

**APPENDIX 10****PART A****FIRE SAFETY REQUIREMENTS FOR PETROLEUM SERVICE STATION**

A person willing to construct or trade, retail petroleum product shall adhere with the following requirements.

**1 SITING OF PETROLEUM SERVICE STATION**

- 1.1** Any site chosen should be sufficiently spacious for it to be designed to minimize the risks of any unauthorized person to be at or near the filling stations. (i.e. it must be sited away from normal human traffics and isolated from other buildings' entrances and exits).
- 1.2** Petroleum service stations shall be sited away from any places of public assembly where there is large number of people, such as town centres, neighborhood centres, important buildings and key installations.
- 1.3** The route for tank vehicles leading to petroleum service stations should not pass through or be near to the kind of places mentioned in clause 1.2.
- 1.4** Service station shall be stand-alone type and dispensing of petrol shall be restricted to the ground level only (see Annex A).
- 1.5** Convenience stores integrated with the petroleum service station is limited to 150 square meters.
- 1.6** Consultation and approval with regards to new petroleum service station shall be sought from MFRS.
- 1.7** Licensing requirements must be in accordance to the Inflammable Liquids and Substances Regulations 1953

**2 STORAGE AND TANK REQUIREMENTS**

- 2.1** Tanks for all classes of petroleum in a Petroleum Service Station shall be installed underground.

**2.2 *Tank Requirements***

The tank shall be designed, constructed, installed and tested to meet any of the following or other equivalent standards:

- (i) British Standards (BS 2594): Carbon Steel Welded Horizontal Cylindrical Storage Tanks.
- (ii) NFPA 30, Flammable and Combustible Liquids Code.



### **2.3** *Underground Tanks and Access Pits*

All underground tanks shall be in accordance with the following requirements:

- (a) The road surface above the underground tanks shall be of reinforced concrete of the thickness necessary to support itself and any superimposed loads, but not less than 150mm.
- (b) The depth from the road surface to the top of the tank shall be not less than 450mm.
- (c) Each access pit shall be fitted with a cover that is water tight or raised above the level of the surrounding ground to prevent the entry of surface water and of strength sufficient to withstand any superimposed loads. The strength of such a cover shall not be inferior to those of 5mm low carbon steel.

### **2.4** *Separation from Property Boundaries and Building Foundations*

The distance of the underground tank to any property boundaries and foundations shall be not less than 2.5m and 1m respectively (see Annex B).

### **2.5** *Corrosion Protection*

Any underground tank and its associated piping shall be protected from corrosion by one or more of the following methods:

- (a) Protective coating or wrappings
- (b) Cathodic protection
- (c) Corrosion-resistant materials of construction

### **2.6** *Venting*

Each tank shall incorporate a system to release excess vapour to the atmosphere from the vapour space above the liquid.

### **2.7** *Vent Capacity*

The size of any vent shall be such that pressure or vacuums resulting from filling, emptying or atmospheric temperature change, will not cause stresses in excess of the maximum design stress for the tank and shall have a minimum internal diameter of 25 mm to 50 mm.

### **2.8** *Vent Terminal*

- (a) The discharge end of a vent shall be protected from the ingress of foreign material by a protective cage of fitting and shall discharge only vertically upward in order to disperse vapours.
- (b) A vent provision shall be connected to a vapor recovery or collection system, similarly provided for at the filling mentioned in clause 2.9.



## 2.9 *Filling Connection*

The filling connection to a storage tank, which is filled from a tank vehicle, shall incorporate a vapor-tight connection. A cap or cover with lock shall be provided for the filling point. Means shall be provided to prevent accumulation or abnormal discharge of vapour during refilling by having a vapor recovery system.

## 2.10 *Location of Filling Point*

The location of the filling point for any storage tank intended to be filled from a tank vehicle shall comply with the following requirements (see Annex A):

- (a) The length of any hose required to connect a tank vehicle to the filling point shall not exceed 5m
- (b) The filling point shall be protected from accidental or physical damage. Guardrails or any necessary measures shall be installed to prevent damage by collision.
- (c) The filling point for any tank containing a Class A, Class B substances shall be in open air at least 3.0m from any opening into a building and boundary. If a distance of 3.0m cannot be complied, a vapour barrier made of non-combustible material shall be used and shall not be less than 500mm high above the center of the filling point inlet. The vapor barrier must be at least 1m from the boundary line. The distance measured in a horizontal plane around the end of any vapour barrier must be 3m from the center of the outer most filling point inlet to the Building and boundary. See Annex B for details.
- (d) The edge of the tank vehicle designated parking area for refilling shall be at least 3m from any opening into any building and boundary.
- (e) The filling point for the underground tank shall be located in such a way that there are no obstructions for the tank vehicle to have a clear access from the entry to the exit of the service station.

