

**SINGAPORE CIVIL DEFENCE FORCE
FIRE SAFETY & SHELTER DEPARTMENT**



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Registrar, Board of Architects (BOA)
Registrar, Professional Engineers Board (PEB)
President, Singapore Institute of Architects (SIA)
President, Institution of Engineers, Singapore (IES)
President, Association of Consulting Engineers (ACES)

Dear Sirs

TECHNICAL GUIDELINES ON FIRE SAFETY REQUIREMENTS FOR PETROLEUM SERVICE STATION

The Fire Safety and Shelter Department (FSSD) has recently reviewed its Technical Guidelines on Fire safety Requirements for Petroleum Service Station. These guidelines were used by FSSD officers and given to persons who come forward for consultation on petrol service station projects. They have not been officially published or released for use by Qualified Persons. The guidelines were discussed in the FSSD Standing Committee and presented in the recent FSSD Seminar organized by SCDF. A new clause 1.1.8 is to be inserted in Chapter 1 of Volumes VI (Purpose Group VI) and VIII (Purpose Group VIII) of the Fire Code (Code of Practice for Fire Precautions in Buildings 2002). Please see Annex (A) for the details of the clause and the Technical Guidelines on Fire Safety Requirements for Petroleum Service Station.

2 Henceforth, Qualified Persons will be able to refer to the Fire Code for fire safety requirements pertaining to petrol service stations. The guidelines shall take immediate effect.

4 We would appreciate it if you could convey the contents of this circular to members of your organisation. You may reproduce the pages of the new clause and the guidelines for dissemination to your members. This circular is also available in our website : <http://www.scdf.gov.sg>.

5 For any inquiry or clarification, please contact CPT Aidil Arshad at Tel 68481465.

Yours faithfully,

(Transmitted via e-mail)

Teo Lim Teck
Secretary
FSSD Standing Committee
for Commissioner
Singapore Civil Defence Force

cc

All members of FSSD Standing Committee
President, REDAS
President, IFE
President, SISV
CEO, BCA
CEO, URA
CEO, HDB
CEO, PSA
CEO, JTC
CE, LTA – (Attn : Dr. Chin Kian Keong)
CE, PSB – (Attn : Ms Tan Chiew Wan/Mr. Lau Keong Ong)
GM, SPRING Singapore – (Attn : Mr. Teo Nam Kuan)

Technical Guidelines on Fire Safety Requirements for Petroleum Service Station

- 1.1.8 The requirements for storing and dispensing of liquid petroleum in Petroleum Service Station as defined under the Petroleum Regulations (Fire Safety Act) are drawn up at Appendix (I). Its purpose is not intended to preclude the use of alternative designs, materials and methods that provide equivalent standards of safety. Petroleum Service Stations are installations where petrol and diesel are kept and dispensed as fuel for motor vehicles, on forecourt areas to which members of the public have access.

Measures and provisions must be made to prevent ignition sources coming into contact with liquid petroleum or its vapor. The control of ignition sources may become more difficult on sites where the public have access. This would cause the risk to life and property to be potentially high, especially where there are activities apart from dispensing petrol or where supervision is not constant.

TECHNICAL GUIDELINES ON FIRE SAFETY REQUIREMENTS FOR PETROLEUM SERVICE STATION

Appendix to Clause 1.1.8

1. SITING OF PETROLEUM SERVICE STATION
 - 1.1 Any site chosen should be sufficiently spacious for it to be designed to minimise 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, neighbourhood centres, important buildings and key installations. Examples of places of public assembly are shown in Annex A (not exhaustively listed).
 - 1.3 Safe distances from the boundary line of petroleum service stations to residential buildings and places of public assembly shall comply with the following.
 - a) Residential buildings - 50 meters
 - b) Places of public assembly - 90 meters
 - 1.4 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.
 - 1.5 Service station shall be stand-alone type and dispensing of petrol shall be restricted to the ground level only (see Annex B).
 - 1.6 Convenience stores integrated with the petroleum service station is limited to 300 square meters.
 - 1.7 Consultation and approval with regards to new petroleum service station shall be sought from FSSD (URA and NEA) before the actual plan submission with regards to the Self-Regulation Scheme.
 - 1.8 Licensing requirements must be in accordance to the Fire Safety Act, Fire Safety (Petroleum & Flammable Materials) Regulations.
2. STORAGE AND TANK REQUIREMENTS
 - 2.1 Tanks for all classes of petroleum in a Petroleum Service Station shall be installed underground.
 - 2.2 All underground tanks shall have a water capacity not more than 20kl each.

