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IS 8198-5 (1984): Code of Practice for Steel Cylinders for Compressed Gases, Part 5: Liquefied Petroleum Gas (LPG)
[MED 16: Gas Cylinders]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**CODE OF PRACTICE FOR
STEEL CYLINDERS FOR COMPRESSED GASES
PART 5 LIQUEFIED PETROLEUM GAS (LPG)**

(First Revision)

1. Scope — This standard (Part 5) covers filling, inspection, testing and maintenance of portable steel cylinders for the storage and transportation of liquefied petroleum gas in cylinders exceeding 500 ml water capacity.

2. Terminology

2.1 For the purpose of this standard, the terminology given in IS : 7241-1981 'Glossary of terms used in gas cylinder technology (first revision)' shall apply.

3. Approved Specifications for Manufacture

3.1 The cylinders used for the storage and transportation of liquefied petroleum gas (LPG) shall conform to one of the specifications approved by the statutory authority. A list of approved specifications is given in Appendix A.

4. Filling

4.1 Inspection Before Filling — Before filling any cylinder, the filler shall subject it to a thorough examination to ensure that :

- a) The cylinder is manufactured to a specification approved by the statutory authority;
- b) The cylinder is not due for retesting as required under 6;
- c) All statutory requirements in respect of markings, valve fittings and painting are complied with;
- d) The valve and its parts including outlet threads are in good condition; and
- e) The cylinder does not have excessive dents [see IS : 5845-1984 Code of practice for visual inspection of low pressure gas cylinders in use (first revision)].

4.2 Empty cylinders which have been involved in a fire should not be refilled. They should be carefully inspected by a competent person to assess the damage, if any, caused to the cylinders by the fire; and also to advise the repairs to cylinders, if required (see IS : 5845-1984).

4.3 Filling Ratio — Cylinders for liquefied petroleum gas shall not be filled in excess of the filling ratio specified by the statutory authority [see also IS : 3710-1978 Filling ratios for low pressure liquefiable gases (first revision)] based on the design of the cylinder and the chemical composition of LPG being filled. The amount of gas charge into the cylinder shall be determined by weighing. The weight shall be checked if after the cylinder has been disconnected from the charging line.

4.4 Leakage — All cylinders shall be carefully examined for leaks after filling. Leaky cylinders shall be emptied in approved safe location and inspected for cause of leakage.

4.4.1 For venting, the cylinder shall be placed in a vertical position in an open space, observing the procedure laid down in 4.4.2 and 4.4.3.

4.4.2 Area around the cylinder shall be cordoned off. The security nut shall be removed and the valve opened to vent the cylinder.

4.4.3 The operation shall be carried out in an open space away from any building or drains with a minimum 10 metres clear distance around the cylinder and where the escaping gases shall disperse into the air without creating a hazard or constituting a public nuisance. Care shall always be taken to ensure that no sources of ignition, of whatsoever nature, are brought into the cordoned area. Apart from excluding entry of all sources of ignition it shall be ensured that no sparks are created by tools, shoe nails, etc, striking metallic or concreted surfaces.

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4.4.4 All cylinders received without residual gas shall be either purged or evacuated at the filling plant before filling with LPG.

4.4.5 Before a cylinder leaves any filling station, the filler shall ensure that the cylinder is not leaking from any part and valve and the cylinder is in order in all respects.

5. Marking and Labelling

5.1 *Marking* — Liquefied petroleum gas cylinders shall have the following markings in letter/figure, permanently stamped on them, either at footing or on any non-pressure part of the cylinder:

- a) Serial number and identification of owner and manufacturer;
- b) Specification to which cylinder has been manufactured;
- c) Maximum working pressure;
- d) Test pressure, month or quarter and year of last hydrostatic test;
- e) Tare of cylinder. (It shall be the weight of empty cylinder with valve fitted, but excluding cylinder cap and security nut);
- f) Water capacity in litres; and
- g) Inspector's official mark.

5.2 *Colour Identification* — Each cylinder shall be painted in accordance with the requirements of IS : 4379-1981 'Identification of the contents of industrial gas cylinders (*first revision*)' in use, and also, if required, in accordance with the regulations indicated in the Red Tariff for conveyance by rail of explosives and other dangerous goods published by Indian Railway Conference Association.

