STORAGE, HANDLING & REFUELING

OF

LPG FOR AUTOMOTIVE USE

PREPARED BY
FUNCTIONAL COMMITTEE

Oil Industry Safety Directorate
Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)
Website: www.oisd.gov.in
Tele: 0120-2593800, Fax: 0120-2593802
Preamble

Indian petroleum industry is the energy lifeline of the nation and its continuous performance is essential for sovereignty and prosperity of the country. As the industry essentially deals with inherently inflammable substances throughout its value chain – upstream, midstream and downstream – Safety is of paramount importance to this industry as only safe performance at all times can ensure optimum ROI of these national assets and resources including sustainability.

While statutory organizations were in place all along to oversee safety aspects of Indian petroleum industry, Oil Industry Safety Directorate (OISD) was set up in 1986 Ministry of Petroleum and Natural Gas, Government of India as a knowledge centre for formulation of constantly updated world-scale standards for design, layout and operation of various equipment, facility and activities involved in this industry. Moreover, OISD was also given responsibility of monitoring implementation status of these standards through safety audits.

In more than 25 years of its existence, OISD has developed a rigorous, multi-layer, iterative and participative process of development of standards – starting with research by in-house experts and iterating through seeking & validating inputs from all stake-holders – operators, designers, national level knowledge authorities and public at large – with a feedback loop of constant updation based on ground level experience obtained through audits, incident analysis and environment scanning.

The participative process followed in standard formulation has resulted in excellent level of compliance by the industry culminating in a safer environment in the industry. OISD – except in the Upstream Petroleum Sector – is still a regulatory (and not a statutory) body but that has not affected implementation of the OISD standards. It also goes to prove the old adage that self-regulation is the best regulation. The quality and relevance of OISD standards had been further endorsed by their adoption in various statutory rules of the land.

Petroleum industry in India is significantly globalized at present in terms of technology content requiring its operation to keep pace with the relevant world scale standards & practices. This matches the OISD philosophy of continuous improvement keeping pace with the global developments in its target environment. To this end, OISD keeps track of changes through participation as member in large number of International and national level Knowledge Organizations – both in the field of standard development and implementation & monitoring in addition to updation of internal knowledge base through continuous research and application surveillance, thereby ensuring that this OISD Standard, along with all other extant ones, remains relevant, updated and effective on a real time basis in the applicable areas.

Together we strive to achieve NIL incidents in the entire Hydrocarbon Value Chain. This, besides other issues, calls for total engagement from all levels of the stake holder organizations, which we, at OISD, fervently look forward to.

Jai Hind!!!

Executive Director

Oil Industry Safety Directorate
FOREWORD

The Oil Industry in India is more than 100 years old. As such, a variety of practices have been in vogue because of collaboration/association with different foreign companies and governments. Standardisation in design philosophies, operating and maintenance practices was hardly in existence at a national level. This, coupled with feedback from some serious accidents that occurred in the recent past in India and abroad, emphasised the need for the industry to review the existing state of art in designing, operating and maintaining oil and gas installations.

With this in view, the Ministry of Petroleum & Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry for formulating and implementing a series of self regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safer operations. Accordingly, OISD constituted a number of functional committees comprising of experts nominated from the industry to draw up standards and guidelines on various subjects.

Liquefied Petroleum Gas (LPG) has been identified as one of the alternate fuels to liquid petroleum fuels, on account of the added environmental benefits, it offers. This fuel is being used internationally with proven success as an automotive fuel. It is envisaged that LPG would be widely used as automotive fuel in the coming years in the country. Therefore, a need was felt to frame guidelines for safe storage, handling and refueling of LPG at Auto LPG Dispensing Stations.

The present document “Storage, Handling & Refueling of LPG for Automotive Use” was prepared by the Functional Committee on “Auto LPG Dispensing Station”. This document was prepared based on the accumulated experience and knowledge of industry members, and various national and international codes and practices.

This document will be reviewed periodically for improvements based on the new experiences and better understanding. Suggestions may be addressed to:

The Coordinator,
Committee on “Auto LPG Dispensing Station”
Oil Industry Safety Directorate
Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhawan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)
Website: www.oisd.gov.in
Tele: 0120-2593800, Fax: 0120-2593802
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These documents are intended to supplement rather than replace the prevailing statutory requirements.

Note 1 in superscript indicates the changes / modifications / additions as approved in the 20th Safety Council Meeting held in October 2002.
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<td></td>
</tr>
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</tr>
<tr>
<td><strong>MEMBERS</strong></td>
<td></td>
</tr>
<tr>
<td>Sh. A.N. Biswas</td>
<td>Deptt. of Explosives, Nagpur</td>
</tr>
<tr>
<td>Sh. A. Mishra</td>
<td>IBP Co. Ltd., New Delhi</td>
</tr>
<tr>
<td>Sh. B.V. Raviprakash</td>
<td>Bharat Petroleum Corporation Ltd., Mumbai</td>
</tr>
<tr>
<td>Sh. N. Dasgupta</td>
<td>Bharat Petroleum Corporation Ltd., Mumbai</td>
</tr>
<tr>
<td>Sh. S. Sreenivasulu</td>
<td>Hindustan Petroleum Corporation Ltd., Mumbai</td>
</tr>
<tr>
<td>Sh. S. Bhalla</td>
<td>Gas Authority of India Ltd, New Delhi</td>
</tr>
<tr>
<td>Sh. Sunil Mathur</td>
<td>Indian Oil Corporation Ltd., Mumbai</td>
</tr>
<tr>
<td>Sh. K.G. Malhotra</td>
<td>Engineers India Limited, New Delhi</td>
</tr>
<tr>
<td>Sh. M.K. Chaudhari</td>
<td>The Automotive Research Association of India, Pune</td>
</tr>
<tr>
<td>Sh. Janardan Sharma</td>
<td>Indian Institute of Petroleum, Dehradun</td>
</tr>
<tr>
<td>Sh. I. M. Bholia</td>
<td>LPG Equipment Research Centre, Bangalore</td>
</tr>
<tr>
<td><strong>MEMBER COORDINATOR</strong></td>
<td></td>
</tr>
<tr>
<td>Sh. S. C. Gupta</td>
<td>Oil Industry Safety Directorate, New Delhi</td>
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STORAGE, HANDLING & REFUELLING OF LPG FOR AUTOMOTIVE USE

1.0 INTRODUCTION

Liquefied Petroleum Gas (LPG) has been identified as one of the alternate fuels to liquid petroleum fuels, on account of the added environmental benefits, it offers. This fuel is being used internationally with proven record of success as an automotive fuel.

LPG is a mixture of light hydrocarbons primarily C₃ & C₄ derived from petroleum, which is gaseous at ambient temperature and atmospheric pressure, is liquefied at ambient temperature with application of moderate pressure. For the purpose of this standard LPG means "Auto LPG" conforming to IS : 14861.

