

(Garuda Emblem)

MINISTERIAL REGULATIONS

Fuel Oil Storage Premises
B. E. 2551 (2008)

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By virtue of Section 5 of the Fuel Oils Control Act, B.E. 2542 and Section 7 of the Fuel Oils Control Act, B.E. 2542 as revised by the Fuel Oils Control Act (No. 2), B.E. 2550 which are laws containing some provisions that involve restriction of individual rights and freedom albeit permitted by Section 29 in conjunction with Sections 33, 41 and 43 of the Constitution of the Royal Kingdom of Thailand, these Ministerial Regulations are, therefore, issued by the Minister of Energy pursuant to the law as follows:

1. These Ministerial Regulations shall come into full force and effect after the lapse of ninety days from the date of their publication in the Government Gazette.

2. In these Ministerial Regulations:

“Fuel Oil” means fuels under the Fuel Oils Control Act, B.E. 2542 as revised by the Fuel Oils Control Act (No. 2), B.E. 2550 but excluding natural gas and liquefied petroleum gas.

“Fuel Storage Premises” mean premises where fuels are stored pursuant to the Ministerial Regulations setting out criteria, method and conditions governing notification, authorization and rates of fees pertaining to the conduct of fuel operations, B.E. 2546.

“Boundaries of fuel storage premises: mean boundaries of fuel storage premises as defined in the site-map drawings for fuel storage premises.

“Flash point” means temperature at the point where fuel vapour bursts into a flash of flame when it comes into contact with test flames.

“Fuel distributing platform” means building and materials/equipment used for the distribution of fuel to fuel transporting trucks/trains.

“Fuel transporting truck” means a vehicle with fuel tank(s) affixed on top used to transport fuels by land but does not include fuel transporting train(s).

“Fuel transporting train” means a vehicle running on rails with fuel tank(s) affixed on top which is used to transport fuels by land.

“Place of education” means educational premises providing education either in the basic elementary stage or higher pursuant to laws governing national education.

“Religious premises” mean temples/monasteries under laws governing the Buddhist Sangha Order, mosques under laws governing administration of Islamic institutions, cathedrals/chapels under laws governing features/characteristics of legitimate Roman Catholic churches in Siam or premises where religious activities are conducted by other religions or religious sects.

“Clinic/nursing home” means venue of medical treatment where in-patients are accepted for overnight stay pursuant to laws governing clinics/nursing homes.

“Archaeological places” means archaeological places under laws governing archaeological places, antiques, objets d’art and the National Museum.

“Pathway/access way” means highways, public roadways, public ways or private roads.

“Junction/crossroad” means pathway with a road of 12.00 m or more in width and 200 m or more in length measured from the point(s) of crossing or joining.

“Road width” means the distance measured from the boundary of one side of the road to the boundary of the opposite side of the road.

Chapter 1

General Provisions

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3. Measurement of safety distances for the purpose of storing fuel containers in fuel storage premises: it shall be measured from the nearest point(s) between fuel containers and the designated point(s).

4. Fuel containers: fuel shall not be filled in excess of ninety percent of the fuel container's capacity.

5. To measure the volume of fuel in a fuel container, computation shall be made pursuant to the fuel container's capacity irrespective of the volume of fuel contained inside.

Chapter 2

Fuel Storage Premises, Type One

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Part 1

Storage of Fuels and Internal Safety Distance

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6. The following safety distance must be maintained for storage of containers containing fuel which are highly-inflammable, medium-inflammable or low-inflammable with a flash point of not more than 93° C inside a building for distribution purposes:

(1) On the side with openings such as door(s) or window(s): there must be a distance of not less than 1.50 m from any of such opening(s).

(2) On the side without openings: there must be a distance of not less than 0.60 m from the edge/rim of the building's wall(s).

7. Fuel containers shall not be stored below ground level unless they are kept inside a building with below-ground level spaces and contain only low-inflammable fuel with a flash point of 93° C or more.

Part 2

Fuel Storage Containers

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8. Fuel cans or fuel tanks must be made of materials which will not react with fuels and must be of the type for specific use with fuels.

Part 3

Fire Prevention and Eradication

9. Lids of fuel containers must be closed at all times while they are not in use.

10. Fuel may not be transferred or partially separated for storage purposes inside premises where they are kept for distribution or sale.

11. There must not be a connection between oil tanks by fuel hoses/pipelines.

12. Fire prevention/fighting equipment must be provided at premises for storage of containers of highly-inflammable, medium-inflammable and low-inflammable fuels with flash point exceeding 93° C for distribution purposes, as follows:

(1) at least one dry-chemical type of fire extinguisher or fire extinguishing chemicals of not less than 6.80 kg capacity and fire-extinguishing capacity of not less than 3A 40B pursuant to standards of the Engineering Institute of Thailand under Royal Patronage, or other equivalent standards as published in the Government Gazette.

(2) such fire extinguisher(s) must be in good working conditions and inspection and maintenance work must be carried out by operators of the controlled operations every six months with evidence of such inspection affixed or suspended on the fire-extinguisher(s).

(3) at least 20 litre of sand which can be easily accessible for use at all times.

13. Signs of warning must be put up at areas where fuel containers are placed for distribution and the text, type and location of such must be as follows:

(1) The following statements must at least be shown on the sign:

“DANGEROUS.

1. No Smoking.

2. Do not create fire flashes/flames”.

(2) Wordings in the sign must be clearly visible and easily legible with their letterings of at least 2.50 cm height.

(3) The sign must be placed at not more than 2.00 m distance from the location where fuel containers are placed and must be set up in a clearly visible location.

Chapter 3

Fuel Storage Premises, Type Two

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Part 1

Fuel Storage and Internal Safety Distance

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14. There must be a safety distance for fuel containers kept inside a building as set out in Table 1.

Table 1: Safety Distance for Placement of Fuel Containers Inside a Building

Type of Fuel	Fuel Volume (ltr)	Minimum Safety Distance (m)		
		Distance from bldg's walls	Distance from openings	Distance from fuel storage premises
Highly inflammable.	> 1,000	0.60	1.50	1.50
Medium inflammable.	< 1,000 – 3,000	0.60	1.50	3.00
Low inflammable with flash point of not more than 93° C	< 3,000 – 15,000	0.60	1.50	4.50
Low inflammable with flash point exceeding 93° C	> 7,500	0.60	1.50	1.50
	< 7,500 – 15,000	0.60	1.50	3.00

15. There must be a safety distance for fuel containers placed outside a building as set out in Table 2.

Table 2 Safety Distance for Placement of Fuel Containers Outside a Building

Type of Fuel	Fuel Volume (ltr)	Minimum Safety Distance (m)
		from fuel storage premises
Highly inflammable. Medium inflammable.	> 1,000	1.50
Low inflammable with flash point not more than 93° C	< 1,000 – 3,000	3.00
	< 3,000 – 15,000	4.50
Low inflammable with flash point exceeding 93° C	> 7,500	1.50
	< 7,500 – 15,000	3.00

16. Fuel containers are to be stored in compliance with the provision of 7.

Part 2

Type of Site Plan(s)/Layout and Construction Drawing(s)

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17. For a fuel storage premise, Class Two, there must be a brief site map/layout showing its location as well as various structures existing at least within its parameters of 50 m.

Where the location of a fuel storage premise may not be indicated clearly in the site map/layout under the preceding paragraph, a site map/layout may be prepared with such parameters/distance which may indicate its location.

18. For fuel storage premise, Class Two, a site map must be provided which show its boundaries as well as fuel containers, lines of fuel pipelines and fuel storage building(s).

19. Construction drawing(s) of large fuel storage tanks with more than 2,500 litre capacity must at least give the following details:

- (1) Plan drawings of the upper section, various equipment affixed to the tank, plan drawings of the lower section and basic foundation.
- (2) Side-view and cross-section drawings as well as details of the structural foundation.
- (3) Details of construction and installation of fuel storage tanks.
Use a scale of not less than 1 : 100 for construction drawings under (1) and (2).

Part 2

Fuel Storage Tanks

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20. Features and method of installation of underground fuel storage tanks shall be as follows:

- (1) The body of the tank must be made of steel with a yield stress of not less than 1.5 times the allowable stress ensuing from the absorption of weight and the weight of its various contents, or made with other materials with equivalent standards as announced by the Minister in the Government Gazette.

(2) The body of the tank must be installed and fixed to the structural foundation in a way such that it cannot be moved or floats up as the result of pressure from underground water. Its structural foundation must be designed and built to allow safe absorption of the tank's weight as well as that of fuel contained in the tank including any other weight/pressure made against the tank's body. Nothing may be constructed/affixed over the upper portion of the tank's panel.

(3) Anti-corrosion measures must be provided for the tank's external surface.

(4) The upper portion of the tank's panel must be at least 0.50 m below ground level.

(5) There must be at least 0.60 m distance between the panels of each tank.

(6) The tank must be placed inside the boundaries of a fuel storage premise and the panel of the tank must be placed at a distance of at least 3.00 m from such boundaries.