6. Periodic Inspection and Testing

6.1 Cylinders are subjected to periodic inspection and testing to ensure that they are safe for further use. In the case of LPG, the periodic inspection interval is not to exceed 5 years (*see* IS : 8868-1978 Periodical inspection interval of gas cylinders in use) The periodic testing consists of :

- a) *Visual Inspection* — To be acceptable cylinders shall satisfy the requirements of external and internal examination in accordance with IS : 5845-1984.
- b) *Hydrostatic Test* — The test pressure shall be retained for a period of not less than 30 seconds. Any reduction in pressure noticed during this retention period or any leakage, visible bulge or deformation shall be treated as a case of failure of the test. In all cases, the inside of the cylinder shall be dried after carrying out hydrostatic test before filling.
- c) *Weighing* — Cylinders shall be weighed and if the tare is less than 95 percent of the original tare marked on the cylinder, the cylinder shall be condemned.
- d) *Checking of Valves* — Prior to the hydrostatic test, the valves shall be removed and the threads examined for distortion and suitability for re-use. Valves or parts of the valves which are not in serviceable condition shall be reconditioned or renewed as necessary.

6.2 Periodic inspection shall also be carried out on cylinders whenever special circumstances necessitate it, as for instance, when the cylinder shows a serious damage or is exposed to fire.

7. Repair of Cylinders and Attachments

7.0 *General* — Repair and inspection of cylinders shall be undertaken by organizations approved by the statutory authority.

7.0.1 Before commencing any major repairs, the valves shall be removed and the cylinders gas-freed. Gas-freing shall be carried out preferably by steaming for at least 10 minutes. If steam is not available, the cylinders shall be filled to overflowing with water and allowed to stand for one hour. They shall be emptied, refilled with water and emptied again.

7.0.2 Cylinders shall always be checked to ensure that they are gas-free before hot work is carried out.

7.1 *Dent Removal*

7.1.1 Hot dedenting shall not be permitted. Subsequent to cold dedenting the cylinder shall be stress-relieved.

7.1.1.1 Hot dedenting may however be permitted if the inspecting authority is satisfied after verification of markings on the cylinder or certificates pertaining thereto, that the cylinder was originally normalized. Cylinders so dedented shall be again normalized.

7.1.2 Removal of small dents shall be done by hydraulic pressure on a cold cylinder; but the pressure used should not exceed the test pressure of the cylinder.

7.1.3 For large dents which are within the permissible limits specified in IS : 5845-1984, the cylinder shall be partially filled with water and positioned so that the dent is uppermost and in the air space. The cylinder shall be fitted with a pressure gauge to record the pressure inside the cylinder, after connecting the cylinder to an air pressuring system. The area of the dent shall be heated carefully with an oxygen-gas blow pipe and the pressure inside the cylinder shall be slowly raised until the dent disappears. Very light dressing or tapping with a light weight hammer is permissible while the steel is hot.

7.2 Repair of Seams — Cylinders may be withdrawn from service to carry out repairs of pinholes in welded or brazed seams provided that :

- a) if the original seams were welded, the repair is done by welding;
- b) the cylinder is heat-treated after repair;
- c) after heat treatment the cylinder is subjected to the hydrostatic test and the pneumatic test; and
- d) adequate records of such repairs are kept.

7.3 When footrings or valve protection rings or handles are removed and re-welded to the cylinder, the cylinder shall be subsequently stress-relieved or normalized.

8. Valves and Pressure Regulators

8.1 Valve Fittings — Valve fittings used on LPG cylinders shall conform to IS : 8737 (Part 1)-1979 'Valve fittings for use with liquefied petroleum gas (LPG) cylinders for more than 5-litre water capacity: Part 1 Valve fittings for replacement purposes' or IS : 8737 (Part 2)-1978 'Valve fittings for use with liquefied petroleum gas (LPG) cylinders for more than 5-litre water capacity : Part 2 Valve fittings for newly manufactured LPG cylinders' regarding material, design, construction and testing. The part of the valve in contact with the contents of the cylinder shall be of metal which does not react with the gas and shall be capable of withstanding the test pressure of the cylinder.

8.2 Pressure Regulators — Pressure regulators used on LPG cylinders shall conform to IS : 9798-1981 'Low pressure regulator for use with liquefied petroleum gas (LPG) mixtures'.

9. Handling, Use, Storage and Transportation

9.1 Handling and Use

9.1.1 Those responsible for the handling and use of cylinders should understand the characteristics of LPG [see 4576-1978 Specifications for liquefied petroleum gas (LPG)] and it is essential that they be trained in good practices relating to their job.

9.1.2 As empty cylinders are not in fact truly empty but contain LPG vapour, their handling and storage shall, in general, be subjected to the same considerations as for full ones.

9.1.3 Cylinders represent a very heavy capital outlay, and their life depends almost entirely on the care with which they are handled and stored at all times. Cylinders shall, therefore, be well cared for.

9.1.4 Cylinders shall not be rolled on their sides but shall always be carried or rolled on their footrings.

9.1.5 Before cylinders are handed over for transportation, it shall be ensured that the cylinders are not leaking from any part and valve. Also it shall be ensured that the valve outlet is fitted with a safety cap and that the valve is in order in all respects.