2.3 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) Underwriters Laboratories (UL 58): Steel Underground Tanks for Flammable and Combustible Liquids.
- (iii) Standards Association of Australia (1962): Steel Tanks for the Storage of Flammable and Combustible Liquids.
- (iv) NFPA 30, Flammable and Combustible Liquids Code, 1996, Chapter 2 and 3.

2.4 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.

2.5 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).

2.6 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

2.7 Venting

Each tank shall incorporate a vent to atmosphere for the vapour space above the liquid.

2.8 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 38mm.

2.9 Vent Piping

Any vent piping between the tank vent connection and the discharge point shall comply with the following requirements (see Annex D):

- (a) The vent pipes shall fall consistently back to the tank at a slope not less than 1 in 40.
- (b) A vent pipe shall not pass through building foundations but may be embedded in concrete, which is part of other building construction. A vent shall not be run within a cavity wall but may pass through a cavity wall or through masonry which incorporates cavities, provided that it is in a sleeve which will prevent vapour gaining access to the cavities.
- (c) A vent pipe may be either embedded in a concrete slab or laid in the earth. If the vent pipe is laid in the earth, it shall be:
 - (i) Located not less than 300mm below ground level;
 - (ii) Surrounded by clean washed sand, or provided with equivalent corrosion protection; and
 - (iii) Suitably protected if the area is subject to vehicular traffic.
- (d) The vent pipe and terminal shall be located or protected so that they are not liable to damage resulting from normal activities.
- (e) The vent pipe shall be vapour-tight throughout its length.
- (f) All underground tanks or compartment in a tank shall have a separate individual vent pipe.

2.10 Vent Outlet Location

The discharge point of a vent shall comply with the following requirements:

- (a) The location, direction and velocity of discharge shall be such that venting vapour will not cause danger to the surrounding.

- (b) The vent discharge point shall be not less than 2.0m from any boundary and opening in a building e.g. Window, door, ventilator, air conditioner and forced air intake (see Annex B).
- (c) The vent shall discharge into open air and vent discharge point shall be located not less than 4m above ground level (see Annex D).

2.11 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 2.12.

2.12 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 vapor during refilling by having a vapor recovery system.

2.13 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 B):

- (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 I, Class II and Class III petroleum 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.

2.14 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.

2.15 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.

2.16 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.

2.17 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 accessway 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.

2.18 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 B).
- 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 C). 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 C).
- 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. The attendant is to be above 18 years of age formally trained in the safe handling 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 B).

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 SS 254.

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, 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 FIRE CONTROL

9.1 Fire Extinguishers

Approved types of fire extinguishers of rating not less than 70B (9kg) or 34B (2 x 4.5kg) shall be provided at the individual dispensing units and protected from the weather.

9.2 Hose reels

(a) 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) Hosereels shall comply with the requirements of CP29.