It is expected that LPG will be widely used as an automotive fuel in coming years. It is envisaged that LPG would be either dispensed from an exclusive Dispensing Station or with additional facilities for auto LPG in an existing Motor Spirit (MS) / High Speed Diesel (HSD) Retail Outlets. Because of expected growth in auto LPG stations in the coming years, a need was felt to frame guidelines on safety of these Auto LPG Dispensing Stations.

Safety at these installations is one of the important considerations in view of the operating conditions such as pressure, storage of other flammable materials etc.. In addition to general precautions being taken for handling of MS/HSD, following aspects need to be considered while handling LPG :-

- LPG is normally stored as liquid under pressure.
- Leakage particularly of liquid would result in release of large volumes of flammable gas.
- A very small proportion of these gases in air can give rise to an explosive mixture.
- LPG vapour is heavier than air and would flow along the ground or through drains and may be ignited at a considerable distance from the source of leakage.

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LPG liquid by its rapid vaporisation and consequent lowering of the temperature, can cause severe frost burns if it comes in contact with the skin.

2.0 SCOPE

This standard lays down the minimum safety requirements for Auto LPG Dispensing Stations.

It does not cover the certification or fitness requirements of vehicles using LPG.

This Standard does not deal with provision of CNG and LPG dispensing facilities together for automotive use in the same station.

3.0 DEFINITIONS

Authorised Person: A person trained and assigned to carry out a specific job by the owner or LPG marketing company.

Auto LPG: A mixture of certain light hydrocarbons derived from petroleum, which are gaseous at normal ambient temperature and atmospheric pressure but may be condensed to liquid state at normal ambient temperature by the application of moderate pressure, and which conforms to IS: 14861.

Auto LPG Dispensing Station (ALDS): The premises used for storing and dispensing auto LPG to the motor vehicles for automotive purpose.

Auto LPG Tank: A steel container for storage and transport of Auto LPG, fitted permanently in a motor vehicle or vehicle as its fuel tank, for automotive fuel and filled in that position and conforming to IS: 14899 and as approved by the Chief Controller of Explosives under Gas Cylinder Rules 1981.

Bulk Storage: The facilities for storing LPG in stationary pressure vessels exceeding the capacity of 1000 Lt. These pressure vessels shall conform to the Static & Mobile Pressure Vessels (Unfired) Rules, 1981.

Capacity: The maximum volume of water that can be stored in a vessel/container at 15 °C at atmospheric pressure.

Competent Person: A person recognised by the concerned Statutory Authority for the purpose in respect of which the competency is required.
Dispenser: The equipment provided in the ALDS for delivering LPG to the Auto LPG Tank of motor vehicles.

Emergency shut off Valve: A shut off valve which, in an emergency, operates automatically or can be operated remotely.

Filling Point: The point of inlet pipe connection of a bulk storage tank for MS/ HSD/ LPG, where hose is connected for filling the products into the tank.

LPG Tank Truck Unloading Hard Stand: The area specially prepared in a Auto LPG Dispensing Station beside the LPG fill point for unloading from tank truck to bulk storage vessel.

LPG Vent: The vertical pipe provided on the vessel for discharge of LPG vapours from safety relief valve at a height of at least 2 meters above the top level of the vessels but not less than 3 meters from the ground level.

MS /HSD Vent: The vertical pipe open at the top, fitted on an underground tank in Retail Outlets for breathing.

Retail Outlet/ MS/ HSD Service Station: The segregated area provided with facilities and specially prepared, for storage and delivering MS/ HSD to the fuel tanks of motor vehicles.

Safety Relief Valve: A pressure relief device fitted on a pressure vessel to protect the vessel against maximum allowable pressure.

Tank Truck: A truck mounted with a properly designed vessel/tank for transportation of LPG or MS / HSD in bulk to the dispensing stations.

4.0 STATUTORY REQUIREMENTS

Auto LPG dispensing station (ALDS) are covered under SMPV (U) Rules, 1981 and require approval / licence from Chief Controller of Explosives (CCE). The site layout, installations details, storage vessels, fittings, dispensers, pumps etc. also require specific approval from CCE.

In addition to above, approval from local bodies etc., if any, shall be obtained.

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5.0 LAYOUT & FACILITIES

5.1 General Guidelines

i. The layout should ensure unobstructed movement of all vehicles together with adequate provision for entry and exit of Tank trucks.

ii. Location of the facilities, equipment, entrance, exit & paving shall be arranged in such a manner to avoid the risk of any collision amongst the motor vehicles.

iii. It is preferable that there should be unobstructed view of the operating and dispensing areas from the salesroom.

iv. Access for mobile fire fighting equipment to all the ALDS facilities shall be ensured.

v. In case of above ground bulk storage vessels, provision of storage of adequate fire water as stipulated in this standard shall be made.

vi. Provision of escape route for personnel and vehicle in emergency shall be made.

vii. The LPG bulk storage area at ALDS shall be enclosed by an industrial type fencing at least 2 M high erected on a kerb/toe wall of at least 0.3 M high and fill point shall be at the inner edge of this fencing and area shall be suitably guarded against vehicular impact. Such fence shall have at least two means of exit and the gates of such exits shall open outwards and shall not be self locking.

5.2 Siting and Layout:

i) ALDS may be located in an existing MS/ HSD retail outlet or an exclusive station. Safety distances to be followed are given in the table 1 and 2 below:
**TABLE - 1**

**Safety distances for bulk LPG storage vessels**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Water Capacity of vessel (in litres)</th>
<th>Minimum distance from line of adjoining property or group of buildings not associated with storage &amp; operation (in metre)</th>
<th>Minimum distance between vessels (in metre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Above ground vessel</td>
<td>Underground or above ground vessels covered with earth (mound)</td>
</tr>
<tr>
<td>1)</td>
<td>Not above 2000</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2)</td>
<td>above 2000 but not above 7500</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>3)</td>
<td>Above 7500 but not above 10000</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>4)</td>
<td>Above 10000 but not above 20000</td>
<td>15</td>
<td>7.5</td>
</tr>
<tr>
<td>5)</td>
<td>Above 20000 but not above 40000</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
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Note: For higher capacity storages, OISD-STD-144 to be followed.

**TABLE – 2**

**Minimum Safety Distances between facilities associated with storage and dispensing of LPG in ALDS**

<table>
<thead>
<tr>
<th>To from LPG storage vessels</th>
<th>LPG storage vessels</th>
<th>Fill point of LPG storage vessel and centre of LPG tank truck unloading hard stand</th>
<th>LPG Dispenser</th>
<th>Property Line / buildings*</th>
<th>Petroleum class A or B service station licensed</th>
<th>Fill point of petroleum class A/B tanks</th>
<th>Vent pipe of petroleum class A/B tanks</th>
<th>Petroleum class A/b dispensing pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPG storage vessels</td>
<td>Table -1</td>
<td>9 (aboveground/ mounted vessels exceeding 7500 litres capacity)</td>
<td>6 (aboveground/ mounded vessels not exceeding 7500 litres capacity)</td>
<td>3 (underground vessels)</td>
<td>9 (aboveground vessels not exceeding 20000 litres capacity or underground/ mounded vessels)</td>
<td>15 (above ground vessels exceeding 20000 litres capacity)</td>
<td>Table 1</td>
<td>9</td>
</tr>
<tr>
<td>Fill point of LPG storage vessel and centre of LPG tank truck</td>
<td>9 (aboveground/ mounted vessels exceeding 7500 litres capacity)</td>
<td>6 (aboveground/ mounded vessels not exceeding 7500 litres)</td>
<td>-</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

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| unloading stand | capacity | 3 (underground vessels) | | | | | | | | | | | | LPG dispenser | 9 (aboveground/mounted vessels exceeding 20000 litres capacity or under ground/mounded vessels) | 6 | - | 6 | 6 | 6 | 6 | | Property line/buildings* | Table - 1 | 9 | 6 | - | 3 | 4 | 6 |  

* The distance of sales room shall be maintained as specified by Chief Controller of Explosives.