## 2.11 *Piping Design Suitability*

The design, fabrication, assembly, test and inspection of piping shall be suitable for the expected working pressure temperatures and structural stresses and shall comply with relevant international standard.

## 2.12 *Piping Material Suitability*

Any material used in the construction or installation of piping shall be suitable for the conditions of use, and in particular:



- (a) It shall be compatible with the particular petroleum or any other component with which it may be in contact;
- (b) It shall be resistant to any heat to which it may be exposed; and
- (c) Where subject to corrosion, it shall be sufficiently resistant to ensure an acceptable life.

### **2.13 *Piping Flexible Tube***

Flexible tubing, piping or hose may be used only on condition that:

- (a) The use of such tubing is unavoidable because of the need to provide for movement or to reduce the effect of vibration;
- (b) The tubing is of flexibility metallic, metal-reinforced, armored or other construction suitable for the working pressure, temperature and the liquid being handled.

### **2.14 *Piping Design and Construction***

The following general design consideration shall be taken into account when designing or installing any piping:

- (a) The layout shall take into account of the needs for all operating access and shall ensure that any access way are not impeded.
- (b) Supporting and fixing shall be secure and the piping shall be not unduly exposed to mechanical damage;
- (c) Provision shall be made wherever necessary, for the expansion or contraction of the piping and its contents;
- (d) Any buried piping shall be protected from superimposed loads, ground settlement etc.
- (e) Any necessary electrical bonding and earthing shall be provided.
- (f) Piping shall be painted and/or marked in a manner sufficient to permit ready identification of its contents.

### **2.15 *Pump Drive***

Any motor or engine that drives a pump for use with any classes of petroleum shall be of the type specifically approved for such use.



### **3 FUEL DISPENSING SYSTEM**

- 3.1** Dispensing units at a service station shall be located in the open air where they will be adequately ventilated. These shall be located such that all parts of the vehicle being served will be on the premises of the service station and shall be sited not less than 6m away from any building, public roadway or boundary (see Annex A).
- 3.2** A clearly identified and easily accessible switch or circuit breaker (a centralized Emergency Shut-Off Device) shall be provided at a location remote from the dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency and shall not be less than 6m or more than 15m from the dispenser. A sign incorporating the wordings "EMERGENCY CUT-OFF" shall be provided in the vicinity of the cut-off switch (see Annex B). A similar device shall be provided in close vicinity to the console area/cashier as stipulated in Clause 6.3.
- 3.3** Petroleum shall be transferred from underground tanks by means of fixed pumps designed and equipped to allow control of the flow and prevent leakage or accidental discharge.
- 3.4** A control shall be provided such that the pump will operate only when a dispensing nozzle is removed from its bracket or normal position with respect to the dispensing unit and the switch on this dispensing unit is manually activated. This control shall also stop the pump when all nozzles have been returned, Either to their bracket or to the normal non-dispensing position.
- 3.5** The dispensing unit and its piping shall be mounted on a concrete island. Each island shall rise not less than 150mm above the surrounding ground level and shall extend not less than 300mm on both sides of the dispensing units and at least 500mm from the dispensing unit to the edge of the base measured longitudinally (see Annex B).
- 3.6** Hose length at service station shall not exceed 5m. When not in use hose shall be secured so as to protect it from damage.
- 3.7** The nozzle through which fuel is dispensed to a vehicle shall be such that it automatically closes when the fuel tanks of the vehicles are full.
- 3.8** Individual dispensing units shall be provided with an emergency shut-off device.
- 3.9** A rigidly anchored emergency shutoff valve, incorporating a fusible link or other thermally activated device, designed to close automatically in the event of a severe impact or fire exposure shall be properly installed in the supply line at the base or inlet of each dispenser. The automatic closing feature of this valve shall be checked at the time of initial installation and at least once a year thereafter by manually tripping the hold-open linkage.



#### **4 REMOTE PUMPING SYSTEMS**

- 4.1** This section shall apply to systems where petroleum is transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.
- 4.2** Pumps shall be designed or equipped so that no part of the system will be subjected to pressure above its allowable working pressure.
- 4.3** Pumps installed above grade shall be located not less than 3m from the boundary or building opening and shall be substantially anchored and protected against physical damage.
- 4.4** Pit lid or cover for subsurface pumps or piping manifolds of submersible pumps shall be in accordance with clause 2.4(c).

