IS 6044-1 (2000): Code of Practice for Liquefied Petroleum Gas Storage Installations, Part 1: Commercial and Industrial Cylinder Installations [PCD 3: Petroleum, Lubricants and their Related Products]

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भारतीय मानक

द्रवित पेट्रोलियम गैस भंडारण संयंत्रों की रीति संहिता

भाग 1 वाणिज्यिक तथा औद्योगिक सिलिंडर संयंत्र

(पहला पुनरीक्षण)

Indian Standard

CODE OF PRACTICE FOR LIQUEFIED PETROLEUM GAS STORAGE INSTALLATIONS

PART 1 COMMERCIAL AND INDUSTRIAL CYLINDER INSTALLATIONS

(First Revision)

ICS 75.200

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 3

AMENDMENT NO. 1 SEPTEMBER 2008
TO
IS 6044 (PART 1) : 2000 CODE OF PRACTICE FOR LIQUEFIED PETROLEUM GAS STORAGE INSTALLATIONS

PART 1 COMMERCIAL AND INDUSTRIAL CYLINDER INSTALLATIONS

(First Revision)

(*Page* 1, *clause* **3.2**, *second sentence*) — Substitute the following for the existing sentence:

'All other equipments such as pressure regulators, valves, pigtails, manifolds and other installation materials shall comply with the statutory provisions or relevant Indian Standards. In the absence of any such provisions or standards equivalent international norms may be followed.'

(*Page* 2, *clause* **5.1**) — Substitute the following for the existing clause:

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

(*Page* 3, *clause* **6.1**) — Substitute the following for the existing clause:

'Pressure regulators and other devices used to control the gas shall comply with the statutory provisions or relevant Indian Standards. In the absence of any such provisions or standards equivalent international norms may be followed.'

(*Page* 3, *clause* **7.1**) — Substitute the following for the existing clause:

'All piping, tubing and fittings shall comply with the statutory provisions or relevant Indian Standards. In the absence of any such provisions or standards equivalent international norms may be followed.'

(*Page* 5, *clause* **10.4**) — Substitute the following for the existing clause:

'**10.4** Test pressure for portions of installations not subjected to cylinder pressure but carrying gas at a pressure more than 30 gf/cm^2-1.5 times the working pressure.'

Amend No. 1 to IS 6044 (Part 1) : 2000

(*Page* 5, *clause* **10.5**) — Substitute the following for the existing clause.

'**10.5** Portions of installation subjected to gas pressure of 30 gf/cm^2 or less — Test pressure of 150 gf/cm^2.'

(ME 16)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Petroleum Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

In the liquefied petroleum gas (LPG) trade, 'industrial installations' generally refer to the installations at factories and the 'commercial installations' relate to the larger type of catering establishments, such as hotels, restaurants and canteens. In these applications, the LPG installations generally consist of a larger number of cylinders, pressure regulators, piping, etc, and are handled by relatively unskilled workers and hence a code of practice is most needed. The application of this standard is recommended in order to promote safety and consumer satisfaction.

This standard was first published in 1971. In this version (first revision) scope has been enlarged. General recommendations, cylinder location, fittings and installation of flexible hoses have been modified. Leak testing has been redrafted. New clauses for instruction to consumer have been added.

In using this code, the *Gas Cylinder Rules*, 1981, and the *Rules for Storage of LPG in Cylinders*, framed by the Chief Controller of Explosives, shall be borne in mind.

Indian Standard

CODE OF PRACTICE FOR LIQUEFIED PETROLEUM GAS STORAGE INSTALLATIONS

PART 1 COMMERCIAL AND INDUSTRIAL CYLINDER INSTALLATIONS

(First Revision)

1 SCOPE

1.1 This standard (Part 1) lays down the code of practice for the installations of LPG cylinders (vapour withdrawal only), piping and equipment in commercial and industrial premises.

1.2 This code also applies to installations in educational, institutional premises and domestic installations including wherever cylinder manifold is provided.

2 NORMATIVE REFERENCES

The following Indian Standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1239 (Part 1) : 1990	Mild steel tubes, tubulars and other wrought steel fittings : Part 1 Mild steel tubes (*fifth revision*)
2171 : 1995	Portable fire extinguishers, dry powder (cartridge type) (*third revision*)
2501 : 1995	Solid drum — Copper tubes for general engineering purposes (*third revision*)
2878 : 1986	Fire extinguisher, carbondioxide type portable and trolley mounted (*second revision*)
3601 : 1984	Steel tubes for mechanical and general engineering purposes (*first revision*)
4784 : 1968	Low pressure regulators for use with butane gases
4785 : 1968	Low pressure regulators for use with propane gas
4786 : 1968	Variable high pressure regulators for use with liquefied petroleum gas

3 GENERAL RECOMMENDATIONS

3.1 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.

3.2 Cylinders and cylinder valves shall comply with the standard approved by the Chief Controller of Explosives. All other equipment such as pressure regulators and other installation material shall comply with distributing company's stipulations and meet IS specifications wherever available. Wherever any thread joint provided, a suitable jointing compound be used on male thread.