**Notes**

(i) If the aggregate water capacity of a multi vessel installation exceeds 40 KL, the minimum safety distance from any vessel to the property line/group of buildings shall not be less than 30 m for above ground vessels and 15 m for under ground vessels.

(ii) The distances specified above are required to be measured from the nearest point on the periphery of the vessel.

(iii) Minimum 6 m distance shall be kept between LPG bulk storage vessel and Storage vessel of the other petroleum products

Typical layout of installation is attached as annexure – I.

**5.3 Bulk Storage Vessel :**

The mechanical design of the storage vessel shall be based on following considerations (For details refer OISD-STD-144)

The storage vessel shall be designed in accordance with the codes i.e. PD – 5500, ASME-Sec VIII, IS:2825 or equivalent duly approved by CCE. Design shall also take into account the requirements specified in Static and Mobile Pressure Vessels (Unfired) Rules 1981.

A single code shall be adopted for design, fabrication, inspection and testing i.e. ASTM and BS shall not be combined.

**Material:** Carbon steel conforming to ASTM A516 Grade 60 / 70 or A537 Class I. Micro-alloyed steel containing Ni, Mo, Va shall not be considered. Maximum specified tensile stress of the material shall be below 80,000 psi.

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Design Temperature: -27 °C to +55 °C.

Design Pressure: Maximum Vapour pressure of LPG conforming to IS: 14861 at 55 °C and shall be taken as minimum 14.5 kg/cm².

Other Design Considerations

Corrosion Allowance: 1.5 mm (minimum)

Radiography: 100 %

Stress relieving: 100% irrespective of thickness.

Wind pressure: as per IS: 875

Earthquake pressure: as per IS: 1893

Hydrotest pressure: As per Design Code

Additional requirement, if any, on account of design codes/statutory stipulations shall also be considered.

5.3.1 Above Ground Storage Vessel

i. The bulk storage vessel shall be placed on a firm foundation.

ii. There shall be single nozzle at the bottom for liquid inlet/outlet with ROV as first valve. The first flange shall be at least 3 m away from the shadow of the vessel.

iii. In multi vessel installation, top of the vessels shall be in the same plane.

iv. Suitable arrangement for draining of water from storage vessel shall be provided with double valve.

5.3.2 Mounded / Underground Storage Vessel

Mounded / Underground storage vessels shall also conform to the following requirements: (For details OISD–STD-150 shall be referred)

i. The specific consideration shall be given to

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a. Internal vapour and hydraulic pressure  
b. External loading on the vessel  
c. Internal vacuum  

ii. The dimensions (diameter and length) of the vessel shall be decided based on site conditions, soil mechanics and other design considerations.  

iii. The vessel shall be protected against corrosion by appropriate anti corrosive coating and provided with cathodic protection.  

iv. The cathodically protected pipelines/ vessels etc. shall be isolated from the unprotected structures /surfaces.  

v. Reference points on inner surface of the vessel shall be marked for Non Destructive Testing for subsequent inspections.  

vi. The underground vessel shall be installed on a firm foundation and firmly secured to the foundation so as to prevent movement or floatation.  

vii. The underground vessel shall be placed within a concrete or brick masonry pit with a minimum gap of 1 m between the walls of the pit and the vessel as well as in between the vessel.  

viii. The vessels shall be covered by earth or sand or any other non corrosive material and thickness of the covering material above the top surface of the vessel shall not be less than 0.5 m.  

ix. The fittings / mountings on the vessel shall be in such a way that these can be operated and maintained without disturbing the earth cover.  

5.4 Fittings  

Each storage vessel shall have at least two safety relief valves, two independent level indicating devices, one independent high level cut off switch with alarm, temperature gauge, pressure gauge, suitable arrangement for water draining etc. Remote operated valve (ROV) shall be provided on all liquid and vapour lines connected to the storage vessel.  

5.4.1 Safety Relief Valve  

Each safety relief valve shall be set to discharge at not more than 110 % of design pressure and have relieving capacity adequate to prevent the maximum pressure in the vessel from exceeding 120 % of the design pressure. Each safety relief valve shall be provided with a lock open type
isolation valve between it and the vessel so that one of the two valves can be removed from testing without emptying the vessel.

The set and reset pressure of the safety valve shall meet the requirements of Auto LPG conforming to IS : 14861.

The relieving capacity of the safety valve storing LPG in mounded & underground storage vessel shall be at least 30 % of that for above ground storage vessel in fire condition.

5.4.2 Emergency Shut off Valve i.e. Remote Operated Valves

Emergency shut off valves of remote operated type shall be provided on all liquid & vapour connections i.e filling, discharge, pump by pass & vapour return lines of the bulk storage vessels except those for safety valves / instruments tapping and those not exceeding 3 mm diameter for liquid and 8 mm diameter for vapour. ROV's shall be operable from sales room/control panel and from operating area.

The remote operated valves shall be fire safe valves with a closing time not exceeding 15 seconds.

ROV's shall have an open / closed position indicator.

Additionally, isolation valves of ball type shall be installed at shortest distance from ROV.

5.4.3 Excess flow check valves (EFCV):

Excess flow check valve shall be provided on the liquid lines. The closing flow of the EFCV shall not be more than 120 % of the rated flow of the line / as recommended by the manufacturer. Excess flow check valve shall be provided with a breathing arrangement to allow equalisation of pressure.

In closed position, the opening of the EFCV shall not be more than 2 mm².

5.4.4 Manual Shut Off Valves:

Manual shut off valves shall be provided in all liquid and vapour pipelines as close to ROV as possible. All shut off & isolation valves shall be of
quick closing ball type, readily accessible for operation and maintenance under normal & emergency conditions.