#### **5 ATTENDED SELF-SERVICE STATIONS**

- 5.1** All self-service stations shall have at least one attendant on duty while the station is open to the public. The attendant's primary function shall be to Supervise, observe and control the dispensing of petroleum.
- 5.2** Clear operating instructions shall be conspicuously posted at every dispenser.
- 5.3** The dispensing area at all times is in clear view from the console area/cashier (area having control of the emergency shut-off devices for all and individual dispensing units including remote pumping systems).
- 5.4** A clear line-of-sight between the dispensing area and the console area/cashier shall always be maintained.
- 5.5** The console/cashier operator shall at all times be able to communicate with persons at the dispensing area. This can be by means of a voice communication system.
- 5.6** Sufficient numbers of close circuit cameras are to be installed at the petroleum service station to cover the forecourt, backcourt, dispensing areas and other critical areas of the petroleum service station.
- 5.7** Provisions must be made for bollards and chains to be installed at the exit and the entrance of the petroleum service station during refilling by the tank vehicle to cater during high alert situations.
- 5.8** The setback distance from the edge of the roof of the dispensing area to any boundary line must be in accordance to the requirements in clause 3.5.3 of the Fire Code or 3m, which ever greater. (See Annex A).



**6 ELECTRICAL EQUIPMENT & AREA CLASSIFICATION**

**6.1** All electrical wiring and equipment shall be of a type suitable for the location, in accordance with NFPA 70, or BS 7671.

**7 CAUTION LABELING**

**7.1** An Emergency Information Panel shall be provided at the filling point.

**8 WARNING SIGNS**

**8.1** Warning signs shall be conspicuously posted at the individual dispensing area incorporating the following wordings: "WARNING - NO SMOKING, NO NAKED LIGHTS, and STOP ENGINE". The lettering shall be at least 50mm high.