9.1.6 Cylinders shall not be handled in any way which shall cause the seal to break before the cylinder is required for connecting up.

9.1.7 Cylinders shall not be dropped.

9.1.8 Cylinders shall always be used in an upright position, and be so placed that they cannot be knocked over. Open flames, lights, lighting of fires and smoking shall be prohibited in close proximity of any cylinder containing liquefied petroleum gas, except those while in use for welding, cutting or heating.

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9.1.9 Unless proper means of attaching rope or chain slings are provided, slings shall not be used in the handling of cylinders. Magnetic devices shall not be used for lifting.

9.1.10 When cylinders have to be vented, the operation shall be carried out in the open, under the supervision of a competent person, taking the necessary safety precautions.

9.2 Storage

9.2.1 Full and empty cylinders shall be stored only in places constructed in accordance with statutory rules.

9.2.2 Cylinders shall always be stored with security nuts, seal plugs or transit plugs and valve protection caps, where provided, in position.

9.2.3 Cylinders shall not be stored below ground level or on upper floors.

9.2.4 Cylinders shall not be stored near corrosive substances or vapours.

9.2.5 Cylinders shall not be stored in positions or places where they are liable to become overheated, for example, near boilers.

9.2.6 Cylinder storage places shall be adequately ventilated at floor level and at eaves level.

9.2.7 Empty cylinders which have not been made gas-free shall be kept inside approved storage sheds.

9.2.8 Cylinders shall be stored on solid floors; alternatively, the space beneath the flooring shall be adequately ventilated to the open air and not to any other room or compartment.

9.2.9 Cylinder storage spaces shall be kept clean at all times in order to prevent the accumulation of combustible material. Particular attention shall be given to ventilating apertures to prevent their becoming blocked.

9.2.10 All doors or gates giving direct access to the cylinder storage shall open outwards.

9.2.11 Adequate precautions shall be taken to prevent unauthorized persons from having access to LPG cylinders kept in the storage shed or storage areas.

9.2.12 Vehicles not specifically designed or adapted for operation in flammable atmospheres shall be forbidden from entering inside storage compartments or from approaching nearer than two metres from cylinder stacks in outdoor storage.

9.2.13 Smoking and the use of naked flames, etc, in storage spaces, whether indoor or outdoor, shall be prohibited. Further a notice to this effect shall be permanently and prominently displayed immediately adjacent to any means of access to the storage space.

9.2.14 If artificial lighting is used in the store or storage space, it shall be electric. Any electric fitting shall be of the flame-proof type and wiring shall be in robust conduit to protect it from damage. No storage shed shall be opened and no handling of LPG cylinders shall be permitted between sunset and sunrise except where approved lighting is exclusively used.

9.2.15 If any accident, fire or explosion occurs involving the cylinder which is attended with loss of life or serious injury to person or property, this shall be immediately reported to the nearest magistrate or to the officer-in-charge of the nearest police station and by express telegram to the Chief Controller of Explosives as required under the Gas Cylinders Rules, 1981.

9.2.16 *Methods of stacking*

9.2.16.1 When LPG cylinders are stacked horizontally they shall be restrained (wedged) to prevent their rolling apart due to the weight of the stack or due to the removal of any cylinder.

9.2.16.2 A gangway approximately 0.6 metre wide enough to permit access and manoeuvring of cylinders shall be left between stacks of single or double rows and between stacks and the walls of indoor storage compartments.

9.2.16.3 Generally, cylinders may be stacked vertically (valve upper most) or horizontally but it is recommended that those which incorporate safety relief devices should be piled vertically.

9.3 Transportation

9.3.1 Every vehicle on which LPG cylinders are transported shall be of strong construction with sides and back of adequate height and shall be maintained in good condition.

9.3.2 Every vehicle while engaged in the transport of LPG cylinders shall be constantly attended to by at least one person. The attendants shall have basic knowledge of fire hazards attached to LPG cylinders.

9.3.3 The speed limit of the vehicle shall not exceed 50 km/h. If a lower limit is imposed by the State Transport Authority, it shall be observed.

9.3.4 No LPG cylinders shall be carried in public service vehicles carrying passengers, and no other goods shall be permitted on vehicles carrying LPG cylinders.

9.3.5 A suitable dry powder or carbon dioxide type of fire extinguisher shall be provided on the vehicles used for carriage of LPG cylinders.

9.3.6 No person in a vehicle carrying LPG cylinders shall smoke, and no fire or other source of ignition shall be permitted in the vicinity of the vehicle.

9.3.7 LPG cylinders shall be so transported as not to project in the horizontal plane beyond the sides or ends of the vehicle in which they are transported.

There shall be no sharp projection on the inside of the vehicle and adequate measures shall be taken to prevent cylinders falling off the vehicle and being subjected to rough handling, excessive shocks or local stress.