5.5 Tank Truck Unloading Facilities

i. The layout of the unloading location shall be such that tank truck being unloaded shall be in drive out position.

ii. Suitable provision shall be made for evacuation of LPG from bulk storage vessels to tank truck to empty the vessel in case of emergency or for statutory testing.

iii. Tank truck shall be unloaded using hose with isolation arrangement on both ends so that no release of liquid LPG take place at the end of the unloading. Alternatively, loading arms can be provided.

iv. The hose - coupling / flange joint shall be of 300 lb rating with metallic gasket. The hose coupling shall be provided with a cap or blind flange by which the nozzle can be closed when not in use.

v. The LPG hose used shall conform to OISD-STD-135.

vi. Hose length shall not be more than 5.5 m.

vii. The pipeline and the hose shall be laid so as to be above the ground to prevent any damage. The entire assembly shall be suitable supported and be installed in a lockable enclosure.

viii. The fill point shall be provided with non return valve and quick shut off isolation valve.

ix. Proper arrangement for earthing & bonding shall be made.

x. The vent pipe, if required, shall be at height of at least 3 m from the grade and 6 m away from potential sources of ignition / likely places of vapour accumulation.
5.6 LPG Pump

LPG pump can be either external or submerged.

5.6.1 External LPG Pump

i. Each pump shall have suitable arrangement for weather protection.

ii. Pump and motor shall be effectively earthed.

iii. Pumps shall be provided with arrangement to protect the pump casing from over pressure when pumping against a closed discharge. The bypass shall discharge into the LPG storage vessel at predetermined pressure.

iv. The maximum discharge pressure of the pump (shut off pressure) shall be less than the design pressure of the piping system.

5.6.2 Submersible Pump:

i. Pump shall be installed in properly designed well.

ii. Design shall be based on combined load of pump, vessel & forces generated by operation.

iii. Design shall be such that installation & removal of the pump can be done at any level of LPG in the storage vessel.

iv. Suitable arrangement for closing the flow of LPG from vessel to pump well shall be provided.

v. No LPG shall escape outside from the conduit/well during normal operation, maintenance or sudden breakdown of any component.

vi. Provision of purging the well/pump with nitrogen for complete gas freeing, prior to removal of pump cover plate, shall be provided.

vii. Provision of a pressure gauge shall be made at the discharge line of the pump.

viii. Piping connections on well cover shall be provided with excess flow check valve.

ix. Pump shall have in built safety interlock to stop automatically in the event of low level, high temperature and dry condition.
x. The electrical installation of the pump shall conform to a code approved by CCOE

5.7 Dispenser

i. The dispenser for Auto LPG dispensing stations shall be designed, constructed, tested and maintained in accordance with the requirements laid down in SMPV Rules (unfired), 1981.

ii. The dispenser shall be provided with an excess flow check valve, a remote operated shut off valve and a pipe shear provision in that order in the liquid inlet pipe.

iii. The dispenser shall be installed on a firm foundation and protected against physical damage.

iv. A breakaway device with excess flow valves or quick action cut off valves on both sides of the breakaway device, conforming to UL 567 or equivalent shall be provided on the delivery line from the dispenser so as to prevent spillage of liquefied petroleum gas from both sides of the breakaway point in the event of its breakage.

v. The dispensing nozzle at the end of the hose shall be of self sealing type matching with filler connection of multi function valve conforming to IS: 15100, fitted on the auto LPG tank of the vehicle. The liquid released on disconnection shall not exceed 5 ml.

vi. The hose for delivery of liquefied petroleum gas by the dispenser to motor vehicles shall be suitable for auto LPG. The design pressure of the hose shall be minimum 25 kg/cm² with a safety factor of five. The hose shall be electrically and mechanically continuous.

vii. The length of the hose connected to the dispenser shall be kept minimum keeping in view the operational requirement and shall not in any case exceed 5.5 m.

viii. Clearly identified emergency shut down switches/circuit breakers shall be provided at easily accessible location not less than 6 m away from the dispenser to cut off power supply in the event of fire, accident or other emergency. The switches or circuit breakers shall be visible from point of dispensing liquefied petroleum gas to motor vehicles.

ix. Flexible hoses shall have permanent markings indicating the manufacturer's name/identification, applicable code, working pressures and suitability of use with LPG.

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x. Provisions shall be kept to stop all operations simultaneously through push buttons located near dispenser / sales room.

xi. Means shall be provided on the outside of the dispenser to readily shut off the power in the event of fire or accident.

xii. An excess flow check valve, or an emergency shut off valve shall be installed before the connection of dispensing hose. A differential pressure valve shall be considered as meeting this provision.

5.8 Piping

i. All metallic piping for LPG service shall be rated for auto LPG and designed to ASME-B-31.3 or equivalent with minimum design pressure 25 kg/ cm² with a factor of safety of four. The materials of pipe shall be low carbon or alloy steel conforming to American Standard ASTM-SA-333 grade 6, or SA-106 grade B Schedule 40 (for above ground) and Schedule 80 (for under ground), or equivalent. The pipeline shall be tested at one and half times of the design pressure, if hydro tested, or ten percent in excess of the design pressure if pneumatically tested. Joints of pipeline above 40 mm diameter shall be welded or flanged. Threaded or screwed connection shall not be provided except for special fittings like excess flow valve, pump connections upto 50 mm diameter”.

ii. Piping shall be protected against physical damage, collision & corrosion.

iii. Pipe length shall be short & diameter shall be kept as small as practicable.

iv. Entire piping system including the appurtenances shall where ever possible be constructed with welded joints and where necessary with flanged joints. The number of flanged joints shall be kept down to a minimum.

v. Piping shall be run as directly as practical from one point to another and with as few restrictions such as elbows and bends as conditions will permit.

vi. Provision shall be made in the piping including connection to the bulk storage vessel to compensate for expansion, contraction, jarring, and vibration

vii. Where ever threaded joints are used, a seal weld shall be provided. All threaded joints and socket weld pipe fittings shall be rated at least 3000 lb to BS 3799 or at pressure class 3000 to ASME B 16.5 or equivalent.

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viii. All gaskets shall be of flexi-metallic type. Whenever a flange is opened gasket shall be replaced.

ix. All flanged joints shall be rated at least class 300 to BS 1560 : part 2 or ASME : B : 16.5 or equivalent.

x. Flexible piping connections shall be introduced into fixed piping systems where ever it is necessary to absorb vibration or where a rigid connection is impractical. Flexible connections shall be short and not exceed 500 mm in length and shall be of an approved metallic construction suitable for auto LPG service and braided on outside with stainless steel wire. The design parameters for flexible piping connections shall be identical to other piping network. The non - metallic pipe , tubing or hose for permanently interconnecting storage vessels shall not be used.

xi. All sections of pipe in which LPG liquid can be trapped by the closing of the valves shall be fitted with thermal safety valves and shall be located in fenced area.

xii. Upon mechanical completion of the ALDS, a complete set of as built installation drawings shall be maintained.