**8.2** The signs shall be posted not less than 1.8m and not more than 2.5m above the ground level.

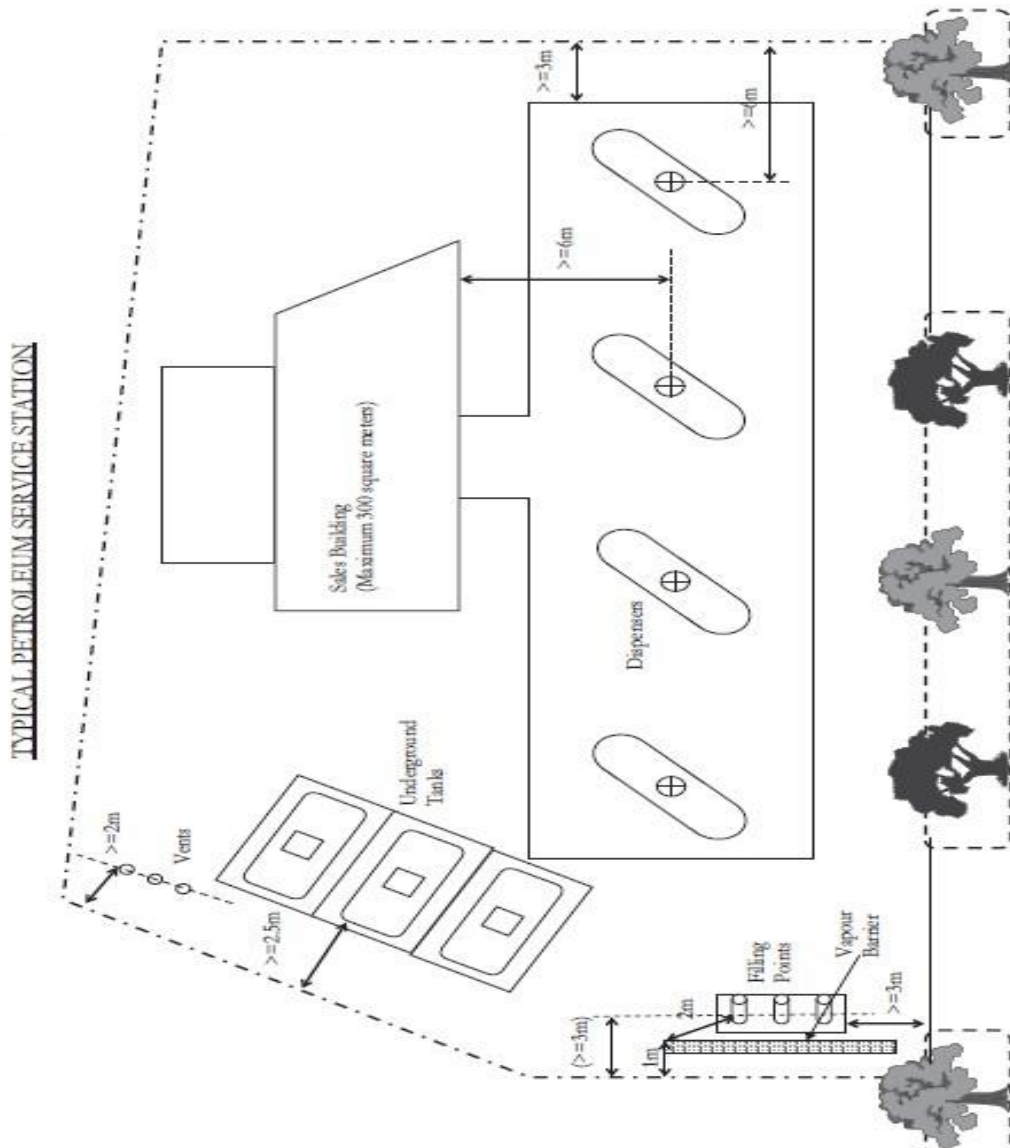
**9 HOSE REELS**

(a) In addition to fire extinguishers, sufficient hose reels coverage shall be provided such that the service station usable area is within 6m of a nozzle attached to a 30m hose.

(b) Hose reels shall comply with the requirements of BS 5306.

ANNEX A

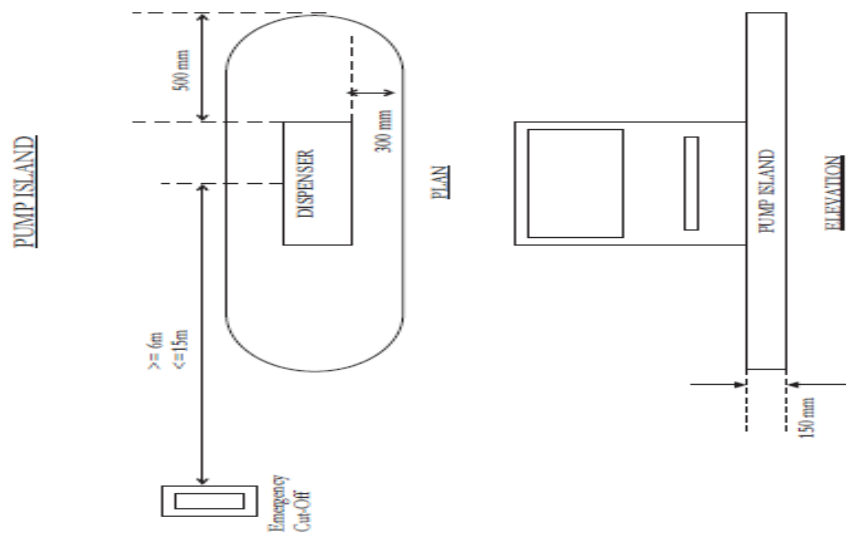
**TYPICAL PETROLEUM SERVICE STATION**







ANNEX B



**PART B****PETROL SERVICE STATION RETAILING AUTOGAS AS FUEL**

These guidelines recommend basic safety requirements for the Storage and dispensing of L.P.G. as Automotive fuel at Petrol Filling Stations and conditions to be imposed.

These fire safety requirements cover the design, construction and use of L.P.G storage vessels and ancillary facilities as well as safe operations at such sites.

The use of alternative designs, materials and methods where these provide equivalent standard of safety may be accepted.

The installation for the storage and dispensing of L.P.G at Petrol Filling Station shall be approved by the Chief Fire Officer.

**1 LAYOUT, LOCATION AND SPACING OF STORAGE VESSELS**

- 1.1** L.P.G storage vessels, pump bays, loading and discharge facilities shall be located and spaced to ensure: -
- (a) That they are sufficiently distanced from fixed sources of ignition.
  - (b) That they provide access for firefighting and other emergency services.
  - (c) That spillage from one vessel work area does not flow under any other vessel or directly to any other important facility / work area.
- 1.2** L.P.G vessels can be installed *aboveground* or *mounded* or *below ground*.
- 1.3** Ground beneath *aboveground* pressure storage vessels and in unfilled below ground chambers shall be either compacted or concreted and graded to levels so as to ensure that any spillage has a preferential flow away from the vessel and its connections.
- 1.4** Pits and depressions other than those which are provided as catchment areas shall be avoided in and close to the storage area.
- 1.5** No pressure vessel for L.P.G shall be located within the bunded enclosure of:
- (a) a tank containing any flammable liquid
  - (b) A tank containing liquid oxygen or other hazardous or cryogenic substances.
  - (c) A tank containing refrigerated L.P.G or L.N.G.
  - (d) A heated storage tank.
- L.P.G vessels shall not be installed under forecourt driveways.
- 1.6** When damage to L.P.G systems from vehicular traffic is a possibility, precautions to guard against such damage must be taken. E.g. use of crash barriers.



- 1.7** Below ground and mounded storage vessels shall be protected from above loadings due to vehicular traffic or other cause either by fencing off the area under which the storage is buried or by the use of reinforced concrete slab adequate to prevent the weight imposing concentrated direct loads on the vessel.

The vessel manhole cover and other fittings shall be protected against damage and tampering.