3.3 Gas piping shall be of the colour stipulated by the explosive authorities to distinguish it from other piping and the piping shall be painted silver grey with red bent of 150 mm wide.

3.4 Fire extinguishers of dry powder type (*see* IS 2171) or carbondioxide (*see* IS 2878) type 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 to 200 kg	2	Dry powder	10 kg
b) For installations with LPG more than 200 and up to 320 kg	2	Dry powder	10 kg
c) For installations with LPG more than 320 and up to 1 000 kg	3	Dry powder	10 kg

For electrical installation 1 No. CO_2 (4.5 kg capacity) to be provided.

4 CYLINDER LOCATION

4.1 Stationary Installations

4.1.1 Stationary installation not exceeding 40 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.

4.1.2 Stationary installations each not exceeding 40 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.

4.1.3 Stationary installation not exceeding 80 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.

4.1.4 Stationary installations each not exceeding 80 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 are a is one installation per 12 m^2 and the aggregate quantity of gas of all such installations does not exceed 200 kg.

4.1.5 Stationary installation not exceeding 320 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.

4.1.6 Stationary installations above 320 kg (200 kg in case provision as in 4.1.5 is not possible) but not exceeding 1 000 kg shall be installed outdoors on ground 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.

4.1.7 The position of the cylinders shall facilitate:

a) changing and quick removal of any cylinder in case of necessity, and

b) access to cylinder valve connections and regulating devices.

4.1.8 Cylinders shall be installed upright with the valves uppermost.

4.1.9 Cylinders shall not be installed or used below ground level, in cellars or basements.

4.1.10 Cylinders containing more than 20 kg of gas shall not be located on floors above ground level.

4.1.11 Cylinders shall not be installed at a place where they may be overheated, for example, close to steam pipes and boilers.

4.1.12 Cylinders shall not be installed at a place where they are likely to cause an obstruction, to be damaged or to be exposed to conditions likely to affect their safety.

4.1.13 Cylinders shall be located on a concrete or brick floor, preferably raised in case of outdoor installations.

4.1.14 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.

4.1.15 Cylinders which have safety relief valves or similar devices incorporated in them shall be so positioned that if the relief device operates, escaping gas is not hazardous.

4.2 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 80 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 directed 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) At any time the total quantity of gas at portable installations shall be in proportion to the floor area as specified in 4.1.1 to 4.1.6.

e) At any time the provision at 4.1.1 to 4.1.14 to be ensured for all installations.

5 CYLINDER MANIFOLDS

5.1 All materials, fittings, etc, used in cylinder manifold systems shall comply with the distributing company's stipulations.

5.2 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 25 kgf/cm^2 or one and a half times the maximum pressure corresponding

to the maximum assessed temperature of the cylinder, whichever is more.

5.3 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.

5.4 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.

5.5 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°C.

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

6 PRESSURE REGULATORS

6.1 Pressure regulators and other devices used to control the gas shall comply with the distributing company's stipulations (*see* IS 4784, IS 4785 and IS 4786).

6.2 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.

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

7 PIPING, TUBING AND FITTINGS (EXCLUDING MANIFOLDS)

7.1 All piping, tubing and fittings shall comply with official regulations and the distributing company's stipulations.

7.2 Copper Tube

Solid drawn copper tubes of outside diameter 10, 12 or 20 mm, as suitable, conforming to IS 2501 shall be used. The minimum wall thickness of the tubes shall be 1 mm.

7.3 Steel Tubes

Cold drawn seamless, electric welded, cold drawn electric resistance welded (ERW), or oxyacetylene welded tubes of suitable sizes conforming to IS 3601 shall be used.

7.4 Mild Steel Tubes

Hot finished seamless, or electric resistance welded (ERW) mild steel tubes of suitable size, conforming to medium or heavy class of IS 1239 (Part 1) or any other installations approved by CCOE shall be used.

7.5 The material used for flexible tubing and hose which are not subjected to full cylinder pressure shall be such that the tubing may withstand a test pressure without bursting of 3.5 kgf/cm^2 or five times the maximum operating pressure to which it may be subjected in normal use, whichever is more.

7.6 The material used for shut-off valves and similar equipment which are not subjected to full cylinder pressure shall be such that they may withstand a test pressure of 14 kgf/cm^2 or one and a half times the maximum operating pressure to which they may be subjected in normal use, whichever is more.

7.7 Cast iron and aluminium fittings shall not be used.

7.8 In the case of flange connections, the flanges shall be machined and should preferably have raised face. Metallic with gasket of minimum thickness or 1.5 mm is preferable to be used.

7.9 For any kind of movable appliance or burner, flexible connectors shall be used and they shall be of a type that resists abrasion.

7.9.1 Where the operating pressure of the appliance or burner exceeds 100 kgf/cm^2, both ends of the connectors shall be positively attached (for example, by suitable clips) to prevent them from coming off the hose nipples because of pressure or tension in the hoses.

8 INSTALLATION OF PIPING AND VALVES

8.1 Flexible Hose

8.1.1 Installations on which flexible hose is used shall satisfy the following conditions:

a) The cylinder and the appliances connected to it shall be in the same room,

b) The length of hose shall be kept as short as possible and should normally not exceed 2 m, and

c) The appliances connected shall be of portable type and not mounted in a fixed position.