5.9 Control Panel

i. A remotely located and easily accessible control panel for normal operations shall be installed preferably at the sales room. It shall have provisions and indications of on / off, low pressure of instrument air, high temperature trip of LPG pumps and quantity of product in the vessel. It shall also have an alarm and indication for high level cut off. All indications connected with emergency shut off switch shall be provided on this control panel alongwith and "Reset" provisions.

ii. Piping and Instrumentation Diagram (P & ID) of entire LPG system shall be displayed near the control panel. (Typical P&ID attached as Annexure – II)

iii. All switches shall be clearly marked for its purpose in the field.
5.10 Electrical Equipment/ Fittings

The electrical equipment and fittings in ALDS shall conform to hazardous area classification for that purpose and be of a type approved by the CCE. The extent of hazardous area for dispenser at ALDS shall be as under:

i. Entire space within the dispenser enclosure cabinet and 46 cm horizontally from the exterior of enclosure cabinet and upto an elevation of 122 cm above dispenser base and the entire pit or open space beneath the dispenser shall be Zone "1".

ii. 46 cm vertically above surrounding ground level and horizontally beyond 46 cm upto 6 m on all sides of the dispenser enclosure cabinet shall be Zone "2".

iii. The area upto 1.0 m around the fill point shall be taken as Zone "1" and area within 1.5 m of LPG vent shall be considered as Zone "1". The area beyond 1.0 m and upto 4.5 m from fill point and beyond 1.5 m and upto 3 m from LPG vent shall be taken as Zone "2" as given in OISD-STD-113.

5.11 Fire Fighting Facilities

At ALDS having only underground or mounded LPG storage vessels, two numbers of 70 kg dry chemical type fire extinguishers shall be provided.

At ALDS having above ground LPG storage vessels, hydrants with minimum water pressure of 7 kg/cm² shall be provided at convenient positions for all round coverage of storage vessels and handling area, and water sprinklers with spray density of 10 lpm / m² shall be provided. The fire water pump shall be preferably diesel engine driven with capacity to deliver water at the rate and pressure specified above. The minimum fire water storage at the premises shall be that needed for fighting fire at least for one hour.

Additionally, two numbers of 9 kg DCP fire extinguishers shall be provided near tank truck unloading area and one number shall be provided near each dispenser and transfer pump location.
6.0 OPERATING PROCEDURES

6.1 General

i. Adequate training shall be imparted to the operators, service engineers etc. and records thereof shall be maintained.

ii. Operating personnel of ALDS shall possess adequate knowledge and experience of handling LPG to ensure functioning of the station in a safe and efficient manner.

iii. During unloading of the product from the tank truck to the bulk storage vessels the tank truck shall be parked in the space marked for the purpose.

iv. During the period of unloading of fuel from tank truck to the storage vessels, operation of dispensing fuel to motor vehicles shall be suspended.

v. During the period of unloading of LPG from tank truck to bulk storage vessel and also while evacuating the storage vessel for maintenance, testing etc., all dispensing, maintenance operations etc. at ALDS including that for MS/ HSD shall be suspended.

vi. LPG shall be dispensed only into the fuel tank container of a motor vehicle duly approved by the CCE.

vii. LPG shall not be filled in the fuel tank of motor vehicle while the engine of the vehicle is running.

viii. The operating procedures shall be displayed at relevant locations for activating the ALDS, unloading of tank truck, LPG dispensing etc.

ix. Dos and Don’ts shall be prominently displayed in ALDS.

x. Safe ingress, fuelling and egress of all vehicles shall be ensured.

xi. System of periodic inspection and maintenance of ALDS facilities shall be established as an integral part of operations.

xii. Action in the event of emergency shall be clearly established and understood by all concerned and displayed prominently.
xiii. Important operational activities shall be logged and records of such activities highlighting receipt, inventory, level, pressure, temperature, equipment running etc shall be maintained.

xiv. All repairs, maintenance work etc. shall be carried out after issuance of work permit in line with OISD-STD-105.

 xv. LPG unloading operations shall be carried out under the supervision of authorised person of ALDS and TT crew.

xvi. Limits of operating parameters including level, pressure and any other condition as set for sound and safe operations shall not be exceeded. In case any abnormal operating conditions are encountered, the causes shall be investigated and corrective actions taken.

xvii. The operating staff shall maintain vigilance for detection and control of any leakage at the dispensing station.

xviii. During the operations, LPG leaks should be monitored with explosimeter.

6.2 Receipt of Bulk LPG at ALDS

All Checks essential for ALDS safety as given in item No.1.2 of annexure - III shall be carried out for each tank truck before starting unloading at ALDS (for details refer clause 6.1.3 of OISD-RP-158).

i. Bulk LPG at ALDS shall be unloaded preferably in non-peak hours.

ii. Unloading of bulk T/T shall be carried out only at location as approved by CCE.

iii. The unloading of LPG shall be done in presence of the authorised person at ALDS & TT Crew.

iv. Fire extinguishers (2 nos of 10 Kg DCP type) to be positioned as an immediate aid to extinguish any fire except that of Liquid LPG.

v. Storage tank pressure, temperature and level shall be recorded. Crew/operating staff at ALDS shall closely monitor unloading activities.

vi. Tank Truck shall be placed in drive out position.

vii. After placement, engine master control switch shall be switched off, if applicable.

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viii. Minimum two wooden chokes shall be placed under wheels.

ix. Chassis and LPG vessels are to be earthed independently for which bare metal cleats shall be provided.

x. Liquid and vapour hose shall be connected after examining integrity of joints using proper studs. Bolts shall not to be used.

xi. The main control panel and other panels shall be energized to activate automatic over fill protection, emergency shut down systems, remote operated valves and compressed air systems.

xii. The readings of the level gauges provided on the tank/tanks at ALDS shall be recorded.

xiii. The tank trucks valves shall be crack opened and checked for leaks.

xiv. LPG level in the storage tanks shall be monitored at regular intervals so that it does not exceed 85%.

xv. On completion of unloading operation, following activities shall be carried out in sequence.

a. Close the valves rigid liquid and vapour lines connected to the tank truck.

b. The hose contents should be forced into the tank truck by controlled nitrogen pressure. Alternatively, use loading arms or hoses with isolation valves at both ends. Only vapours shall be vented through the vent.

c. Isolate the valves at fill point.

d. Remove hose connection and electrical-bonding wires.

e. Cap the vapour/liquid outlet lines of the tank trucks.

f. Remove chokes placed under the wheels.

g. Record the roto gauge, pressure gauge, temperature gauge readings and final readings provided on the fixed gauging systems of the storage tank/tanks at ALDS.
6.3 Storage of Bulk LPG

Following shall be ensured for storage of LPG.

i. Filling shall not exceed 85% of the capacity.

ii. The visible portion of vessels shall be inspected daily for any LPG leakage and corrective action if required shall be taken.

iii. All gauges like high-level alarm, level indicating devices, temperature & pressure gauges shall be kept in operating conditions at all times and shall be checked daily.

iv. Product gauging shall be done before commencement of dispensing operations and also at the time of closing the operations of the ALDS every time.

v. Functioning of remote operated valves shall be checked prior to receiving of product into the storage tanks.