The perimeter of the area under which storage is buried shall be permanently marked.

- 1.8** Below ground and mounded storage vessel shall have a minimum cover of 500 mm
- 1.9** The area which includes storage vessels pumping equipment and loading / unloading facilities shall be enclosed by a commercial type fence at least 2 metre high unless otherwise adequately protected. Adequate ventilation shall be provided.
- 1.10** Aboveground vessels shall not be positioned under power cables. Distances from the vessel outline should not be less than 1.5 metre for power cables less than 1.0 KV and 10 metre for cables 1.0 KV above.
- 1.11** Separation Distances are established to ensure clearance from vessel and / or potential sources of ignition which, if these fire would pose a risk to the vessel or the associated equipment.

Separation distances from buildings, boundaries and fixed sources of ignition are shown in Table 1.



**Table 1 – Minimum separation distances for vessels up to and including 135cu metres.**

Vessel Water Capacity in Litres	Minimum separation distances (metres)					
	Aboveground vessels			Buried or <i>mounded</i> vessels		
	From boundaries; property lines, buildings, fixed sources of ignition		Between vessels	From boundaries; Property lines, buildings Fixed sources of ignition		Between vessels (2)
		With fire wall (4)		PRV or valve assembly	Vessel shell (1)	
≤ 2500	3.0	1.5	1.0 (3)	3.0	3.0	1.5
>2500 - ≤10000	7.5	4.0	1.0 (3)	4.0	3.0	1.5
>10000- ≤135000	15.0	N/A	1.5 (3)	7.5	3.0	1.5

Where the target is a building or structure, the distance is to be measured to the edge of the foundation nearest to the vessel.

The distance between adjacent vessels must be sufficient to allow access to the shell for inspection / maintenance and to facilitate working with earth moving equipment, erecting scaffolding etc.

¼ of the sum of the diameters of adjacent vessels with a minimum of the distance indicated.

The separation distance for vessels < 5000 litres water capacity may be reduced to those indicated if a suitable fire wall is constructed between the vessel and boundary or occupied buildings etc.

Separation distances between components is shown in Table 2



**Table 2 – Minimum separation distance between facilities handling LPG and flammable liquids at automotive Retail sites.7**

	<b>LPG storage Vessel</b>	<b>Storage vessel Filling Connection</b>	<b>LPG pump</b>	<b>LPG dispenser</b>	<b>Motor vehicle LPG filling connection</b>
LPG storage vessel	-	N/A	Note 3	3 m	3 m
Storage vessel filing connection	Note 1	-	Note 2	3 m	3 m
LPG pump		Note 2	-	Note 3	Note 3
LPG dispenser	3 m	3 m	Note 3	-	N/A
Motor vehicle – LPG filling connection.	3 m	3 m	Note 3	N/A	-
Underground tank (flammable liquid) manhole or fill point	1.5 m Note 4	3 m	3 m	3 m	3 m
<i>Aboveground</i> storage tank/bund (flammable liquid) flash point <65degree Celsius	6 m Note 5	6 m Note 5	6 m Note 5	6 m	6 m



Vents– flammable liquids tanks horizontal distance	3 m	3 m	3 m	3 m	3 m
Forecourt pumps – flammable liquids	3 m	3 m	Note 3	Note 6	N/A
Parked motor vehicles	1.5 m with fire wall	3 m	1.5 m	1.5 m	1.5 m
Site boundary, buildings, fixed sources of ignition	Refer to table 1		4.5 m	4.25 m	4.25 m
LPG cylinder storage area	8 m	8 m	8 m	8 m	8 m

Note 1.

Filling may be by remote fill or via filler valve attached to LPG storage vessel.

Note 2.

Adequate space for safe access to fill connection to be provided

Note 3.

Pump to be protected by location or mechanical means from vehicle accident but not positioned under the vessel. Adequate space for maintenance to be provided around dispenser and pump.

Note 4.

The distance of 1.5 m applied to the distance between the LPG vessel and the underground flammable liquid tank. Any spillage of flammable liquid during filling of underground tank to be directed away from the LPG vessel.

Note 5.

Any spillage from flammable liquid tanks to be directed away from the LPG vessel and equipment. Pool fire from flammable liquids spillage shall not result in flame impingement on the LPG facility.



Note 6.

No separation distance is required between LPG dispensers and flame-proof liquid automotive fuel dispensers. Non-flame – proof equipment must not be located within the hazard zone associated with LPG dispensers.

**2 STORAGE VESSEL**

**2.1** Vessels shall be designed, constructed, installed, inspected and tested in accordance with a recognized pressure vessel code as appropriate e.g. BS 5500, ASME section VIII.

**2.2** Each vessel shall be provided with at least one of each the following fittings, all of which shall be suitable for use with LPG over the vessel's design range of pressure and temperature.

