duct should be at least 1.0 m high. Cover of the chamber should be capable of sustaining expected vehicular load. The service chamber should be filled with sand after MGL PE gas pipe is laid through the ducts provided.

12.3.7 The ducts for gas pipeline should be maintained at offset distance of at least 1.0 m from electrical services and 1.5 m from any other structure. Crossing with other utilities/services should be at a difference in level of at least 300 mm.

12.3.8 During the period between laying of ducts and insertion of gas pipeline, all the ends/entries of the ducts laid shall be temporarily closed to avoid the entry of mud, debris, rodents, etc, inside the ducts.

12.3.9 After the insertion of gas pipeline through ducts, the annular space between the duct and the gas pipe at all the ends (which creates possibility of entering

undesired objects) should be plugged using a RCC half round pieces and plastered with cement.

12.3.10 The ducts and other elements of the duct system should be properly maintained subsequent to their installation and till the time of insertion of gas pipeline through the same.

12.4 Guidelines for Service Regulator Modules

The user-group/society should provide adequate open spaces in the premises for installation of gas equipment like regulating stations, which will be required to facilitate supply of PNG to the residents of the building/premise. The identified location shall be such that it does not obstruct any vehicular movement and is at a safe location in the premise.

12.5 Guidelines for Above Ground Riser and Lateral System

12.5.1 The riser and lateral system supplying gas to multi-storeyed residential buildings shall be in compliance with the requirements of the PNGRB regulations.

12.5.2 Multi-occupancy buildings having eight floors or more should have purpose-built utility shafts/ducts for accommodating riser and lateral system, which should be preferred route for constructing/locating the riser.

12.5.3 Provision shall be made for safe access to the riser and lateral system by the representatives of the CGD entity for future maintenance and repair. In the case of a continuous shaft, a concrete slab or similar flooring shall be provided for maintenance work at each floor.

12.5.4 *Ventilation*

12.5.4.1 Adequate provision for natural ventilation shall be provided in the building where PNG infrastructure is laid, so as to prevent any potential gas leaks from accumulating in the atmosphere to an unsafe level. Mechanical ventilation shall not be used to achieve the required ventilation levels. The minimum levels of ventilation in risers ducts/shafts shall be as given below:

Cross Sectional Area (CSA) of Riser Duct	*Minimum Free Area of Each High and Low Level Ventilation (Open Ventilator)*	*Typical Air Duct Size*	*Typical Ventilator Size*
m^2	m^2	mm	mm
less than 0.01	0.002	Ø50	Ø70
0.01 to 0.375	0.010	Ø100	100 x 100
0.375 to 0. 5	0.02	Ø150	100 x 200
0. 5 to 7. 5	0.05	Ø250	200 x 250

more than 7.5	1 percent CSA of the duct	–	–

12.5.4.2 Where the duct has a single ventilator that is part of the architectural design of the building, the free area of the ventilator to outside area shall be a minimum of 0.04 m^2 or 4 percent of the CSA of the duct, whichever is greatest.

12.5.4.3 Pipe work shall be installed in an unventilated void.

12.5.4.4 The pipe may enter the building to gain access to the riser shaft *via* a basement or car parking area, provided the area is well ventilated.

12.5.4.5 Any duct containing a riser or lateral shall be ventilated either directly to outside air, or indirectly to outside air *via* an area that is normally occupied and is itself ventilated to outside.

12.5.4.6 The provision of ventilation should be *via* permanent ventilators within the area/duct containing pipe-work.

12.5.4.7 All flammable release sources shall be at a lower elevation than the bottom of the highest ventilation opening.

12.5.4.8 Pipes may run in the same duct (subject to availability of adequate clearance from other utilities and ventilation) as most other services, including hot and cold water services, heating pipes, electrical conduits and cables and pipes containing other fuels. However, the following services shall not be installed in the same duct as gas pipes:

a) Ventilation ducts and vacuum pipes that operate at sub-atmospheric pressure and that are not of all-welded or all-brazed construction; and
b) Services containing oxidizing or corrosive fluids.

12.5.5 There shall be provision for installing risers and laterals such that a minimum distance of 300 mm is ensured from any electrical equipment or installations and associated excess current control boxes of fuse boxes, and 25 mm is ensured from the electricity supply and distribution cables and other metal piped services.

12.5.6 In case where the gas pipeline is required to cross through a wall, provisions (like core cutting) or holes of adequate size drilled through the wall/building structure, to accommodate an easy passage of the gas pipelines through them, shall be made. The elevation of these provisions/holes shall be near the roof and not near the floor of the room.

12.6 Guidelines for Pipeline Inside Premise and/or Kitchen of Individual Customer

12.6.1 Meters will normally be located inside the property on an outside wall with a minimum length of inlet pipe-work inside the property. Kitchen is the preferred room to locate the meter, thereby minimizing the length of the outlet pipe work.

12.6.2 The gas meter shall be installed in an area with adequate ventilation and at a proper location to facilitate safe and convenient meter reading and maintenance activities in future. A minimum ventilation area of 2 percent of the internal floor area of the room shall be provided in the room where the gas meter is located. The gas pipeline inside the kitchen shall be laid along the walls of the kitchen and in a ventilated area.