6.4 Dispenser Operation

i. Ensure that the area is safe for refueling.

ii. Guide the vehicle to the position at the designated area of the ALDS facing the direction of exit.

iii. Do not leave the vehicle unattended during refueling operation.

iv. Ensure that sources of ignition, such as pilot lights, electrical ignition devices, electrical appliances/gadgets, and engines located on the vehicle being refueled are turned off before dispensing of LPG to a vehicle.

v. Check for stamping of Road Transport Authority in the Registration Certificate of vehicle prior to refueling.

vi. The operator at ALDS shall satisfy himself before commencement of filling in the vehicle in respect of following:

a. The vehicle is fitted with only approved Conversion Kit and Auto LPG Tank with standard fittings as per AIS 026 or equivalent.
b. A COMPLIANCE PLATE is installed near the filling connection which is clearly visible, displaying following information:

- Auto LPG Tank identification number
- Date of installation
- Water capacity (Litres) of total installation
- Date of last retest
- Vehicle Registration / Identification No.
- “LPG installation complies with the safety requirements of AIS 026 Installed by

c. Check a green coloured label of size 80 mm x 80 mm with the text “LPG” is affixed either close to the vehicle number plate or on left side of the wind screens.

d. Check for the ‘Automatic Fill Limiter (AFL)’, which shuts off fuel supply to tank at 80 % of tank capacity, on the fill point of the auto LPG tank.

e. LPG filling shall not be carried out for vehicles having auto LPG tank due for retesting as per Gas Cylinder Rules, 1981.

vii. Ensure that the emergency shut-off valve and the manual isolation valves are open on both delivering and return lines.

viii. Set the dispenser meter at the quantity/ value to be filled.

ix. Position the fill nozzle on the vehicle container and couple securely.

x. Check that the vehicle fill connection is in sound condition in terms of tightness and leakage.

xi. Energize the system through push button & allow flow of LPG into the auto LPG tank.

xii. When using a filler nozzle with a nozzle bleed valve, open the valve to empty the nozzle before disconnection.

xiii. Return the nozzle to correct position after the filling is over.

xiv. At the end of the day’s work, ensure that valves are closed, hoses are properly stowed and electrical equipment is switched off.

Commissioning and de commissioning procedure for the ALDS is given in Annexure - IV.

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7.0 INSPECTION & MAINTENANCE

i. A well designed system of periodic inspection of all facilities of ALDS shall be formulated to maintain it in safe operable condition all the time.

ii. Safety audit of the ALDS shall be undertaken & certificate of fitness declaring integrity with respect to equipment, facilities, operations & safety procedures shall be accordingly issued. Check list for inspection is enclosed as Annexure - II.

iii. All recommendations of the safety audit/ inspections shall be complied in a time bound manner and records maintained thereof.

iv. Disassembly or removal of the facilities and components of equipment whilst any part of the system is under pressure is hazardous and shall not be undertaken unless the system is depressurised, gas freed and certified.

v. The system of permit to work shall be established for non-routine works in line with OISD-STD-105 and such works shall be undertaken with full knowledge and approval by authorised person.

vi. Equipment appurtenances, protection devices associated with the dispensing unit as incorporated in the design and approved by CCE shall be tested, maintained, repaired and replaced as recommended by the manufacturer.

vii. Checklist shall cover conformity with the design intention, operating and maintenance procedures, preventive measure & protection systems and safety practices.

viii. Preventive maintenance schedules shall be drawn for all equipment in accordance with manufacturer’s recommendations and established mandatory / recommendatory standards. Records of all preventive maintenance undertaken shall be maintained and updated from time-to-time.

ix. Calibration of dispenser shall be carried out in line statutory requirements.
8.0 TESTING OF RELIEF AND PROTECTION SYSTEM

i. All periodic tests shall be carried out by competent / authorised persons, as applicable and records shall be maintained.

ii. For in house testing of safety relief valve, only properly built, certified testing facilities shall be used.

iii. After the calibration/ re-calibration of the safety relief valve and excess flow check valve, it shall be certified by competent person.

iv. A schedule for testing of Relief Valves and Protection System of various equipment shall be developed. The checks shall be done as specified by manufacturer. The frequency of testing shall be either as given below or as recommendation by manufacturer whichever is of shorter period.

<table>
<thead>
<tr>
<th>Equipment/ Facility</th>
<th>Frequency</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Relief valve</td>
<td>Once in a year</td>
<td>Competent person</td>
</tr>
<tr>
<td>Thermal / Hydrostatic relief valve</td>
<td>Once in a year</td>
<td>Competent person</td>
</tr>
<tr>
<td>Excess Flow Check Valve</td>
<td>Once in a year</td>
<td>Competent person</td>
</tr>
<tr>
<td>High Level Alarm of storage vessel</td>
<td>Once in 6 months</td>
<td>Competent / authorised person.</td>
</tr>
<tr>
<td>Remote Operated Valves</td>
<td>Once in 6 months</td>
<td>Competent / authorised person.</td>
</tr>
<tr>
<td>LPG Pump/ Compressor Trips</td>
<td>Once in 6 months</td>
<td>Competent / authorised person.</td>
</tr>
<tr>
<td>Compressor Trips</td>
<td>Once in a quarter</td>
<td>Competent / authorised person.</td>
</tr>
<tr>
<td>Emergency Push Button Trips</td>
<td>Once in a month</td>
<td>Competent / authorised person.</td>
</tr>
<tr>
<td>Breakaway Coupling</td>
<td>Once in six month</td>
<td>Authorised person.</td>
</tr>
<tr>
<td>Cathodic Protection System</td>
<td>Once in a year</td>
<td>Authorised person.</td>
</tr>
<tr>
<td>Piping Network</td>
<td>Once in three year</td>
<td>Authorised person.</td>
</tr>
<tr>
<td>LPG Unloading Hoses</td>
<td>Once in 4 months</td>
<td>Authorised person.</td>
</tr>
<tr>
<td>Fire Extinguishers</td>
<td>Once in 6 month</td>
<td>Authorised person.</td>
</tr>
<tr>
<td>Dispensing hoses</td>
<td>Once in 6 months</td>
<td>Authorised person.</td>
</tr>
</tbody>
</table>

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9.0 SAFETY INSPECTIONS / AUDIT

The safety inspections / audit of ALDS shall be carried out as given below:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FREQUENCY</th>
<th>AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Inspection</td>
<td>Daily</td>
<td>Operating personnel</td>
</tr>
<tr>
<td></td>
<td>Once a month</td>
<td>Engineering in-charge of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LPG mktg. Company</td>
</tr>
<tr>
<td>Safety Audit</td>
<td>Once in 6 months</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>Electrical Audit</td>
<td>Once a year</td>
<td>Licensed Electrical agency</td>
</tr>
</tbody>
</table>

10.0 EMERGENCY PLAN AND PROCEDURE

i. Each ALDS shall be provided with at least 3 shut down devices located in convenient locations near storage vessels, dispenser and office/ sales room.

ii. The Operating Company having control over the ALDS shall draw an operational emergency plan keeping in view the following:

a) Loss of or interruption to the gas supplies due to leaks or failure of pipeline
b) Major failure of LPG fittings
c) Accidents or other emergencies, which can affect the ALDS
d) Civil emergencies
e) Any other risk arising from the existence or operation of the ALDS