- (a) Pressure relief system connected directly to the vapour space.
- (b) manhole
- (c) drain system
- (d) Means of determining the liquid level.
- (e) Pressure indicator connected to the vapour space.
- (f) Temperature indicator for contents.
- (g) Maximum level device.

**2.3** Connections shall be minimized, particularly those below the maximum liquid level.

**2.4** Connections shall be designed and attached to the vessel in accordance with its design code, e.g. B.S 5500 or ASME section VIII. Connections shall preferably be welded and flanged but screwed connections smaller than 50 mm to BS 3799 or equivalent may be used.

**2.5** The manhole shall be not less than 0.55 m internal diameter.

**2.6** For below ground and mounded vessels, the manholes and connections shall be extended to suit the depth of cover i.e. to facilitate access to valves.

**2.7** Consideration shall be given to providing two independent level gauges in addition to the maximum level device column type gauge glasses for determining liquid level are not acceptable.

**2.8** The requirements for pressure relief as specified in the vessel's design code e.g BS 5500, ASME section VIII must be complied with.

- (a) Relief valves shall be spring loaded, weight relief valves should not be used.
- (b) Relief valves shall be constructed so that the breakage of any part will not obstruct the free discharge of vapour under pressure.



- 2.9** The pressure at which relief valves start to discharge and reach full flow should be in accordance with the vessel's design code e.g. BS 5500 or ASME section VIII.
- 2.10** Every relief valve shall incorporate permanent markings as follows: -
- (a) Manufacturer's identification including name or symbol, catalogue or type number.
  - (b) Nominal inlet and outlet size.
  - (c) Start to discharge pressure.
  - (d) Certified capacity in defined terms.
- 2.11** Relief valves, discharging directly to the atmosphere shall be fitted with vent pipes, adequately supported and have at least 1.5 m above ground level.
- 2.12** All liquid and vapour connections on vessels with the exception of those for relief valves, plugged openings, and those where the connection through the tank shell is not greater than 1.4 mm diameter shall have shut – off valves. These valves shall be preferably of fire safe type as per B.S 5146, B.S 6683 or equivalent.
- 2.13** The shut – off valves shall be located as close to the vessel connection as practicable.
- 2.14** All liquid and vapour connections other than for relief valves level gauges and drainage connections which are larger than 3 mm for liquids and 8 mm for vapour shall have an emergency shut – off valve.
- 2.15** The maximum quantity of L.P.G which shall be filled into any vessel shall be such that the vessel will not become liquid full due to expansion of its contents with rise in temperature, that is the highest level which the contents will reach in operational service due to whatever cause, must never fill the vessel. The maximum safe filling level shall not exceed 90% of the vessel.
- 2.16** Insulation when provided on vessels shall-
- (a) Withstand, together with its cladding direct impingement from those streams.
  - (b) be impervious to the ingress of water vapour and
  - (c) Be sufficiently robust to ensure that minor mechanical damage will not destroy its vapour barrier.
- 2.17** Vessels and their supports should be treated externally to prevent corrosion.
- 2.18** *Belowground or mounded* vessels need special consideration for external protection (e.g. coating, cathodic protection) such protection must be adequate to resist corrosion from surrounding material.





- 2.19** The backfill or covering material which will be in contact with *belowground* or *mounded* vessels shall be clean and free from rocks or similar abrasive material. The backfill shall be carefully consolidated and the covering of *mounded* vessels prevented from migration. The minimum cover provided shall be 500 mm.
- 2.20** Each pressure vessel shall be conspicuously and permanently marked to include the following :-
- (a) The pressure vessel code to which it is designed and constructed.
  - (b) The manufacturer's name and serial number.
  - (c) The capacity in defined units.
  - (d) The maximum and minimum safe working pressure.
  - (e) The minimum safe working pressure.
  - (f) The date of original test, test pressure and symbol of testing authority and space for subsequent inspection / test marking.

### **3 PIPING, VALVES AND FITTINGS**

- 3.1** Piping systems shall conform to the provision of a recognized piping code as appropriate – E.g. B.S 3351 or its equivalent.
- 3.2** The usual material for pipe work is seamless carbon steel pipe (e.g. BS 3601 or its equivalent) with suitable fitting.
- 3.3** Irrespective of the design code, minimum pipe thickness shall conform to the schedule thickness specified in BS 1600 or ANSI B 36.10 or its equivalent.
- 3.4** Joint on piping runs shall preferably be welded joints. Pipe joints of 50 mm nominal size and larger should be welded or flanged. Joints smaller than 50 mm nominal size may be screwed.
- 3.5** When installed underground only welded joints are permitted and the pipe work needs to be fully protected against corrosion.
- 3.6** The primary shut off valves shall be of fire - safe type and of steel or nodular iron to BS 2787 or its equivalent.
- 3.8** Steel flanges and flanged fittings shall be to BS 1560, or its equivalent standards.
- 3.9** Steel butt welding fittings, other than flanges shall be to BS 1640 or its equivalent standards.
- 3.10** Steel socket welding and screwed fittings and screwed couplings shall be to BS 3799 or its equivalent standard.
- 3.11** All pipe lines shall have adequate flexibility to accommodate settling of vessels or other equipments, thermal expansion and contraction or any other stresses which may occur in the pipe work system.