8.1.2 Flexible hose shall not be extended from one room or verandah or one space to another and, therefore, shall not be passed through doors, windows, walls, partitions, ceilings, or floors.

8.1.3 Flexible hose shall be accessible for easy inspection and shall not be connected from view in walls, cupboards, cabinets and other obstructions.

8.1.4 Flexible hose shall not be used in conditions where ambient temperature exceeds 52°C.

8.1.5 Flexible hose shall be so installed that it is not twisted, looped or kinked and is not subjected to any external pressure. Periodic inspection to be carried out by the supplier of the gas.

8.2 Appliances which are rigidly fixed in position shall be connected by means of rigid piping.

8.3 Appliances which are portable, if connected to rigid piping, shall be connected through flexible or semi-flexible connections.

8.4 Piping

8.4.1 Piping shall be free internally and externally of cutting burrs, loose scales, dirt, dust and other foreign matter before the installation is completed.

8.4.2 It is recommended that, where possible, joints should not be placed beneath ground level in inaccessible places, confined places (for example, cellars), air or ventilating ducts, space under flooring or lift shafts.

8.4.3 If joints have to be used in piping beneath ground level in inaccessible places or confined places, they shall be welded or brazed to minimize the risk of leakage which may lead to hazardous collection of gas.

8.4.4 Where welded or brazed joints are used, they shall be of adequate mechanical strength and, for fire resistance, the material used for welding or brazing shall have a minimum melting point of 540°C.

8.4.5 Joints other than welded or brazed shall be readily accessible.

8.4.6 Piping shall be so located or protected as to avoid extremes of temperature which might give rise to condensation or cracking of the gas.

8.4.7 Provision shall be made to avoid damage to the piping from its expansion, contraction and vibration and by settlement of the building by which it is carried.

8.4.8 Piping shall be protected against corrosive atmospheres and materials.

8.4.9 As far as possible, concealed piping shall be avoided. If concealed piping is used, it shall be protected against inadvertent damage, such as from nails and knocks, by its location, type of material used or sheathing.

8.4.10 Piping shall not be run in or through an air or ventilating duct, chimney, flue or lift shaft.

8.4.11 Piping up to an outside diameter of 12 mm shall be supported at intervals of about 50 cm by means of pipe saddles or clamps in a way to avoid sagging and shifting. For larger diameter pipes, suitable longer supporting intervals may be used.

8.4.12 It is recommended that if the pipes are run along a surface of a structure, the supports should be so designed that the joints are sufficiently clear of the surface to permit the use of tools without damage to the surface.

8.4.13 It is recommended that when installing pipes along a surface of a structure, the installation is done in such a way that moisture is not trapped between the surface and the pipeline.

8.4.14 It is recommended that the piping passing through walls should be protected by a covering sleeve. If it is necessary to pack the space between the piping and the sleeve, a moisture-proof material which does not corrode the piping shall be used.

8.4.15 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 below the electrical wiring.

8.4.16 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.

8.5 Suitable line shut-off valves shall be fitted for each appliance or burner.

8.6 A main valve shall be fitted in the piping as near as possible to its point of entry into building. It shall be enclosed in a metal box with a glass frontage.

8.7 It is recommended that the number of fittings used in an installation should be kept to a minimum in order to reduce the risk of gas leakage. As far as possible, straight lengths of piping should be used. where there are bends in the pipeline, these should have a radius of at least five times the diameter of the pipe.

8.8 The open ends of piping and fittings (with the exception of terminal taps or vales in regular use) shall always be made gas-tight by means of either an appropriate terminal fitting or a plug, welded or brazed in position. Welding or brazing material shall have a melting point of at least 540°C.

8.8.1 Hammering over the ends of piping or plugging with wood, as a means of sealing, shall not be allowed.

9 LEAK TESTING

9.1 Before any system of gas piping is finally put into service, it shall be carefully tested to ensure that it is gas-tight. Where any part of the system is to be enclosed or concealed, the test shall precede the work of closing in.

9.2 Naked flames shall never be used for checking gas-tightness of the installations.

9.3 It is recommended that the location of leaks should be found by the use of soap solution or similar materials.

9.4 Defective pipes or fittings shall be replaced and shall not be repaired *in-situ*.

10 INSTRUCTIONS TO CONSUMERS

10.1 Consumers shall be instructed by the supplier on the following:

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.

10.2 Parts or Installation Subjected to Cylinder Pressure

Test pressure of one and a half times the pressure corresponding to the maximum assessed temperature (temperature used for design of cylinder).

10.3 Portions of Installation Downstream of Adjustable Regulators

Test pressure of one and a half times the maximum outlet pressure that may be given by an adjustable regulator or 2 kgf/cm^2, whichever is more.

10.4 Portions of installation not subjected to cylinder pressure but carrying gas at pressure more than 30 kgf/cm^2, whichever is more.

10.5 Portions of installation subjected to gas pressure of 30 kgf/cm^2 or less – Test pressure of 150 kgf/cm^2.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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