The above emergency plan shall be disseminated amongst all personnel involved and ensured that they understand their roles and responsibilities in the event of an emergency.

iii. The in-charge of the ALDS shall maintain close liaison with Fire Service, Police, District Authorities and LPG marketing company.

iv. Important telephone numbers for emergency use shall be displayed prominently in the ALDS.

v. Means of communication shall be always at the disposal of the In charge of the ALDS.
11.0 TRAINING

The objective of training is to provide good understanding of all the facets of dispensing activities including operations, procedures, maintenance and hazards of LPG and the risks associated with its handling. Training shall ensure that the jobs are performed in accordance with the laid down procedures and practices.

i. Training shall be imparted to the staff attached with the LPG dispensing station at the time of induction, which is to be followed up by periodic refresher courses. The training programme shall inter alia cover following aspects:

a) Hazardous characteristics of LPG.
b) Familiarisation with operational procedures & practices.
c) Commissioning of new facilities and equipment.
d) Hands on experience on operation of equipment.
e) Routine checks and maintenance activities of the facilities.
f) Knowledge of emergency and manual shut down systems.
g) Immediate and effective isolation of any LPG leak.
h) Accounting of product.
i) Safety regulations and accident prevention.
j) Fire fighting facilities, its upkeep and operation.
k) Evacuation and safe egress of the vehicles in an emergency.
l) Housekeeping.
m) Safety in transportation of LPG.
n) First aid.
o) Emergency plan/drills

ii. Proper records for the training and refresher courses shall be maintained at the installation.

12.0 CUSTOMER SAFETY & AWARENESS

12.1 Display of important information:

At ALDS, the particulars of licence, emergency telephone nos. of local fire service, police, LPG marketing company and emergency instructions shall be conspicuously displayed.

i. Caution boards shall be displayed near the dispenser for customer awareness as below:

a. Stop the engine before refueling
b. No smoking

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c. No flames or pilot lights or use of electrical gadgets

d. Avoid contact with liquid LPG

e. Do not fill LPG beyond 80% capacity

f. Keep distance from vehicle being fueled.

ii. A display board shall be prominently placed at ALDS for the benefit of the Customer highlighting behavioral characteristics of LPG in bilingual i.e. Hindi/English & local language as below:

a. Auto LPG is stored and delivered as a liquid under pressure.

b. While changing from liquid to gas, LPG expands approximately 260 times its original volume

c. Leakage of liquid LPG is more dangerous than gaseous LPG and it has distinct odour.

d. LPG vapour is approximately 1.5 times heavier than air. So, LPG vapour tends to settle down.

12.2 DOs & DON'Ts

DON'Ts

i. Do not start the engine/drive away the vehicle till the filling nozzle has been disconnected from the filler cap of the vehicle.

ii. Do not refuel the vehicle during the period LPG is being decanted the storage vessel.

iii. Do not handle LPG without protective hand gloves and safety glasses.

iv. Do not fill in the Auto LPG Tank which is over due for pressure retesting

DOs

i. Switch off the mobile phone at the ALDS.

ii. Switch off the engine before commencement of refueling of Auto LPG.

iii. Check vehicle tank spout valve and its rubber seal.

iv. Squeeze trigger fully and hold.

v. Ensure a 10 kg DCP Fire Extinguisher is available near the LPG Dispenser

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vi. Connect Nozzle – avoid cross threading

vii. In case of any leakage / fire observed, press the “EMERGENCY STOP” button on the LPG Dispenser.

13.0 REFERENCES

i. Regulation for LPG Service and Road Tank Trucks in the Netherland, 1987

ii. Code of Practice 11: Recommendations for the safe handling of LPG used as an internal combustion engine fuel for motor vehicles (LPG ITA)

iii. AS/NZS 1596:1997: Storage of Handling of LP Gas

iv. AIS 026 D1: The use of LPG Fuel in Internal Combustion Engine to Power 4-Wheeled Vehicles

v. IS:2825: Code for Unfired Pressure Vessels


vii. IS:5572: Classification of Hazardous Areas (other than mines) having Flammable Gases & Vapours for Electrical Installations.

viii. IS:14861: BIS Specification of LPG for automotive purposes

ix. IS:14899: Liquefied Petroleum Gas containers for automotive use - Specification

x. The Static and Mobile Pressure Vessels (Unfired) Rules-1981

xi. LPG (Regulation of use in Motor Vehicles) Order 2001

xii. Gas Cylinder Rules, 1981

xiii. API Standard 25 – Design and Construction of LP Gas Installations


xv. NFPA 58: Storage and Handling of Liquefied Petroleum Gases

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<table>
<thead>
<tr>
<th>xxv</th>
<th>ASME B - 31.3</th>
<th>Chemical Plant and Petroleum Refinery Piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxvi</td>
<td>ASME B - 31.4</td>
<td>Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols</td>
</tr>
<tr>
<td>xxvii</td>
<td>PD-5500</td>
<td>Specification for unfired fusion welded pressure vessels</td>
</tr>
</tbody>
</table>

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# Annexure - III

## INSPECTION OF THE AUTO LPG DISPENSING STATION

<table>
<thead>
<tr>
<th>S.N o</th>
<th>ITEMS</th>
<th>OBSERVATIONS (State details)</th>
<th>Remarks/Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0 CHECKLIST</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1.1 Bulk Storage Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition of earthing of vessels.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Functioning of level instruments.</td>
<td></td>
<td></td>
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<tr>
<td>Safety valves regularly tested and records maintained.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Functioning of level gauge and high level alarm.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any sign of leakage/corrosion.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positioning of fire extinguishers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fence around storage vessel is 2 m high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions, functioning and coverage of sprinkler/ hydrant system.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No simultaneous unloading of LPG and other fuel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination level adequate.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition of cathodic protection system, current, potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage area is properly paved</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No vegetation in the area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No unauthorised structure upto the property line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housekeeping.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1.2 Tank lorry unloading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approved spark arrestor fitted with the tanklorries.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper earthing connections and earth pit resistance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any visible sign of LPG leakage.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All flanges completely bolted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only metallic gaskets in use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolts &amp; nuts protected against corrosion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical resistance within limits</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>CCE license for the vehicle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hose test certificate available</td>
</tr>
<tr>
<td>2 nos. of fire extinguishers in the vehicle.</td>
</tr>
<tr>
<td>Tool kit available</td>
</tr>
<tr>
<td>First aid box available</td>
</tr>
<tr>
<td>Flange connections having bonding.</td>
</tr>
<tr>
<td>Safety instruction booklet / TREM Card available.</td>
</tr>
<tr>
<td>Wheel choke used while unloading.</td>
</tr>
<tr>
<td>Portable extinguisher positioned and functional</td>
</tr>
<tr>
<td>Tank lorry in drive out position</td>
</tr>
<tr>
<td>Illumination level adequate.</td>
</tr>
<tr>
<td>Housekeeping in order.</td>
</tr>
</tbody>
</table>

1.3 **Dispensing pump**

- Leakage from pump seals.
- Lubrication effective.
- Flameproof fittings and junction box.
- Earthing connections proper.
- Alarms & trips functioning.
- ROV’s can be actuated from remote location
- Telephone in sales room
- Safety guards in position.
- Abnormal vibration / excessive noise.
- Portable fire extinguishers in position.
- Signs of visible leakage.
- Vent and drains with double block valves and without leakage.
- Housekeeping in order.
- Ignition source in the surrounding.