(7) Oil vapour ventilating pipelines must be installed for every tank. For tanks which are separated into compartments, however, oil vapour ventilating hoses/pipelines must be installed separately for each compartment. The type and method of installation of oil vapour ventilating hoses/pipelines shall be as follows:

(a) Its diameter must not be less than 40.00 mm.

(b) The tip end of the oil vapour ventilating hoses/pipelines must be at least 4.00 m above ground level and located at a distance of not less than 1.50 m from the boundaries of fuel storage premises.

(8) The tip end of oil intake hoses/pipelines must be at least 1.50m away from fuel storage premise boundaries.

21. Features and method of installation of above-ground fuel storage tanks shall be as follows:

(1) Its body must be made of steel with a yield stress of not less than 1.5 times the allowable stress ensuing from the maximum working pressure of fuel in the tank, or else made of other materials with equivalent standards as set out by the Minister in the Government Gazette.

(2) Its body must be installed and affixed firmly to its base foundation which, in turn, must be designed and installed in such a manner to allow it to safely withstand the weight of the tank as well as that of fuel contained therein including other weights placed on top of the tap.

(3) Anti-corrosive measures must be provided for the tank's external body.

(4) There must be an embankment or walls set up around the tank. Such embankment or wall must be of a size which will sufficiently store fuel in the equivalent volume of the largest tank's capacity inside the embankment or wall in which respect, the panels of such embankment or walls must be able to prevent penetration/outflow of liquids as well as withstand pressure from maximum weight contents.

(5) Every tank must be equipped with fuel vapour ventilating hoses/pipelines. Features and method of installation of such pipelines must comply with the requirements set out in 20 (7).

(6) The tip end of oil intake pipelines must be at a distance of at least 1.50m from fuel storage premise boundaries.

22. Once fuel storage tanks have been installed pursuant to 20 and 21, tests shall be carried out on leakages from the tank's body as well as from its various joints with the use of water pressure, air pressure or compressed inert gases of not less than 20.6 kPa (3 lbs per 1 inch²) but not exceeding 34.5 kPa (5 lb per 1 inch²). Where water pressure is used for the test, time taken for such test shall not be less than one hour, and not less than twenty-four hours where air-pressure or inert gas pressure is used.

If leakages are found, points of such leakages shall be examined and remedial action taken before tests are carried out pursuant to the preceding paragraph once again until no sign of further leakages appears.

Tanks shall be tested every ten years in the method set out in paragraphs one and two.

Part 4

Fuel Pipelines System and Equipment

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23. Features and method of installation of fuel pipeline system and equipment used with fuel storage tanks shall be as follows:

(1) They must be designed and built to safely withstand the force and various weights which will be made against the pipeline system.

(2) Pipes to be used in the fuel pipeline system must be made of steel or other materials with equivalent standards as prescribed by the Minister in the Government Gazette.

(3) For fuel pipelines which are connected to the fuel pumping machine, closing/opening valve(s) must be provided for inlet/outlet conduits from the fuel pumping machine in order to stop the fuel pumping process in any case of emergency.

(4) Installation of above-ground fuel pipelines system shall be as follows:

(a) To prevent corrosion, pipes must be placed on a supporting stand/base made of stable and strong concrete or steel shaft above ground with enough space from the floor base.

(b) There must be protective measures in place to prevent the fuel pipeline system from being damaged by vehicles or other things and to ensure that there are anti-corrosive measures in place.

(c) For pipelines running above ground and crossing over pathways – there must be sign(s) indicating its height from the level of surface traffic to the lowest point of the pipes, structure or other components of that pipe.

(5) Installation of underground fuel pipelines system shall be as follows:

(a) pipes to be used must be anti-corrosive or having anti-corrosive measures in place.

(b) signs must be in place to show clear lines/direction of the pipelines.

(c) where closing/opening valve(s) or various equipment are installed underground, they must be installed in such a way which will facilitate ease of inspection and maintenance.

(6) Materials used in the fuel pipeline system such as opening/closing valves, sealants or leakage preventive materials must be of the kinds used specifically with fuel and which will not react with fuel.

24. Once installation of the fuel pipeline system and their equipment are completed, they must be examined and tested before use, as follows:

(1) careful inspection of materials or various accessories/parts of the fuel pipeline system to ensure that they are in good conditions and conform to the prescribed standards.

(2) tests must be carried out for leakages for at least thirty minutes with the use of water pressure, air pressure or inert gas with a pressure of 345 kPa (50 lb/in²). In the case of double-layered pipelines, only internal pipes will be tested and the provisions of Clause 22, paragraphs two and three will be applicable *mutatis mutandis*.

25. Tests on fuel storage tanks and fuel pipeline systems and equipment pursuant to Clauses 22 and 24 shall be carried out by examiners and inspectors duly qualified under the Ministerial Regulations issued pursuant to Section 7 (4). And, the record of the results of such tests and inspection must be kept by the operator of the controlled operations for access and inspection by the Department of Energy Business for a period of one year.

Where no tests and inspections have been carried out pursuant to the preceding paragraph, the operator of the controlled operations shall carry out such tests and inspection under the supervision of the Officials.

Part 5

Protection and Prevention of Fires

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26. Protection and prevention against fires in fuel storage premises, Class Two, shall be made as set out in clauses 9, 10, 11 and 13.

27. As for storages of highly-inflammable, medium inflammable or low-inflammable fuel with a flash point of not more than 93° C for the purpose of distribution and areas where such fuel containers are placed – fire protection and fire-prevention equipment must be provided as follows:

(1) At least two units of dry-chemical fire extinguishers or fire extinguishing liquids of not less than 6.80 kg with a fire-extinguishing capacity of not less than 3A 40B pursuant to the fire prevention standards of the Engineering Institute of Thailand under Royal Patronage, or other equivalent standards prescribed by the Minister and published in the Government Gazette.

(2) Such fire extinguishers must be in good working conditions and inspection and maintenance must be carried out on them by the operator of controlled operations every six months with evidence(s) of such inspection affixed or hung on the fire-extinguishers.

(3) At least 300 litres of sand which are accessible for ease of use at all times.

Chapter 4

Fuel Storage Premises, Class Three

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Part 1

Features and External Safety Distance

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28. Features of fuel storage premises, Class Three, for distribution purposes, shall be as follows:

(1) located in appropriate and safe locations for transportation purposes.

(2) located at a distance of not less than 1,000.00 metres from the parameters of royal residences.

(3) located at a distance of not less than 200.00 m from educational or religious premises, nursing homes or archeological sites.

(4) there must be access ways for entry and exit for vehicles which are linked to roadways with at least 12.00 m width and authorization or consent must be obtained from the authorized official(s) or owner(s) of such pathways for them to be used as such linkage for the purpose of entry and exit for vehicles. As for entry/exit ways for vehicles, the road's width must not be less than 10.00 m and the edge of the curve leading in and out must be curving out with a radius of not less than 6.00 m to ensure ease of access by fuel transportation trucks as shown in Illustration 1 attached hereto.

(5) The starting points of entry and exit for vehicles which are linked up with roadways containing traffic island, water drainage or ramparts dividing traffic flow into two-way directions must not be less than 50.00 m from the starting point of the openings of traffic island, water drainage or ramparts of such roadways as shown in Illustration 2 attached hereto.

(6) The starting points of entry and exit for vehicles must not be located at the curve of the road which has a radius of less than 1,000.00 m and must be at least 50.00 m away from the starting point of that curve as shown in Illustration 3 attached hereto.

(7) The starting points of entry and exit for vehicles must be at least 50.00 metres away from the starting point of the curve of a junction located on the same side as shown in Illustration 4 attached hereto.

(8) The starting points of entry and exit for vehicles must not be located at the vertical curve of the pathway with a gradient exceeding 1: 25 on either side and must not be located on a road with a gradient in excess of 1 : 25 as shown in Illustration 5 attached hereto.

In case a pathway's gradient on any side ranges from 1 : 50 to 1: 25, the starting points of entry and exit for vehicles must not be located at the vertical curve and must be at least 150.00 m from the starting point of that road's vertical curve as shown in Illustration 6 attached hereto.

(9) The starting points of entry and exit for vehicles must be at least 50.00 m away from the starting or terminating point of the foot of a bridge with a gradient on either side exceeding 1 : 50 lying on the same direction as shown in Illustration 7 attached hereto.

(10) The starting or terminating point of the foot of a bridge is to be measured from a distance of not less than 50.00 m from the starting or terminating point of the gradient of the road which is linked to a bridge with a gradient exceeding 1 : 50. However, if the gradient is less than 1 : 50, it shall be measured from the approach to the bridge as shown in Illustration 8 attached hereto.

29. Fuel storage premises for distribution, Class Three, which have entry/exit ways already inspected for safety and duly authorized to be linked up with roads pursuant to laws governing highways -- they shall be exempted from the requirements to provide a spacing between the starting points of entry and exit for vehicles which are linked up with roadways and such other features of entry and exit ways for vehicles prescribed pursuant to 28 (4), (5), (6), (7), (8), (9) and (10).