- 3.12** Bends or loops may be used to provide flexibility. Where these methods cannot be used, suitable expansion joints of the bellow type properly anchored may be used. Bellows shall be protected against torsional loads.
- 3.14** Piping should preferably be laid above ground and protected against both physical damage and corrosion. When piping must be buried it shall be protected against physical damage from superimposed loads and corrosion.
- 3.15** Any equipment or section of pipelines in which liquid may be trapped shall be protected against excessive pressure caused.
- 3.16** Pipeline insulation shall be in accordance with the requirements of BS 3351 or its equivalent.
- 3.17** Hose materials should be suitable for use with the grade and service condition applicable.
- 3.18** Hoses shall be designed to withstand a minimum bursting pressure of 4 times the maximum pressure they will carry in service.
- 3.19** Hoses shall be examined visually everyday if used continuously, and each time of use if used intermittently. They shall be replaced when they show signs of deterioration.
- 3.20** Hoses shall be tested periodically to their maximum working pressure and for electrical continuity.
- 3.21** *Support for Vessels and Piping.*
- The design of the support systems shall follow the requirements of the code to which the vessel is designed and constructed.
- 3.22** The spacing of individual supports shall depend on vessel stressing and foundation loading which should be related to ground conditions.
- 3.23** The design of support systems shall allow for movement of the vessel as a result of pressure and thermal effects.
- 3.24** The storage vessel shall be securely anchored and adequate pier height.
- 3.25** Vessel skirts shall be provided with both inspection openings and vents to prevent accumulation of vapour.
- 3.26** Vessel support shall be designed to prevent or to drain any accumulation of water.
- 3.27** Pipe supports shall be designed and spaced to suit the pipework configuration, the anchorage and friction forces involved.
- 3.28** Supports for aboveground storage and pipe work shall be 2 hours fire resisting.

**4 PUMP, COMPRESSORS AND METERS**

- 4.1 The design, materials and construction of pumps (dispensers) shall be suitable for L.P.G under foreseen operating conditions.
- 4.2 Pumps may be placed adjacent to a petrol dispenser and shall be protected against physical damage.
- 4.3 When pumps operate in parallel, each pump suction and discharge line shall contain a block valve designed for at least the maximum pressure the pump can deliver.
- 4.4 The design materials and construction of compressors shall be suitable for L.P.G vapour under foreseen operating conditions.
- 4.5 Liquids lines of suitable size shall be equipped with a high level shut down device, a level indicator and a drain.
- 4.6 The design, material and construction of meters and their ancillaries shall be suitable for L.P.G under foreseen operating conditions.
- 4.7 Meters shall be protected by filters.
- 4.8 Transfer systems shall be designed to minimize the risk of operator errors. Equipment shall be clearly marked.
- 4.9 If automatic alarm devices are used to indicate approach to maximum permissible filling level or automatic shut off to prevent overfilling, then they shall be independent of, and not operated by the primary level gauge on the vessel.
- 4.10 Emergency shut off valves (automatic or remotely controlled shall be installed on the pipeline to prevent uncontrolled discharge in case of hose failure.

**5 ROAD LOADING / UNLOADING FACILITIES**

- 5.1 The location of road loading / unloading facilities shall be separate from other traffic. These shall permit easy access and exit without the need of reversing. Kerbs or other suitable barriers shall be provided to protect product handling facilities.
- 5.2 Ground beneath loading / unloading facilities shall be either concreted or compacted and graded to levels to ensure that any spillage has a preferential flow away from the tanker and vessel.
- 5.3 Flexible connections articulated pipe connections or hose between the fixed loading / unloading facilities and the road tanker shall enable connection without undue strains on the fixed facilities or transport connections. Emergency shut off valves shall be installed.
- 5.4 Readily accessible means shall be provided to enable the operator to shut the flow of L.P.G in an emergency.
- 5.5 Safety systems shall be provided to prevent road movement disconnecting the filling hoses or articulated arms.
- 5.6 Non – combustible materials shall be used in the construction of loading / unloading structures.