12.6.3 In case pipe work is required to be laid in solid floors inside the kitchen, adequate provisions (in the shortest possible route and a minimum of 75 mm screed to provide an approximate cover of at least 50 mm over the gas pipe) shall be provided to protect the pipeline against corrosion and failure caused by movement. This method of construction consists of a base concrete raft foundation onto which a cement screed is subsequently laid in order to obtain a satisfactory surface to accept the floor finish. Provision of preformed ducts with protective covers should be made to facilitate laying of gas pipeline. It is advisable to contact the CGD entity at the designing stage so that adequate provisions are incorporated in the design of the kitchen/floor plan to facilitate easy and safe installation of PNG system.

12.6.4 Installation pipe work shall not be placed within the cavity of a cavity wall. Every pipe passing through a cavity wall shall take the shortest possible practicable route and shall be sleeved.

12.6.5 In case of provision of sleeve, the same should be of a diameter that provides a sliding fit to the pipe allowing normal pipe expansion/contraction.

13 USE OF MEDICAL GAS PIPELINE SYSTEM (MGPS)

13.1 General

A medical gas pipeline system (MGPS) is installed to provide a safe, convenient and cost effective system for the provision of medical gases to the clinical and nursing staff at the point of use. It reduces the problems associated with the use of gas cylinders such as safety, porterage, storage and noise.

MGPS generally handles distribution of oxygen, nitrous oxide, medical air, surgical air, medical vacuum only; and sometimes provides anaesthetic gas scavenging systems. All other gases used in hospitals have low volume use and are provided through cylinders at the point of use.

It is essential to ensure that there is no possibility of a cross-connection between any system and that all parts of each system to which connections can be made by users are gas specific.

Separate installations are provided for pathology, general laboratories and special laboratories. These are designated Laboratory Gases (Pipeline) Supply System (LGSS). LGSS is provided with valve controlled outlets and shall never be provided with medical gas terminal units.

Use and storage of medical gases is governed by *Indian Drugs and Cosmetics Act*, 1940.

13.2 Design and Installation

13.2.1 *Pipelines Systems for Compressed Medical Gases and Vacuum*

The design, installation, performance, documentation, testing and commissioning of pipeline systems for compressed medical gases, gases for driving surgical tools and vacuum in healthcare facilities to ensure continuous delivery of the correct gas and the provision of vacuum from the pipeline system, shall be in accordance with the good practice [9-4(10)]. This is inclusive of the requirements for supply systems, pipeline distribution systems, control systems, monitoring and alarm systems and non-interchangeability between components of different gas systems.

13.2.2 *Anaesthetic Gas Scavenging Disposal Systems*

The design, installation, performance, documentation, testing and commissioning of anaesthetic gas scavenging disposal systems to ensure patient safety and to minimize exposure of the operator and other persons to anaesthetic gases and vapours, shall be in accordance with the good practice [9-4(11)]. This is inclusive of requirements for the power device, pipeline system, performance, non-interchangeability between key components and avoidance of cross connections between anaesthetic gas scavenging (AGS) disposal systems and medical gas and vacuum pipeline systems.

LIST OF STANDARDS

The following list records those standards which are acceptable as 'good practice' and 'accepted standards' in the fulfillment of the requirements of the Code. The latest version of a standard shall be adopted at the time of enforcement of the Code. The standards listed may be used by the Authority for conformance with the requirements of the referred clauses in the Code.

	IS No.	*Title*
(1)	14885:2022	Specification for polyethylene pipe for the supply of gaseous fuel (*first revision*)
(2)	IS/ISO 7396-2:2007	Medical gas pipeline systems : Part 2 Anaesthetic gas scavenging disposal systems
(3)	3196 (Part 1):2013	Specification for welded low carbon steel cylinders exceeding 5 litres water capacity for low pressure liquefiable gases: Part 1 Cylinders for liquefied petroleum gases (LPG) (*sixth revision*)
(4)	7142:1995	Specification for welded low carbon steel cylinders for low pressure liquefiable gases not exceeding 5 litre water capacity (*first revision*)
(5)	8198 (Part 5):2022	Code of practice for steel cylinders for compressed gases: Part 5 Liquefied petroleum gas (LPG) (*second revision*)
(6)	15683:2018	Specification for portable fire extinguishers — Performance and construction (*first revision*)
(7)	9798:2013	Low pressure regulators for use with liquefied petroleum gas (LPG) mixtures — Specification (*second revision*)
(8)	6044 (Part 1):2018	Liquefied petroleum gas storage installations — Code of practice: Part 1 Residential, commercial and industrial cylinder installations (*third revision*)
(9)	2190:2024	Code of practice for selection, installation and maintenance of first-aid fire extinguishers — Portable and mobile (*fifth revision*)
(10)	6044 (Part 2):2021	Code of practice for liquefied petroleum gas storage installations : Part 2 Commercial, industrial and domestic bulk storage installations (*second revision*)
(11)	IS/ISO 7396-2:2007	Medical gas pipeline systems : Part 2 Anaesthetic gas scavenging disposal systems