Part 2

Storage of fuel and internal safety distance

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30. Fuel storage tanks containing fuel which are highly-inflammable, medium inflammable and low-inflammable or fuel with a flash point not exceeding 93° C that are placed above the ground must have a safety distance between land boundaries, building(s) and other things, as follows:

(1) Safety distance between the panels of a fuel storage tank and land boundaries shall be as those set out in Table 3.

Table 3: Safety Distance between Fuel Storage Tanks and Land Boundaries

Type of Fuel	Volume of Fuel (Lt)	Minimum Safety Distance (metres)
Highly-inflammable, medium-inflammable, or low inflammable with a flashpoint not exceeding 93° C	not exceeding 1,000	1.50
	> 1,000 – 3,000	3.00
	>3,000 – 45,000	4.50
	>45,000 –110,000	6.50
	>110,000 –190,000	9.00
	>190,000 –380,000	15.00
	>380,000 –500,000	25.00

(2) Safety distances between panels of a fuel storage tank and building(s) shall be as those set out in Table 4.

Buildings under the preceding paragraph do not include fuel pumping stations, electricity sub-stations, buildings which house measuring devices or other buildings as prescribed by the Minister in the Government Gazette.

Table 4: Safety Distance between Fuel Storage Tanks and Building(s)

Type of Fuel	Volume of Fuel (Lt)	Minimum Safety Distance (metres)
Highly-inflammable, medium-inflammable, or low inflammable with a flashpoint not exceeding 93° C	not exceeding 110,000	1.50
	> 110,000 – 190,000	3.00
	> 190,000 – 380,000	4.50
	> 380,000 – 500,000	7.50

(3) Safety distances between the panels of a fuel storage tank and other things shall be as those set out in Table 5.

Table 5: Safety Distance between Fuel Storage Tanks and Other Things

Type of Fuel	Minimum Safety Distance (metres)
High, medium or low inflammable a flash point not exceeding 93° C	Distance between the panels of each with tank must be equivalent to 1 in 6 parts of the product of addition of the diameter of the tank which is next to it and must not be less than 1.00.
High, medium or low inflammable a flash point not exceeding 93° C	Distance between the tank and inside panels of the embankment or wall or fuel storage tank ?? must not be less than 1.50.
High or medium inflammable	Distance between the panels of a tank and rims of the fuel distributing platform must be equivalent to 1 time the diameter of the large tank and not less than 6.00
High, medium or low inflammable flash point not exceeding 93° C.	Distance between the edge of the external panels of a dam and fuel storage premises must not be less than 3.00.

31. Safety distances must be provided for above-ground fuel storage tanks containing low-inflammable fuel with a flash point in excess of 93° C which are placed with the same group of fuel storage tanks under 30 as set out in Table 5.

32. Safety distances must be provided for above-ground fuel storage tanks containing low-inflammable fuel with a flash point in excess of 93° C as prescribed in Table 5.

Type of Fuel	Volume of Fuel (litre)	Minimum Safety Distance		
		from land	from edge of boundaries	between a building's wall tanks
Low-inflammable with a flash point exceeding 93° C.	>227 - 7,500	1.50	1.50	1.00
	>7,500 – 113,000	3.00	1.50	1.00
	>113,000 – 189,000	3.00	3.00	1.00
	>189,000 – 378,000	4.50	3.00	1.00
	>378,000 – 500,000	4.50	4.50	1.00

33. In areas where tanks or groups of fuel storage tanks and the fuel distributing platform of Class Three fuel storage premises for distribution are located, fence(s) of not less than 3.00 metres in height must be put up around them and their gates must be made of strong and non-inflammable materials.

34. There must be embankment(s), walls or fuel well around areas where tanks or groups of fuel storage tanks are located which must be adequately strong to withhold the weight around them, with their features being as follows:

(1) For tanks or groups of fuel storage tanks with a flash point not exceeding 93° C, the embankment, walls or fuel storage well must be of a size that will adequately contain fuel in an equivalent volume to the largest tank's capacity.

(2) For tanks or groups of fuel storage tanks with a flash point exceeding 93° C, the embankment, walls or fuel storage well must be at least 0.50 high or wide, as the case may be.

35. Fuel pumping machine used for intake/outtake of fuel or points of fuel intake/outtake may be set up within the embankment, walls or fuel storage wells.

36. Features and safety distances of buildings which keep fuel containers in storage must be as follows:

(1) They must be strong enough to safely bear the maximum weight and other weights which may be made against/on the fuel storage building.

(2) They must be built mainly of permanent and fire-resistant materials.

(3) Walls and entry/exit gates of the building with automatic closing devices must be made of fire-resistant materials as prescribed in Table 7.

Table 7: Fire Resistance of the Building Storing Fuel Containers

Type of Fuel	Fire-Resistance of Walls (hrs.)	access doors with automatic closing devices must be fire-resistant by (hrs.)
Low-inflammable	not less than 2	not less than 1.5
medium-inflammable	not less than 2	not less than 3

(4) With the following safety distances:

(a) For a building without walls, it must be located at a distance of not less than 15.00 metres from the boundaries of fuel storage premises, or from a building storing fuel containers or other buildings.

(b) For a building with walls, it must be located at a distance of not less than 3.00 metres from the boundaries of fuel storage premises, or from a building storing fuel containers or other buildings.

37. Fuel containers containing highly-inflammable fuel may not be kept in a building used as storage for fuel containers.

38. The following criteria must be adhered to for storage of fuel bottles, fuel cans, fuel tanks or small fuel tanks containing medium-inflammable or low-inflammable fuel for distribution purposes in a fuel containers storage building:

(1) They must not be kept at a level higher than the second floor of the fuel containers storage building.

(2) There must be an embankment of at least 0.10m in height at the location where fuel bottles, fuel cans or fuel tanks are placed to prevent leakages of fuel, with adequate arrangements for water drainage.

(3) For placement of fuel bottles, fuel cans or fuel tanks, there must be safety distances for each group as prescribed in Table 8.

Table 8: Safety Distances for Placement of Each Group of Fuel Bottles, Fuel Cans or Fuel Tanks

Type of Fuel	Volume of each group of fuel (litre)	Safety Distance measured from container's coating (metre)			
		Distance between Groups	Distance between Groups & walls of fuel storage buildings	Distance from ceilings or shafts	Height of placement of fuel storage Containers
Low-Inflammable	not more than 57,000	not less than 1.20	not less than 2.40	not less than 0.90	not more than 6.00
Medium Inflammable	not more than 38,000	not less than 1.20	not less than 2.40	not less than 0.90	not more than 3.00

(4) For placement of several groups of fuel bottles, fuel cans or fuel tanks in aggregate, there must be safety distances as prescribed in Table 9.

Table 9: Safety Distances for Placement of Several Groups of Fuel Bottles, Fuel Cans or Fuel Tanks in Aggregate

Type of Fuel	Aggregate Volume of fuel (litre)	Safety Distance measured from container's coating (metre)		
		Distance from boundary of fuel storage Premises	Distance between fuel storage buildings & other buildings	Distance between different groupings
Low-Inflammable	not more than 200,000	not less than 3.00	not less than 3.00	not more than 3.00
Medium Inflammable	not more than 100,000	not less than 7.50	not less than 7.50	not more than 7.50

(5) For placement of small fuel tanks, there must be safety distances for each group as prescribed in Table 10.

Table 10: Safety Distances for Placement of Each Group of Small Fuel Tanks

Type of Fuel	Volume of each group of fuel (litre)	Safety Distance measured from container's coating (metre)			
		Distance between Groups	Distance between Groups & walls of fuel storage buildings	Distance from ceilings or shafts	Height of placement of fuel storage Containers
Low-Inflammable	not more than 200,000	not less than 1.20	not less than 2.40	not less than 0.90	not more than 4.00
Medium Inflammable	not more than 150,000	not less than 1.20	not less than 2.40	not less than 0.90	not more than 3.00

(6) For placement of several groups of small fuel tanks together, there must be safety distances as prescribed in Table 11.

Table 11: Safety Distances for Placement of Several Groups of Fuel Tanks Together

Type of Fuel	Aggregate Volume of fuel (litre)	Safety Distance measured from container's coating (metre)		
		Distance from boundary of fuel storage Premises	Distance between fuel storage buildings & other buildings	Distance between different groupings
Low-Inflammable	not more than 380,000	not less than 3.00	not less than 3.00	not less than 3.00
Medium Inflammable	not more than 300,000	not less than 7.50	not less than 7.50	not less than 7.50

39. For storage of fuel bottles, fuel cans, fuel tanks or fuel tanks containing highly-inflammable, medium-inflammable or low-inflammable fuel outside a fuel containers storage building, the following criteria must be adhered to:

(1) There must be an embankment of at least 0.10m in height at the location where fuel bottles, fuel cans, fuel tanks or fuel storage tanks are placed to prevent leakages of fuel with adequate arrangements made for water drainage.