9.3.8 Cylinders transported in the vehicles shall be blocked or braced and be so secured as to prevent movement or falling down. In no case cylinders shall be so loaded into vehicles that they may bounce or may strike each other or other objects.

9.3.9 When cylinders are transported by rail, this shall be done in accordance with the Railway Red Tariff Rules.

9.3.10 No lifting magnet or hook shall be used in loading or unloading of cylinders.

9.3.11 Every cylinder containing LPG when transported, shall have its valve protected against damage in a suitable manner, unless it is securely packed in a box or crate.

9.3.12 During transportation of cylinders vehicles shall be parked in safe areas.

9.3.13 Wherever possible, cylinders shall be stacked in vertical position during transportation. If, however, they are stacked horizontally, the maximum height of the stack shall be governed by consideration of the weight that a cylinder in the bottom tier is able to withstand.

10. Disposal of Condemned Cylinders

10.1 Cylinders including the attachments, such as footrings and handle rings which do not comply with the requirements of inspection and testing and which have been rejected and recommended to be destroyed shall be disposed of in accordance with IS : 9200-1979 'Methods of disposal of un-serviceable compressed gas cylinders'.

10.2 History sheets of such cylinders shall be closed and kept on record for period of one year.

11. General

11.1 The jointing compound used at different joints in the system shall be of a type which is resistant to LPG and which remains plastic (see IS : 3465-1966 Specification for jointing compounds for use in liquefied petroleum gas appliances and installations). In any joint in which the thread provides a gas-tight seal, jointing compound shall be used.

11.2 In using the code, IS : 4576-1978, which lists the various types of LPG generally marketed in India, shall be borne in mind.

11.3 Safety devices, if used, shall be of approved design (see IS : 5903-1970 Recommendation for safety devices for gas cylinders).

APPENDIX A

(Clause 3.1)

LIST OF APPROVED SPECIFICATIONS

- A-1.** The list of specifications approved by the statutory authority for use in India is given below:
- IS : 3196-1983 Welded low carbon steel gas cylinders exceeding 5-litre water capacity for low pressure liquefiable gases (*third revision*)
 - IS : 7142-1974 Welded low carbon steel gas cylinders for low pressure liquefiable gases not exceeding 5-litre water capacity
 - BS 401 : 1931 Steel cylinders for storage and transport of liquefiable gases. British Standards Institution.

Note — The list is not comprehensive as new specifications are added from time to time. Up-to-date information on the subject can be had from the Chief Controller of Explosives, Nagpur.

EXPLANATORY NOTE

Liquefied petroleum gases are hazardous if allowed to escape. The low viscosity of these gases compared to heavier petroleum fractions greatly aggravates the problem of containing them. To handle them as liquids they should be confined under pressure or be held at low temperature or both.

If the liquid leaks from a cylinder, it will quickly vaporize, mix with air and probably develop a flammable mixture. The hazard here is increased because most liquefied petroleum gases are heavier than air and will spread along the ground where there are many possible sources of ignition.

Manufacturers, fillers and users of the gas cylinders covered by this standard should be familiar with the precautions laid down in this standard in order to ensure safe and efficient operating conditions. For general information on LPG and other gases conveyed in cylinders, SP : 9-1978 ' Technical data sheet for gases conveyed in cylinders ', may also be referred.

For the purpose of easy reference, the standard is being issued in different parts as under:

- Part 1 Atmospheric gases
- Part 2 Hydrogen gas
- Part 3 High pressure liquefiable gases
- Part 4 Dissolved acetylene gas
- Part 5 Liquefied petroleum gas (LPG)
- Part 6 Liquefied chlorine gas
- Part 7 Ammonia gas
- Part 8 Common organic refrigerant gases
- Part 9 Sulphur dioxide gas
- Part 10 Methyl bromide gas
- Part 11 Methyl chloride gas
- Part 12 Gases for medical use.

In 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 large number of cylinders and are handled by relatively unskilled workers.

Separate Indian Standards for such installations IS : 6044 (Part 1)-1971 ' Code of practice for liquefied petroleum gas cylinder installations: Part 1 Commercial and industrial installations ' and IS : 6044 (Part 2)-1972 ' Code of practice for liquefied petroleum gas cylinder installations: Part 2 Industrial, commercial and domestic bulk storage installations ' have been prepared for the guidance of consumers.

Manufacture, possession and use of liquefied petroleum gas when contained in cylinders is regulated under the Gas Cylinder Rules, 1981 of the Government of India as amended from time to time. Although this standard has been prepared in consultation and agreement with the statutory authorities under these rules, should anything in the standard conflict with the provisions of Gas Cylinders Rules, the latter shall be adhered to.