- 5.7 Road loading / unloading facilities shall be electrically continuous with the rest of product system.
- 6 ***ELECTRICAL INSTALLATION***
- 6.1 The standard of electrical equipment installation and maintenance at Petrol Filling Stations shall be equivalent to that specified in “BS 7117 – Fuel Dispenser”.
- 6.2 Emergency switches connected to the site main emergency shutdown system which will isolate the supply of L.P.G shall be provided as follows:-
- (a) At the control point in sales building.
  - (b) Incorporated at the site main exterior emergency exits.
  - (c) In the L.P.G vessel compound adjacent to exits.
- 6.3 Emergency switches shall be clearly labelled.
- 7 ***FIRE PROTECTION REQUIREMENTS***
- 7.1 An emergency procedure / plan must be developed to handle emergencies arising from leakage, fire or any other circumstances which could give rise to such emergencies. Such a plan shall include necessary liaison with local emergency response authorities and describe in detail who will do what in an emergency.
- 7.2 Two 9 kg dry powder fire extinguishers type.
- 7.3 The application of water to storage vessels may be any one of or a combination of hydrants, hoses, mobile equipment, fixed monitors as well as fixed water sprays.
- 7.4 The equipment at 9.3 shall be designed to permit the application of water at a rate equivalent to 7 litres per minute per square metres of above ground vessel surface area.
- 7.5 All aboveground storage shall be provided with fixed sprays system designed to ensure that a film of cooling water is applied to the whole surface of the vessel.
- 7.6 Hydrants where provided shall be spaced in such a way to cover the whole facility. Hydrant installation shall be in accordance with the requirements of BS 750 or its equivalent.
- 7.8 Sufficient length of fire hose shall be provided. The outlet of each line shall be equipped with a jet / fog nozzle.
- 7.9 Control of water to fixed installations shall be possible from outside the danger area.
- 7.10 An adequate communication / alarm system shall be provided. The system shall be regularly tested.
- 7.11 All firefighting equipment shall be inspected and tested at regular intervals. These must be maintained in operational order at all material time.
- 7.12 Readily ignitable material shall not be allowed to accumulate and remain within 6 metres of any above ground vessel.
- 7.13 Chemicals which are potential source of fire danger shall not be used as weed killers.

**8 WARNING SIGNS / NOTICES**

**8.1** “HIGHLY FLAMMABLE - LPG” signs in black marking on a yellow background and “ NO SMOKING” signs in white marking on a red background shall be displayed on storage vessel or on the compound in block letters of not less than 100 millimeters high.

**8.2** Notices shall be displayed at the dispenser as follows-

- |            |                                     |  |
|------------|-------------------------------------|--|
| <b>8.3</b> | <b>Liquefied Petroleum Gas</b>      | - black marking on a yellow background |
|            | <b>Extremely Flammable</b>          | - black marking on a yellow background |
|            | <b>Switch Off Engine</b>            | - white marking on a blue background   |
|            | <b>Apply Handbrake</b>              | - white marking on a blue background   |
|            | <b>No Smoking – No Naked lights</b> | - white marking on a red background    |
|            | <b>Switch Off Mobile Phones</b>     | - white marking on a red background    |

**8.4** Notice shall be displayed at emergency Switch as follows-

**EMERGENCY**

**L.P.G. PUMP – SWITCH OFF HERE** -black marking on a yellow background

**9 OPERATIONS AND TRAINING**

- 9.1** Only the person in charge of the service station shall authorise the use of any L.P.G dispenser.
- 9.2** Once authorised the operation of a dispenser shall be via a button on the dispenser which must be held in during operation of the pump. Releasing the button shall stop the flow of L.P.G.
- 9.3** L.P.G tanker delivery shall not be permitted at the same time as a Petrol tanker delivery.
- 9.4** All parts of the L.P.G. installation, particularly storage areas and filling / discharge points shall be kept clean, tidy and free from extraneous material.
- 9.5** A written emergency procedure shall be provided at the site and all staff fully trained in the dangers of L.P.G. and what action to take in the event of any emergency.
- 9.6** Training shall include how to find a vehicle and what to do if:
- (a) A customer drives away whilst still connected.
  - (b) A customer arrives at the unit with a different fill coupling than the nozzle supplied.
  - (c) Excess loss of product on disconnection.
  - (d) The dispenser is run into.
  - (e) A user receives a cold burn.
  - (f) There is a problem during the tanker delivery.



- 9.7** Plant personnel shall also be trained in the fundamentals of fire – control and first aid fire - fighting.
- 9.8** All personnel involved with the handling of L.P.G shall understand the characteristic of the product be instructed to observe the procedures according to the spheres of their responsibility for
- (a) Purging and filling of systems.
  - (b) Draining water in service.
  - (c) Transfer operations.
  - (d) Filling or discharging.
  - (e) Emergency stoppage of operations.

All operations shall be carried out **ONLY** when adequate daylight or artificial light is available.