(2) For placement of fuel bottles, fuel cans, fuel tanks or fuel storage tanks, there must be safety distances for each group as prescribed in Table 12.

Table 12: Safety Distances for Placement of Fuel Cans, Fuel Tanks or Fuel Storage Tanks

Type of Fuel	Fuel Storage containers	Volume of fuel in each Group (liter)	Safety Distance measured from container's coating (metre)				
			Distance from boundary of fuel storage Premises, buildings & other buildings	Distance between groupings	Length of Groups	Distance from ceilings or shafts	Height of placement of fuel storage containers
Low-Inflammable	Fuel bottles, fuel cans or fuel tanks	Not more than 83,000	Not less than 3.00	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 5.00
	Fuel storage tanks	Not more than 170,000	Not less than 3.00	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 4.00
Medium Inflammable	Fuel bottles, fuel cans or fuel tanks	Not more than 33,000	Not less than 7.50	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 4.00
	Fuel storage tanks	Not more than 66,000	Not less than 7.50	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 3.00
Highly Inflammable	Fuel storage tank	Not more than 4,000	Not less than 20.00	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 3.00
	Fuel storage tanks	Not more than 15,000	Not less than 20.00	Not less than 1.50	Not more than 60.00	Not less than 0.90	Not more than 4.00

40. As for storage of several types of fuel within the same group, the volume of storage volume and safety distances must comply with criteria governing fuel with higher inflammability.

Part 3

Types of Layouts and Construction Plans

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41. There must be a brief layout in respect of Fuel Storage Premises, Class Three to show the location of fuel storage premises together with various structures located in its vicinity at the following distance:

(1) At a distance of not less than 200.00 m for fuel storage premises with fuel distribution/ouutake platform.

(2) At a distance of not less than 50.00 m for fuel storage premises without fuel distribution/ouutake platform.

Where the layout under paragraph one cannot show such location of fuel storage premises, a layout shall be made at the distance where the location of fuel storage premises can be identified.

42. For Fuel Storage Premise, Class Three, a layout must be made of the area which shows boundaries of land, outlay of fences for fuel storage premises, fuel distribution/ouutake platform, fuel containers, fuel pumping machine, fire-fighting water pump(s), source of water supply for fire fighting, location of systems for water treatment or separation of oil-contaminated water, embankments, panels or fuel well, conduits or pipelines for main drainage system and other structures as well as entry and exit ways for vehicles.

Presentation of details under the preceding paragraph must at least show the various safety distances as prescribed herein.

43. For layouts of various structures in the areas of fuel storage premises, details must be given for each layout, as follows:

(1) Layout of the fuel conduit system and equipment.

(2) Layout of the fire-extinguishing conduit system and equipment which shows the location of fire-extinguishers, source of fire-fighting water supply, storage of fire-extinguisher chemicals as well as various tools and equipment used for fire-extinction.

44. As for fuel containers which take the form of large fuel storage tanks, a Table must be made to show the size, height and capacity of the tank, the type of its roof, type of fuel, product stored in the tank and various safety equipment installed with the tank.

45. Construction layouts of large fuel storage tanks must provide details as set out in 19.

46. Layout of fuel conduit system and equipment must provide the following details, in the least:

- (1) Points of intake and outtake, size of conduit, opening/closing valves and main devices/equipment.
- (2) Fuel pumping machine with specifications of the pump's pressure and pumping rates.
- (3) The base/foundation which supports the fuel conduit system and equipment.

47. Layout/drawings on the fire-extinguisher conduit system and equipment must at least give the following details:

- (1) Size of the conduit, opening/closing valves and main equipment.
- (2) Fuel pumping machine with specifications of the pump's pressure and rates of pumping.
- (3) The base/foundation supporting the fire-extinguisher conduit system and equipment.

48. Layout on housing for the Fuel Distribution/Outtake Platform must at least give the following details:

- (1) Layouts on flooring, basic foundation, roof and structural layout.
- (2) At least two side-view layouts.
- (3) Cross-section and vertical-section layouts.
- (4) Structural details.
- (5) Details of the fuel conduit system and equipment installed with the fuel distribution/outtake platform.

49. Construction layouts of the system for water treatment or separation of oil-contaminated water must at least give the following details:

- (1) Layouts of flooring and basic foundation.
- (2) Cross-section and vertical-section layouts.
- (3) Details of various parts of the system for water treatment or separation of oil-contaminated water.

50. Construction layouts of embankments, panels or fuel wells must at least give the following details:

- (1) Layouts of flooring and basic foundation.

- (2) Cross-section and vertical-section layouts.
- (3) Details of construction.

51. Layouts of fences and doors/gates must at least give the following details:

- (1) Layout of basic foundation, side-view section and cross-section layouts.
- (2) Details of various parts of the fence and doors/gates.

52. Where there are other structures involved with fuel intake or outtake, layouts showing details of such structures must be provided as well.

53. Scales for layouts of areas or construction plans are as follows:

- (1) For layouts of areas under 42 and 43: use a scale of not less than 1 : 500.
- (2) For construction layouts under 45, 48 (1) (2) and (3), 49 (1) and (2), and 50 (1) and (2): use a scale of not less than 1 : 100.

54. Construction of various structures inside Fuel Storage Premises, Class Three are allowed a variation of not more than twenty percent from the parameters of layouts duly authorized provided that safety distances are not less than those prescribed herein. Moreover, ratios of various structures once they are completed must not vary by more than five percent from the approved layouts.

55. For Fuel Storage Premise, Class Three, details must be given for computation of its stability, strength, safety system and toxicity control system of fuel storage tanks, fuel distribution/outtake platform, embankments, panels or fuel wells, fuel conduit system, fire-fighting pipeline system, system of water treatment or separation of oil-polluted water, safety devices/equipment or other structures within fuel storage premises.

Part 4

Fuel Storage Tanks

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56. Features of fuel storage tanks are as follows:

(1) Its body must be made of steel with a yield stress of not less than 1.5 times the allowable stress ensuing from the maximum working pressure of fuel in the tank, or made with other materials with equivalent standards as announced by the Minister in the Government Gazette.

(2) Steel and structural steel used in building the tank must be certified to international standards.

(3) Allowable stress of the tank's steel panels must not be less than 145 N/mm², its yield stress must not be less than 206 N/mm² and its elongation value must not be less than twenty two percent.

(4) The specific gravity value of fuel used for the design must not be less than one. However, if it should exceed one, the actual specific gravity value must be used in making pertinent computations for the design.

(5) It must be equipped with meter(s) in a clearly visible position in order to measure pressure or vacuum.

(6) A warning device must be installed at a distance of not less than 0.20 m from the highest point of the tank's panels.

57. Large fuel storage tanks shall be of the following features:

(1) The base supporting a tank must be adequately strong and stable to safely withhold the weight of the tank and that of its contents at the maximum rate including other weights which will be made against it.

(2) A tank with 100,000 ltr. capacity or more must display the results of soil composition surveys in at least one point around the location where the tank will be built to support computation of strength and stability for the base/foundation supporting the tank.

(3) Engineering data must be displayed which can be checked to ensure that the tank will not incur any damages during the process of fuel intake/outtake in or out of the tank or when temperature changes inside a tank.

(4) The tank's air ventilating pipes must be designed for its pressure not to exceed 7.5 millibar and for the vacuum pressure not to exceed 2.5 millibar.

58. For large above-ground fuel storage tanks, category or type of fuel product and authorized fuel capacity must be stated on at least one side of the tank's outer panel that will be clearly visible and legible within a distance of 25.00 metres.

59. Features of large above-ground vertical fuel storage tanks must be as follows:

(1) The tank's panels must be made of steel with a thickness value derived from the designed layout computation to withstand the maximum weight capacity plus a corrosive value and must not be less than the minimum thickness value prescribed in Table 13.

Table 13: Minimum thickness of iron panels of large, vertical above-ground fuel storage tank.

Tank's diameter (metre)	Minimum thickness
Less than 15.00	5.00 mm (3/16 inch).
15.00 – 36.00	6.00 mm (1/4 inch).

(2) Welding of the tank's steel sheet panels must be made in such a way to ensure that they are strong, stable and safe. When connecting various pipes to a tank's panels, if a pipe should exceed 2 in. in diameter, the panel must be reinforced at the cross-section of such reinforced steel and its thickness must not be less than that of the tank's panel, and its area must not be less than twice the pipe's area.

(3) The tank's steel flooring must not be less than 6.00 mm in thickness. For any tank with its diameter larger than 12.50 m, there must be a circular steel sheet with a thickness of not less than 6.00 m underneath the tank's steel floor.

(4) As for welding of a tank's steel roof which is fixed-type or internal floating type, the welding must be made in an overlapping manner and the seam of such welding must be shown only on one topside. The top of the roof which is welded to the tank's wall must have an indication of welding shown only on one topside.

(5) For any tank with a diameter of not more than 25.00 m, there must be at least two entry/exit channels around the tank's panels and its roof top. For a tank with a diameter of more than 25.00 m, there must be at least three entry/exit channels, with two located in the areas of the panels and another located in the roofing area. Entry/exit channels must be located in opposite directions and these channels' diameters must not be less than 0.40 m. in size.