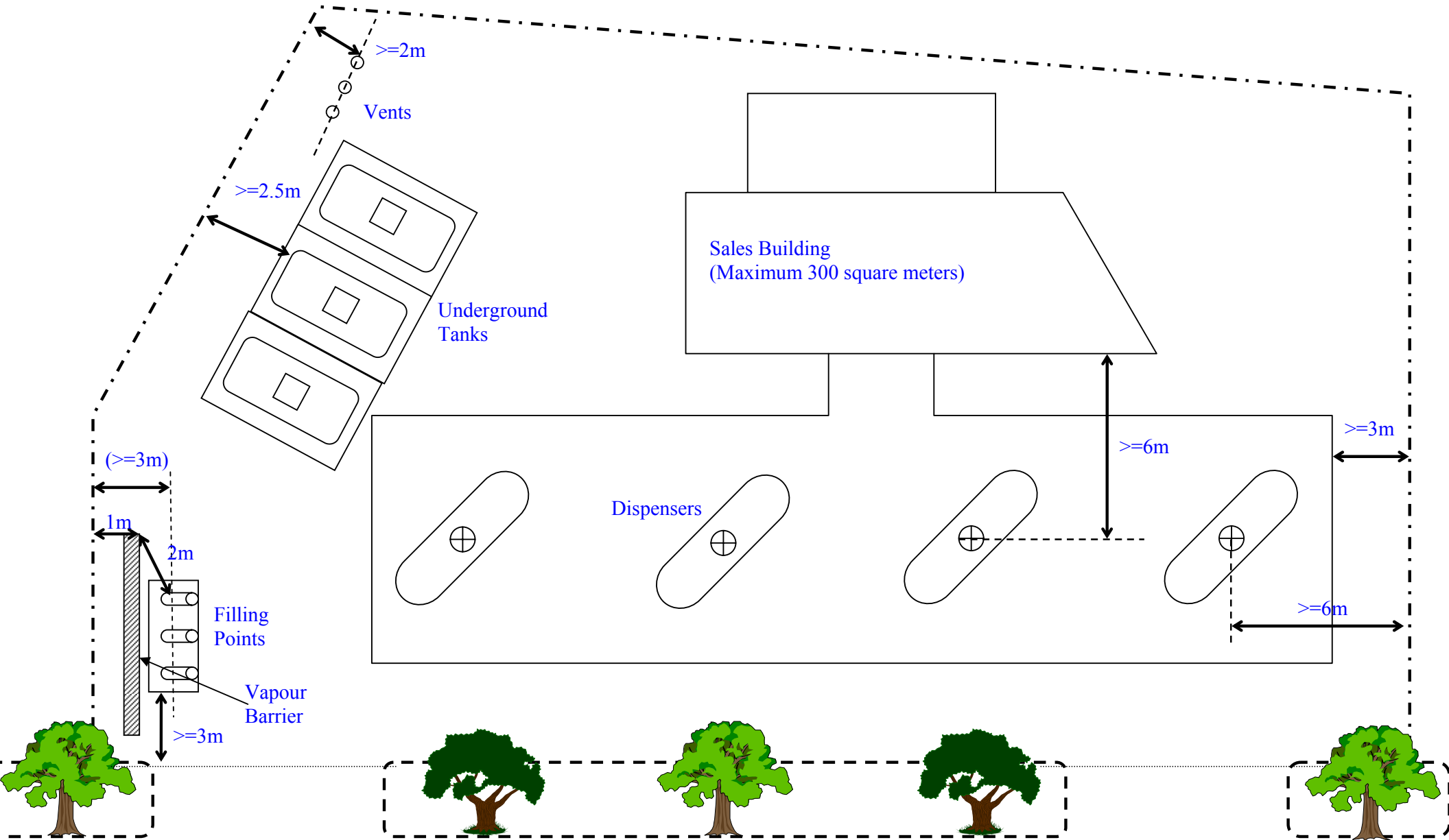
9.3 Absorbents

A small quantity of absorbent or sand (as a guide, 1 full bucket minimum of 40 litres) shall be provided at the service station to mop up any spillage. These absorbent materials shall be kept in a container in a close fitting lid and shall be installed in an accessible place.