1.4 **Dispensing Unit.**

- Effective arrangement to protect against collision damage.
- EFCV and breakaway coupling provided and are functional/ test report available.
- Filling hose is tested as per OISDSTD-135, test report available and due date is marked.
- Fueling nozzle is of self sealing type.
- Leakage from nozzle is within 5 ml & is certified/tested
- Filling operation cannot be started unless

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| the system is properly earth. |  |
| Filling nozzle is in lockable position |  |
| Filling nozzle capped when not in use |  |
| No fugitive emission while disconnecting the nozzle. |  |
| Dispenser is equipped with a device for emergency shutdown of entire dispensing unit. |  |
| All valves, meeting equipment, vapour eliminator and other equipment installed on the dispenser is duly recognised by a CCOE / testing laboratory. |  |
| Cut off valve of the dispenser is in closed position when the dispenser is not activated. |  |
| Pull away device (Break away coupling) provided in transfer hose and is functional. |  |
| Means provided to prevent LP gas from being discharged unless the nozzle is connected to the vehicle. |  |
| The fueling nozzle is provided with a swivel inlet connection (360 deg.) |  |
| Electrical components suitable for class I, group D, division – I applications. |  |

### 1.5 Electrical System.

Transformer in conformity with area classification.

Area classification duly approved by CCOE available.

Alarm and trip circuit functioning.

No temporary electrical connection.

Condition of cable duct & wiring good.

Insulating mats conforming to IS:15652:2006 having ISI mark.

Fuse are of proper type and rating.

Fire extinguishers are in proper working condition.

Motors provided with double independent earthing connection.

Flame proofness of terminal box, fitting & junction boxes maintained and certificates available.

Earthing pit condition good.
| Push buttons earthed properly & flameproof conditions not tampered. |
| Ground resistance at motor/ push button measured and found satisfactory. |
| Water accumulation in lighting fixture distribution box. |
| Lighting fixture flameproof & as per area classification. |
| LPG pipelines with jumper for electrical continuity. |
| Condition of grounding electrode. |
| Area classification duly approved by CCOE available. |
| Records of electrical testing checks maintained up-to-date. |
Annexure - IV

Commissioning & Decommissioning Procedures

1.0 General

i. The commissioning/ de- commissioning operations shall be carried out by well trained and experienced personnel.

ii. The commissioning/ de- commissioning operations shall be preferably during daytime. Such operations shall be done when traffic in the vicinity is minimum.

iii. Caution boards shall be displayed while venting is in progress.

iv. The surrounding area shall be cordoned off and the gas level shall be monitored closely using explosimeter.

v. Fire fighting facilities shall be kept ready.

2.0 Commissioning, purging and charging of new vessels

Pre-commissioning inspection and certification by the competent authority shall be obtained prior to initiating following activities:

3.0 Water/ Nitrogen filling

i. All gaskets shall be changed after hydrotest.

ii. The LPG system shall be first filled with clean water/ Nitrogen. This will assist displacement of air followed by replacement of water/ Nitrogen by introducing vapour LPG. Liquid LPG should not be introduced under any circumstances for purging the vessels.

iii. At the time of filling water/Nitrogen, air shall be released from vent points.

iv. At this stage the system shall be checked thoroughly for leak-proof ness.

v. The complete leak testing during commissioning at 10 % above the working pressure but not exceeding design pressure of the vessel shall be a proof test over and above the hydro test undertaken for various equipment & facilities at earlier stage. This will ensure leak proof ness of the system as a whole before gas charging.
vi. Particular attention shall be given with respect to the fittings, connections and joints of the storage vessel. In case of any leakage is found the vessel shall be depressurised & water/Nitrogen drained/removed for taking corrective action.

vii. Gasket shall be checked & replaced in case any flange joint is found leaking during leak testing.

3.0 Gas charging

i. Liquid/vapour LPG shall not be directly used for displacement of air in storage vessels since the system is likely to contain a flammable mixture for a period of time, which shall be ultimately vented to the atmosphere.

ii. Gas shall be charged only after ensuring elimination/absence of oxygen.

iii. Vapour from LPG tank lorry shall be used for gas charging, taking due precaution that temperature of the contents does not drop substantially.

iv. While charging gas, water / nitrogen shall be drained simultaneously maintaining a positive pressure of around 1-2 kg/sq.cm. in the vessel.

v. Pressure in the storage system shall be monitored and creation of vacuum condition to be prevented.

vi. At the time of draining of water it shall be ensured that no pockets of water remain in the system.

vii. Where water draining is resorted to, by opening of end flanges of headers/lines, such flanges shall be blinded at the end of draining operation.

viii. In case of displacement of Nitrogen with LPG vapour, constant readings of LPG air mixture should be taken with Explosimeter to ascertain the displacement of Nitrogen with LPG vapours.

ix. Functioning of the level gauges, high level alarm and their correctness shall be checked at the time of water filling and gas charging.

x. Provision shall be made for proper drainage of water from vessels, pipe lines and equipment. In case of Nitrogen displacement controlled venting should be done from pipelines and equipment to ascertain Nitrogen displacement with LPG. Explosimeter reading shall also be taken to check the concentration levels.

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4.0 Liquid charging

i. Liquid LPG shall be introduced at a controlled rate after displacement of entire water / Nitrogen with vapour LPG.

ii. The commissioning operations shall be controlled and supervised by authorised personnel.

iii. Fire fighting system shall be kept in readiness.

5.0 Commissioning of Dispensing unit

i. For commissioning of dispenser unit, liquid LPG shall not be charged and displacement of air shall be carried out by introducing vapour LPG from the storage vessel and venting under controlled conditions with due safety precautions.

ii. Water charging during pressure testing shall be limited up to the inlet of the dispenser so that internals appurtenances, instruments, metering element and all other accessories are not affected. However, there are no restrictions if Nitrogen is used for purging.

iii. Manufacturer’s recommendations shall be followed while commissioning the dispensing unit.

6.0 Decommissioning & Gas Freeing of Storage Tanks

i. Water/Nitrogen shall be used for gas freeing adopting procedures similar to water/Nitrogen filling and gas charging during commissioning.

ii. For decommissioning of storage vessels, liquid shall be first exhausted using pumps or compressors followed by displacement of gas by water/Nitrogen.

iii. The liquid LPG can be transferred to the adjacent tank or a road tanker.

iv. In case compressor is available, pressure in the system shall be reduced by recovering vapour from the storage vessel and transferring to another vessel if the layout of the system so permits.

v. While introducing water/Nitrogen, residual vapour in the storage vessel shall be released at controlled rate by venting through cold flare.

vi. Check the vessel is gas free with explosimeter