60. Assembly and installation of large vertical above-ground fuel storage tanks must be made as follows:

(1) Welding of a tank's steel floor.

(a) The welding of a tank's lower section of the panel which is affixed to the supporting circular ring and the tank's steel floor must be welded in a fully consecutive form both inside and outside of the tank's panels

(b) As far as welding of a tank's steel floor is concerned, it must be overlapping by at least 5 times the thickness of the tank's steel flooring sheet, and the overlapping of such steel flooring with the supporting circular sheet must not be less than 65.00 mm.

(2) The vertical line of welding of the tank's steel panels must be spaced by at least 0.30 m distance or by one-third of the length of the steel sheet. Such welding seams, however, must not be in the same line in the three sheets which are placed on top of one another.

(3) The tank's external surface must be base-coated with anti-corrosive substances and then painted over with external paints.

(4) As far as laying of the roof's steel sheets is concerned, the one with a higher position must be placed on top of the sheet with a lower position.

61. Consideration must be given to ventilation of pressure inside a tank when installing safety equipment/devices for large, vertical above-ground fuel storage tanks as follows:

- (1) Receiving fuel into the tank.
- (2) Distributing fuel from the tank.
- (3) Drop of temperature outside a tank.
- (4) Tank's expansion as the result of increased outside temperature.

62. Following action must be taken in building large, vertical above-ground fuel storage tanks:

(1) For a tank with 100,000 litre capacity or more: operators of the controlled operations must notify the Department of Energy Businesses of their plans to build the base foundation to have it duly inspected prior to actual construction.

(2) To ensure that there are no leakages, the welded seam on the tank's floor must be inspected with the use of a vacuum box with a gravity force of not less than 17.23 kPa (2.50 lbs/in²), or by other method(s) with equivalent standards as prescribed by the Minister and published in the Government Gazette.

(3) The welded seams of a tank's panels must be inspected by means of radiation or any other method(s) with equivalent standards as prescribed by the Minister and published in the Government Gazette.

(4) Inspection by means of radiation shall be made as follows:

(A) Vertical welding.

1) For steel sheets with a thickness of not more than 10.00 mm: they shall be inspected by means of one shot of radiation per not more than 3.00 m length in the first welded line. After this, inspection will be made at the rate of one point for every distance of not more than 30.00 m.

2) For steel sheets with a thickness of more than 10.00 mm but not more than 25.00 mm: they shall be inspected by means of radiation under (1) with an additional inspection at the horizontal welded line next to the vertical line as well. As for the vertical welded seam of the lowermost steel, two points at least must be inspected for each welding and at least one point of such inspection must be as close as possible to the tank's floor.

3) Steel sheets which are thicker than 25.00 mm will have the entire welded line inspected by means of radiation.

(B) At every 3.00 m distance of the first horizontal welded line, an inspection must be carried out at one point. Thereafter, another point will be inspected at every 60.00 m.

(C) Radiation made at every point must cover at least 150.00 mm of the length of the welded line, and the width of film used must not be less than 45.00 mm.

(D) Fillet welded line between a tank's floor and its sides must be inspected by means of liquid dye penetrant test or magnetic particle test.

(E) A tank's coordinates must be at the standard values, as follows:

(1) Plumbness value must not exceed 1 : 200 of the tank's height measured from the topmost rim of the tank vis-à-vis its lowermost rim.

(2) Roundness value: a tank's radius when measured at the level of 30.00 cm above the welded line of the tank's floor must not vary in excess of values prescribed in Table 14.

Table 14: Roundness Value

Tank's diameter (m)	Permitted Variation (mm)
Less than 12.00	13.00
12.00 – 45.00	19.00

(3) the value of peaking/dipping of a tank's panels along the vertical welded seam must not be more than 13.00 mm vis-à-vis the curving section of the tank's panels with a length of 900.00 mm.

(4) the value of peaking/dipping of a tank's panels along the horizontal welded line (banding) must not be more than 13.00 mm vis-à-vis the straight section of the tank's panels with a length of 900.00 mm.

63. During construction of a large, vertical underground fuel storage tank, the tank must be inspected as set out in 62 and prior notice given to the officials before construction begins. The outcome of such inspection must be approved by the Department of Energy Businesses.

64. On completion of construction of large, vertical above-ground fuel storage tank, the following tests shall be carried out:

(1) The tank must be tested for water pressure at the following levels:

- (a) At the tank's highest level.
- (b) For a tank with fixed-roof: water shall be filled up to the level of 50.00 mm height above the welded line between the tank's panel and roof.
- (c) Where action cannot be taken as set out in (a) and (b) because an overflow channel is built in the tank or because of limitations in internal floating roof's functions: tests shall be carried out at the highest level possible.

(2) During the course of water-pressure tests under (1), checks/measurements must be taken of the tank's subsiding effect with a water load at a fifty percent, seventy five percent and one hundred percent levels to be tested under (1) in which the water level must be maintained at a constant rate for at least twenty four hours. This measurement on a tank's subsiding must be taken both before and after water is filled in for each phase and such measurement must be made around the tank with each point of measurement set at an equal distance and not more than 10.00 m apart.

(3) Check on leakages along the welded seam between the reinforced steel sheets and the tank's panel with the use of pressurized air of not less than 68.9 kPa (10 lb/in²) but not more than 103.4 kPa (15 lb/in²) pressure.

65. For tests to be carried out on a tank under 64, prior notification must be given to the Officials before action can be proceeded with and the results of such tests must also be approved by the Department of Energy Businesses.

66. Following checks must be carried out on the conditions of a tank and equipment for large vertical above-ground fuel storage tanks which have been in use for one full year to ensure that they are in good conditions and may be used safely in the same manner as when they have been licensed for use:

- (1) Careful screening for leakages or corrosion of the tank's panels, roofs and conditions of signs of external welding.
- (2) Vacuum-pressurized safety equipment for fuel vapour ventilation.
- (3) Equipment for measurement of oil levels, temperature including safety warning devices.
- (4) Water drainage system from the tank's floor to water drainage channels surrounding the tank, to the treatment system or oil-polluted water separation system.
- (5) Drainage system for rain water from the tank's floating roof.
- (6) Fixed/permanent staircase, staircase on the floating roof, the revolving point of the floating roof's stairs and the ground line system between the floating roof and the tank's panels.

- (7) Subsiding of the tank's base foundation, condition of the tank's foundation and sloping.
- (8) Measurement channels of the product's level.
- (9) Tank's insulating sheets.
- (10) Floats, buoys and leakage sealant for open floating roof.
- (11) Ground lines around the tank's base foundation.
- (12) Condition of external paint.
- (13) Condition and strength of railings set up on the tank's roof to prevent people/things falling off.
- (14) Oil stains caused by leakages from the lower part of the panel next to the tank's floor placed on the tank's foundation.
- (15) Leakages of intake/outtake pipelines and equipments affixed to the tank.

67. For large vertical above-ground fuel storage tanks which have been in use for ten full years, checks must be carried out on conditions of the tank and equipment to ensure that they are in good conditions and may be used safely in the same manner as when they have been licensed for use and in accordance with the recorded results of such inspection, as follows:

(1) For external areas of the fuel storage tank: action taken as set out in Clause 66 and additional checks made, as follows:

(a) Stairs and steps-landing: checks made on the conditions of steel structure and welded seams of steps and handrails, gaps, conditions and ground-to-first step welding and measurement channels for the product's level and opening lids.

(b) Fixed-roof: checks made on traces of perforations caused by rust, fissures and corrosions at the welding line's seams, welding lines around the tank's edge and railings around the tank to prevent falls.

(c) Floating roof: checks made on conditions of sealing materials used for the tank's roof, gaps and jostling between sealant materials and the tank's panels; checks for leakages of the floating roof's buoy(s) and mechanical systems of the stairs leading into the tank as well as ground line connections around the tank.

(d) Checks made on conditions of paint coating around the tank, paint cracks, signs of corrosion and tear and dents of the welded lines and leakages of the tank's panels.

(e) Checks on signs of subsiding around the tank and checks for leakages or water penetration around the welded points between the tank's panels and its base.

(f) In areas of reinforced steel around the tank's rims: checks on wear and tear, leakages and cracks of the welded line's seams.

(g) Checks for any twist/contortion or cracks of equipment affixed to the tank such as fuel pipelines, fuel intake/outtake pipelines, entry/exit channels and functions of various valves.

(h) For insulated tank's panels: peel off insulated sheets covering the tank in areas where moisture may be accumulated such as reinforced leg-stands around the tank's topmost rims, reinforced steel of the tank's panels and insulation steel rings. If there is any doubt of water leakages inside the tank's insulated coverings, such coverings must be opened to check for wear & tear/corrosion of the tank's surface in that area.