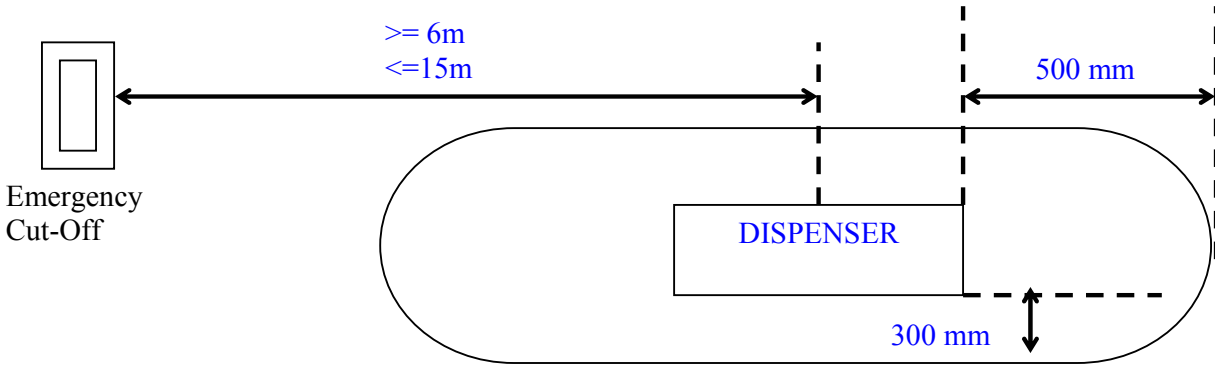
9.4 Fire Hydrant

Fire hydrant must be within 50m from any part of the fire engine access road. The actual travel distance from the edge of the fire engine access road to the most remote point of the petroleum service station usable space must not be more than 50m.