(2) Inside a fuel storage tank: the tank must be cleaned first before carrying out pertinent checks, and rust must be eliminated by surface-scrubbing through firing of iron or sand pellets or with the use of high-pressurized water. Checks and tests must, at least, be carried out as follows:

(a) The tank's flooring: inspection must be made of the welding line in welded areas between the tank's panels and flooring and neighbouring areas. Corroded holes in steel sheets or those scattered throughout must be inspected as well as checks made on the smoothness of the tank's panels, curving or on any subsiding of the tank's floor, corrosion underneath a tank's floor, waste water wells and waste water drainage pipes inside it with checks made on leakages along the welded lines by means of vacuum test or magnetic particle test or liquid dye penetrant test, or by any other means of equivalent standards as prescribed by the Minister in the Government Gazette.

(b) The tank's internal panels: checks are to be made in areas along the line of welding between the tank's panels and floors, seams created by welding between supplementary steel sheets and the tank's panels, seams of accessory equipment affixed to the tank's panel, distortion and tilting/slating of the tank's panels as well as signs of corrosion, denting, subsiding, peeling of painting/coating inside the tank.

(c) As for checks to be carried out in tanks where repairs or replacement have been made on seams of the tank's panels or floor or welding of accessory equipment and drilling of the tank's wall or flooring, such checks shall be made in the same way as those carried out for new tanks pursuant to criteria set out in 62 (2), (3) and 4 and in 63, 64 and 65.

(d) Tests shall be carried out on water pressure at a 100% level under 64 (1) for at least twenty four hours when any of the following actions have been made on a tank:

1) Where the tank's panel is drilled below the filling level, the diameter drilled must be more than 12", or when the floor of a tank of any size is drilled at a distance of not more than 0.30m from the tank's panels.

2) For any part of the panel which is cut-off, replaced or enlarged at a point below the tank's designed filling level or any part of the tank's floor which is supporting a wall on any side with a length in excess of 0.30m.

3) Vertical seams of the tank's panels, or horizontal seams between the tank's sheets supporting the tank's panel which is longer than 0.30m, or where welding repairs are made at a depth of more than half of the seam's thickness.

4) Replacement of a new tank's flooring unless such replacement does not cause any impact on the tank's basic foundation, condition of its flooring which supports the panels, or on the tank's floor at critical areas within a distance of 3" from a tank's rims if it is a tank which does not have any supporting parts for its panels.

5) Any removal or new welding of welded seams between a tank's panels and floor or the tank's base supporting such panels.

6) Padding/support made to raise the tank.

(e) Fixed roof and roofing structure: if it appears that a roof sheet has become less thick or if there are corroded holes in them, inspection must be carried out on the following:

1) Reinforced steel around the topmost part of the tank's brims.

2) Corrosion underneath the roofing frames.

3) Points which trap water on the roofing structure.

4) Pillars supporting roofing structure.

5) Pipes used for measuring fuel-level and temperature.

(f) Floating roof: checks must be carried out as follows:

1) for leakages inside buoy(s) and leakages of roofing sheets which come into contact with fuel.

2) Water-drainage system on the roof and devices to trap water flowing from the roof to the roof's soft or hard water drainage pipes.

3) Pipes/hoses measuring product levels and closing lids.

4) The tank's roundness and gaps between anti-leakage sealants and the tank's panels.

5) Floating suction pipes.

6) Heat coils and heating equipment at suction pipes.

(3) Inspection on the thickness of a fuel storage tank's steel sheets must be carried out as follows:

(a) Thickness of the steel sheet must be measured at one point at least per sheet by means of ultrasonic scanner or ultrasonic thickness gauge, or by any other methods with equivalent standards as prescribed by the Minister and published in the Government Gazette.

(b) Surface areas and points to be checked must be determined by the inspector(s) by taking into account track records of the tanks in the following areas:

1) Checks must be repeated in any area where there has been a record of heavy corruptions.

2) In areas of the tank's wall at 30.00 cm from the tank's lowermost and topmost brims.

3) Where water is trapped around the tank's foundation, detailed checks must be carried out on the tank's padding/supporting parts.

(4) A tank's size coordinates must be within the standard values as follows:

(a) Plumbness: not exceeding 1 in 100 of the tank's height measured from its topmost brim to the bottommost edge.

(b) Roundness: the tank's radius measured at the level of 30.00 cm above the seam of the tank's floor must not exceed the value set out in Table 14.

(c) Value of peaking of the tank's body or tank's panels must not exceed 13.00 mm vis-à-vis the curving design of the tank's panels of 900.00 mm length.

(d) The banding value must not exceed 25.00 mm vis-à-vis the straight line design of the tank's panels of 900.00 mm length.

68. Where corrosion is discovered on large, vertical above-ground fuel storage tanks, remedial action must be taken without delay by operators of the controlled businesses.

69. Results of inspection under 66 and 67 shall be sent by inspectors to inform the operators of controlled businesses who must, in turn, remit the results of such inspection to the Department of Energy Businesses for its further consideration.

70. Features of large, horizontal above-ground fuel storage tanks must be as follows:

(1) The tank's panels must be of such thickness pursuant to the value derived from the design computed to withstand maximum weight capacity plus value of corrosion.

(2) Steel sheets in the tank's panels must be welded in such a way which would ensure its stability and safety when the various pipes are welded in to be linked up with them. For a pipe with a diameter exceeding 2", its panels must be reinforced at the cross-section of such reinforced steel and must not be less in thickness than that of the tank's panel with its areas not being less than twice that of the pipe's areas.

(3) For a tank with a capacity exceeding 19,000 litres, there must be at least one inlet/outlet channel with a diameter of not less than 0.60 m.

71. Features and method of installation of underground fuel storage tanks shall be as follows:

(1) The tank's body must be made of steel with a yield stress of not less than 1.5 times the allowable stress ensuing from the bearing of weight and various weight contents, or made of other materials with equivalent standards as prescribed by the Minister and published in the Government Gazette.

(2) The tank's body must be installed and tightly affixed to the basic foundation in a way such that it cannot be moved or floated as the result of pressure from underground water and there must not be any item built above the said premises.

(3) The top part of the tank's panels must be at a level of not less than 0.50 m underground.

(4) There must be a gap of not less than 0.60 m between the panels of each tank.

(5) Tanks must be placed inside the boundaries of fuel-storage premises and the tank's panels must not be less than 3.00 m away from the boundaries of fuel-storage premises.

(6) Fuel Vapour Recovery Units pipes must be installed in each tank. However, for tanks which are divided into compartments, fuel vapour recovery pipe must be installed separately for each compartment. Features and method of installation of fuel recovery unit pipes are as follows:

(a) Its diameter must not be less than 40.00 mm.

(b) The end-tip of the vapour recovery pipe must be at least 4.00m above ground and at least 1.50 m away from the boundaries of fuel storage premises.

(7) The end-tip of the vapour recovery pipes must be 1.50m at least away from the boundaries of fuel storage premises.

72. At the end of a ten year period of use of underground fuel storage tanks and large, horizontal fuel storage tanks, conditions of the tanks and equipment must be tested to ensure that they are in good conditions and may be used safely just like when they were granted the licenses, as follows:

(1) Tests shall be carried out on the tank's body and various joints with the use of water pressure or air pressure of not less than 20.6 kPa(3 lbs per 1 inch²) but not exceeding 34.5 kPa (5 lb per 1 inch²). Where water pressure is used, time taken for the test shall not be less than one hour and no less than testing times set out in Table 15 where air-pressure or inert gas pressure is used.

Table 15: Times used to test fuel storage tanks with air or inert gas pressure

Tank capacity (litre)	Testing time (Hr.)
Not exceeding 15,000	not less than 24
Not exceeding 30,000	not less than 48
Not exceeding 45,000	not less than 72
Not exceeding 60,000	not less than 96

(2) Tests by means of air pressure must not be used for fuel storage tanks that have been put to previous use.

(3) If leakages are found, points of such leakages shall be looked for and remedial action taken before tests are carried out pursuant to (1) once again until no sign of further leakages is found.

(4) Once an underground fuel storage tank has been tested, clean sand shall be tightly compacted around it with a thickness of not less than 0.20 m.

(5) By other methods with equivalent standards as prescribed by the Minister and duly published in the Government Gazette.

73. Features of large fuel storage tanks with floating roofs are as follows:

(1) Adequate drainage of rainwater from the floating roof must be provided to prevent damages to the tank's roof.

(2) Anti-leakage materials at the tank's rims must not react with fuel.

(3) It must be equipped with fuel vapour recovery equipment to prevent pressure and vacuum from exceeding the capacity of fuel ventilation during the course of fuel intake/outtake.

(4) For earth system, ground connections must be joined up between the floating roof and the tank's body to have electric charges transferred to ground.

(5) Panels around the tank at the level not exceeding 1.00 m from the highest point of the tank must be reinforced for stability and strength.

(6) The floating roof's tripods must be adjustable to the lowest position during the course of fuel intake/outtake operations and to the highest position during maintenance/repairing works.

(7) The roof's steel sheets must be layered on top of one another with the topmost sheet lying underneath the lower sheets [*sic*] to avoid accumulation of moisture along the overlapping lines underneath the roof.

(8) There must be inlet/outlet channels with a diameter of at least 30" for a tank. Where such channels are located at the tank's panels, their diameters must not be less than 24".

74. Where any premises may be located in areas susceptible to the impact of earthquakes pursuant to laws governing buildings control, strict compliance must be made with such laws when making a design to build large fuel storage tanks with a capacity exceeding 100,000 litres.

75. Operators of controlled businesses are required to send specifications on the opening/closing valves, fire-extinguishing system and various safety devices/equipment installed with large fuel storage tanks, to the Department of Energy Businesses for its consideration/authorization prior to making any of such installation.

At least one annual inspection shall be made on equipment after their installation under paragraph by licensed operators of the controlled engineering profession from the class of regular engineers upwards pursuant to laws governing engineers and the reports on such inspection must be kept by operators of the controlled businesses for the Department of Energy Businesses for its access for inspection for a term of one year.

76. Tests and inspections of fuel storage tanks and accessory equipment must be carried out by testers and inspectors as prescribed in 25.

Part 5

Fuel Pipeline System and Equipment

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77. Features and method of installation of fuel pipeline system and equipment shall be as prescribed in Clause 23.

78. Installation and inspection of opening/closing valves, safety devices/equipment, flexible hoses and fuel pumps affixed to fuel pipelines and fire-extinguishers shall be as prescribed in Clause 75.

79. Fuel distribution platforms or receiving or dispatching points of fuel must be equipped with safety system against risks of static electricity with its main ground connection linked up under a system and joined up with ground connection between fuel storage tanks and oil transport trucks while fuel receiving or dispatching is in process pursuant to Ministerial Regulations governing electricity system issued by virtue of Section 7.

80. Before fuel pipeline system and equipment are put to use, tests and checks must be carried out first, as follows:

(1) Materials or various assembly parts of the fuel pipeline system and equipment must be examined to ascertain that they are in good condition and may be used safely.

(2) Tests on the capacity to withstand pressure

(a) The fuel pipeline system and equipment must be tested at the applied pressure of at least 1.5 times the design pressure and for such pressure to be maintained for at least thirty minutes without showing any signs of ensuing leakages.

(b) Capacity to withstand pressure shall be tested by means of hydrostatic test. Inert gas shall be used in lieu where water cannot be used.

(c) Flexible hose will be tested for their pressure-withstanding capacity by applying water at the pressure of 1.5 times the working pressure and to have such pressure maintained for at least ten minutes.

(3) Results of tests and inspection under (1) and (2) shall be recorded and maintained for the Department of Energy Businesses' demand of access for inspection for a period of one year.

81. After the fuel pipe system and equipment have been used for ten years or, after the last test and check-up on them, they shall be tested and checked by methods set out in Clause 80 and the results of such test and check duly recorded. Operators of the controlled businesses must keep the results of such tests and checks for the Department of Energy Businesses' demand of access for inspection for a period of one year.

82. Tests and checks on the fuel pipeline system and equipment must be carried out by testers and inspectors as prescribed in Clause 25.

Part 6

Fire Prevention and Extinguishment

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83. Fuel storage premises for distribution, Class Three, must be equipped with fire-hose system with a diameter of not less than 100.00 mm, or a size equivalent to those of fire-fighting water hoses belonging to the local administrative authorities. The size of their fire-hose joints must be the same as that of the local administrative authorities' fire trucks and there must be at least two points of outlets to dispatch fire-fighting water.

84. Fuel storage premises, Class Three, must be equipped with fire extinguisher of the dry chemicals type or with fire extinguishing chemicals with not less than 6.80 kg capacity and a fire-extinguishing capacity of not less than 3A 40B pursuant to fire-prevention standards of the Engineering Institute of Thailand under Royal Patronage, or other equivalent standards as prescribed by the Minister and published in the Government Gazette. Their installation will be subject to the following criteria:

(1) There must be at least two fire-extinguishers per 200.00 m² area in a fuel storage building.

(2) Storage building(s) of ready made products of medium inflammable fuel must be equipped with at least two fire-extinguishers per 200.00 m² area, and at least one fire-extinguisher per 200.00 m² area for low-inflammable fuel.

(3) There must be at least one fire-extinguisher per two fuel pumping machines in areas where fuel pumping machines are placed and at least four fire-extinguishers where fuel pumping machines exceed eight in number.

(4) There must be at least one fire-extinguisher per two channels at points of receiving or dispatching of fuel in areas at the fuel dispatching platform or points of fuel-receiving.

(5) There must be at least one fire-extinguisher at points of fuel receiving or dispatching by fuel trucks, per each distance of not more than 30.00m apart between channels of fuel receiving or dispatching.

(6) In fuel receiving or dispatching areas in a port: there must be at least two fire-extinguishers per each point of fuel receiving or dispatching and another fire-extinguisher containing at least 50 kg.of chemicals per each fuel receiving or dispatching point.

(7) Installation of fire-extinguishers: they shall be placed around fuel storage premises in visible areas with ease of access for use.

85. Fuel storage premises for distribution, Class Three with a storage volume of more than 15,000 ltr. must have concentrated foams available at all times which will be used as foam solvents pursuant to the following criteria:

(1) The volume of foam solvents to be sprayed into a large above-ground fuel storage tank will be computed from the type of fuel and type of the tank as set in out in Table 16.

Table 16: Volume of foam solvents to be injected into a fuel storage tank.

Type of Fuel	Type of Tank	Rate of use of foam solvents (ltr/min/m ²)	Areas used in computation (m ²)	Time used in computation (min.)
Highly-inflammable	fixed roof	4.1	tank's cross-section	55
Medium or low-Inflammable				30
All types	floating roof	12.2	cross-section areas between foam buffer on tank roof to tank's panels.	20
Highly-inflammable	floating Roof	4.1	tank's cross section	55
Medium or low Inflammable				30
All types		12.2	cross-section areas between foam buffer on tank roof to tank's panel, in the case of floating roof with inside made of steel.	20

(2) As for the volume of foam solvents, the foam hose must be filled up in full as computed from the size and aggregate length of the foam hose.

(3) For volume of supplementary foam solvents to be sprayed at specific points: the rate of such ejection must not be less than 189 ltr./min. The number of foam solvent ejection equipment and duration of such spraying shall be as set out in Tables 17 and 18.

Table 17: Size of fuel storage tanks and number of foam solvents spraying equipment

Tank's Diameter (m)	Minimum number of foam spraying equipment (points)
Not exceeding 19.50	1
Exceeding 19.50 – 36.00	2

Table 18: Size of fuel storage tanks and duration of foam solvents spraying

Tank's Diameter (m)	Minimum duration of foam spraying (minutes)
Not exceeding 10.50	10
Exceeding 10.50 – 28.50	20

(4) Foam solvents must be of such qualities which are suitable to quench out fire in line with the type of fuel.

(5) As for the volume of concentrated foam required to be kept, it shall be computed from foam solvents under (1), (2), and (3) of tanks using the volume of maximum concentrated foams and there must be a reserve of concentrated foam of not less than 1 time the volume of foam used each time.

(6) Storage of concentrated foams and accessory fire-extinguishing equipment: they shall be kept around areas of fuel storage premises, Class Three, in a visible location which could be taken out for use easily and are in a ready condition for use at all times.

86. Fuel storage premises, Class Three, must provide for a water-distribution system to put out fire which must be adequate for fire extinguishment, as follows:

- (1) For use to spray foam solvents under 85.
- (2) For use as cooling water with a volume of not less than 2 ltr/min/m for a duration of one hour.
- (3) For use as fire-fighting water to support actions under (1) and (2), with a water volume at the rate of not less than 1,900 ltr/min for a duration of at least thirty minutes.

87. Fuel Storage Premises, Class Three: arrangements must be made to have a water source available with a ready supply of not less than the maximum water-consumption under 85 and 86 unless it can be proved that there is a water source of adequate volume available for use in support of fire-fighting activities.

88. The following fuel storage tanks must be equipped with foam solvents system and cooling water or water spraying nozzles which are capable of cooling down water around the tank:

(1) Upright fuel storage tanks with diameters from 6.00m or more and used for highly-inflammable fuel.

(2) Upright fuel storage tanks with diameters from 6.00m or more and used for medium- and low-inflammable fuel except lubricants, and which are placed in densely- or moderately-populated areas under laws governing town planning.

(3) Fuel storage tanks for medium- or low- inflammable fuel placed among group(s) of highly-inflammable fuel storage tanks under (1).

89. Pressure and flow rates of pumps for fire-fighting water must correspond with the volume of cooling water, foam solvents and various equipment used for fire-extinguishment as set out in 85 and 86 and there must be at least one engine-operated water pump for water intake from one water source. Locations of fire water pumps to be opened or closed must be placed in an easily accessible position and must be in ready conditions for use at all times. Fire-water pumps must be checked at least once a year.

90. The quality of fire extinguishers, be they dry chemicals or liquid types, must be checked on a random basis at least once a year. Random test must be carried out on concentrated foam substances at least once every three years and the reports concerning their quality made on these checks shall be submitted to the Department of Energy Businesses or information.