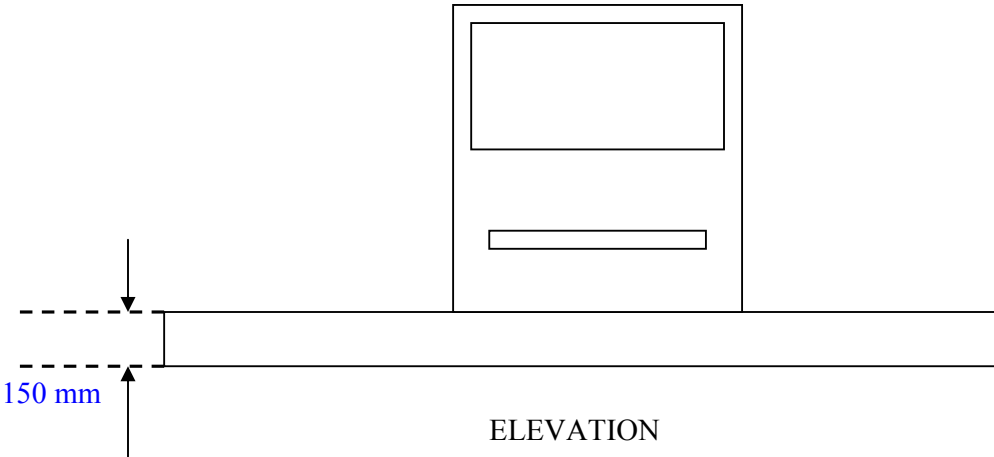
TYPICAL PETROLEUM SERVICE STATION



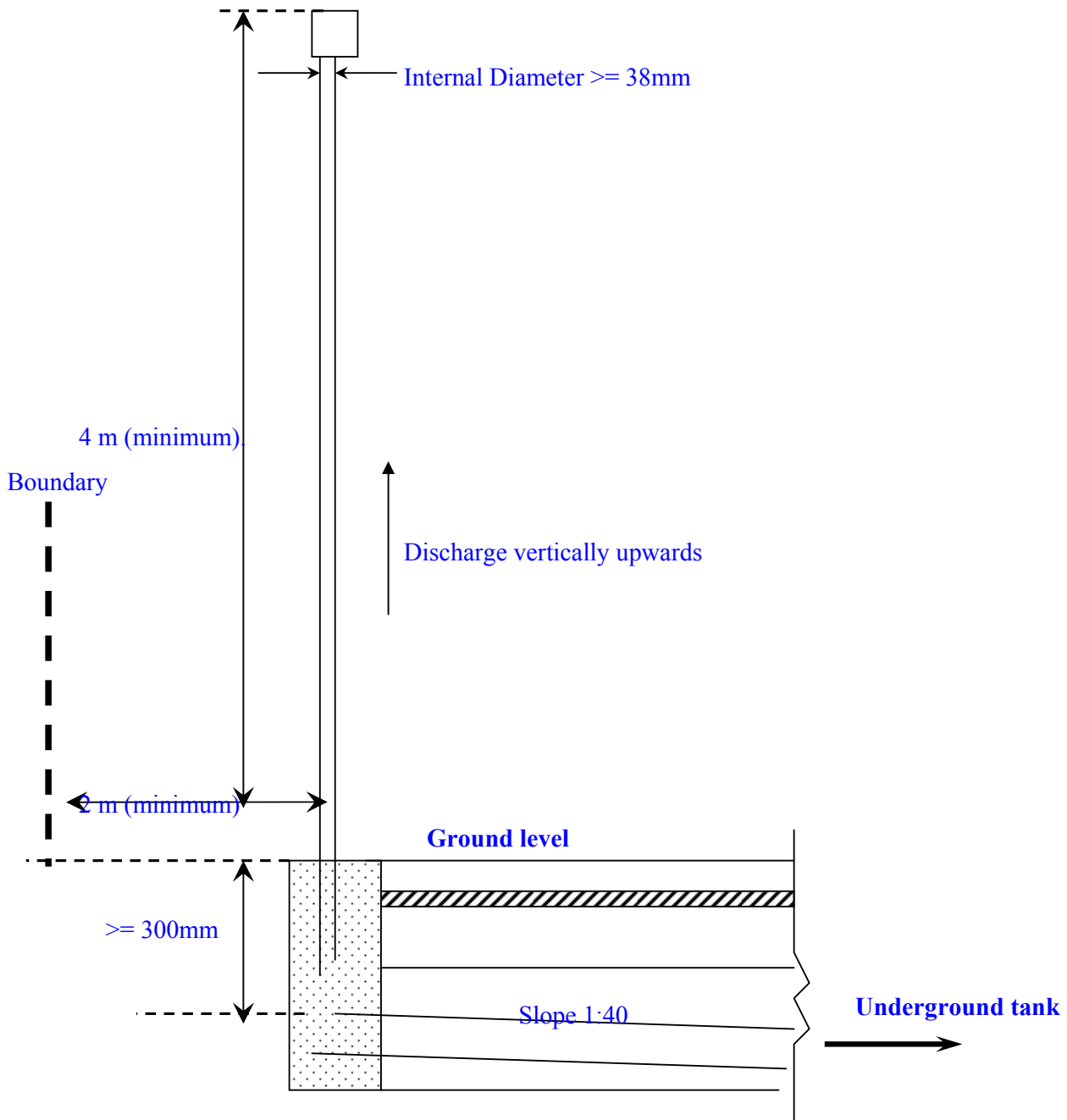
PUMP ISLAND



PLAN



ELEVATION



PLACES OF PUBLIC ASSEMBLY

Examples of places of public assembly are as follows: (not exhaustively listed).

- 1) Places of worship.
- 2) Schools.
- 3) Hospitals.
- 4) Shopping Centres / Malls.
- 5) Hotels.
- 6) Offices.
- 7) Town Centres.
- 8) Neighbourhood Centres.
- 9) Cinemas / Theatres.
- 10) Bus Interchanges.
- 11) MRT / LRT Stations.
- 12) Community Club / Centres.
- 13) Railway Stations.
- 14) Airport.
- 15) Convention Centres.
- 16) Exposition / Exhibition Centres.
- 17) Hawker Centres / Restaurants / Fast Food Centres / Discotheques / Night Clubs.
- 18) Galleries / Museum.
- 19) Stadiums.
- 20) Swimming Complex.
- 21) Custom Check Points.
- 22) Amusement Centres.
- 23) Recreational premises.
- 24) Public places of assembly for persons admitted thereto by ticket (e.g. Zoo, Bird Park, Amusement Parks, etc.)