The quality and conditions of fire extinguishers, be they dry chemicals, liquid or concentrated foam types, must always be readily available and accessible for use at all times.

91. Fire extinguishing plans and fire drills must be arranged by operators of controlled businesses at least once a year and reports on such fire drills must be sent to inform the Department of Energy Businesses and such reports must be kept for at least one year.

92. Fuel receiving or dispatching process must be arranged by operators of controlled businesses at fuel receiving or dispatching areas or at any fuel dispatching platform.

Interim Provisions

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93. Action must be taken by fuel storage premises, Class One which are already operating prior to the enforcement of these Ministerial Regulations to have their premises adjusted in line with these Ministerial Regulations within ninety days from the enforcement hereof.

94. Fuel storage premises, Class Two which are already operating prior to the enforcement of these Ministerial Regulations will be exempted from compliance thereof with the exception of 4, 5, 16 and Part 5 [?]: Prevention and Extinguishment of Fire, for which they are required to correctly comply with the requirements within ninety days from the enforcement of these Ministerial Regulations.

95. Fuel storage premises, Class Three, duly licensed or with their drawings and construction plans duly approved pursuant to the Fuel Control Act, B.E. 2542 prior to the date of application of these Ministerial Regulations shall be waived from having to comply with these Ministerial Regulations except in cases of changes, improvements or modifications of fuel storage tanks, fuel pipeline system and equipment in which they may proceed without having to comply with the provision of 28. And, as far as compliance with the provision of 34 and Part 6 [?]: Prevention and Extinguishment of Fire is concerned, they must correctly comply with the requirements within three years from the date these Ministerial Regulations come into force.

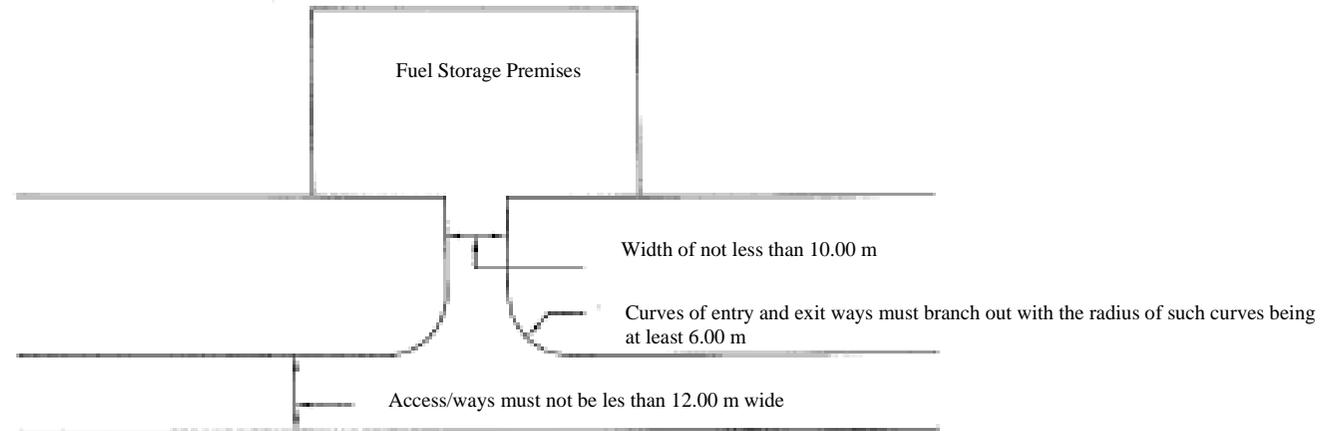
96. Fuel storage tanks which were authorized to be built or installed prior to the date these Ministerial Regulations come into force shall be tested and checked to ensure that they are in line with these Ministerial Regulations within five years from the date these Ministerial Regulations come into force, except for fuel storage tanks which were last tested and checked on a date of not more than five years from the date these Ministerial Regulations come into force when they will be required to be next tested and checked within ten years from the date of their last inspection/test. The results of tests and checks must be certified by operators of the engineering profession, from a class of Ordinary Engineers upwards pursuant to law governing engineers.

Given on January 30th, 2008
Piyasawad Amaranand
Minister of Energy

(Unofficial Translation)

Illustration #1

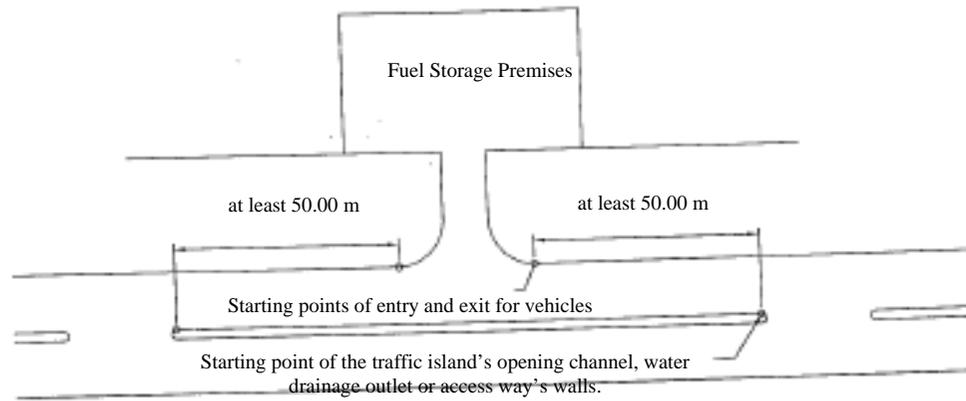
Showing width of access ways, entry and exit for vehicles in Fuel Storage Premises



(Unofficial Translation)

Illustration #2

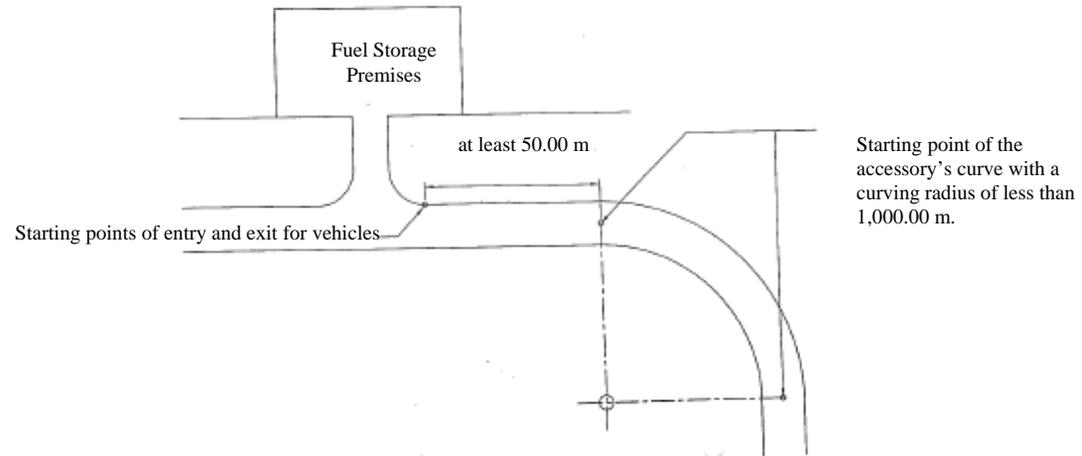
Showing the distance between starting points of entry and exit for vehicles in fuel storage premises and those of the traffic island's opening channel, water drainage outlet or access way's walls.



(Unofficial Translation)

Illustration #3

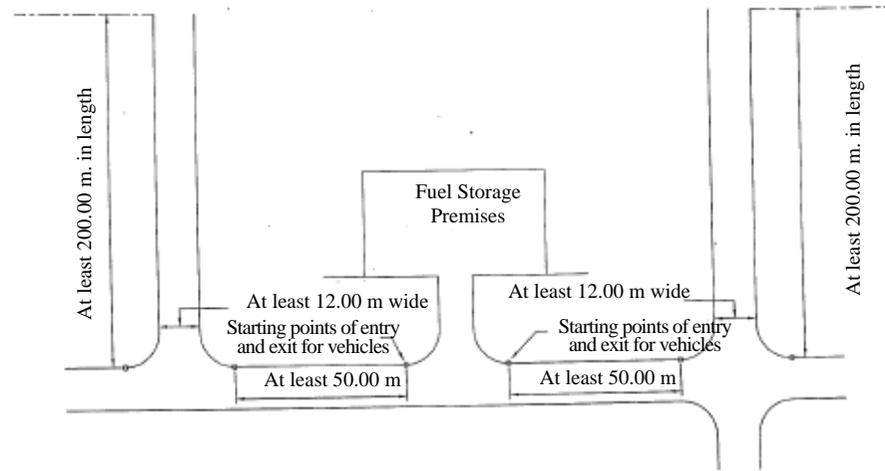
Showing the distance between starting points of entry and exit for vehicles in fuel storage premises and starting point of the access way's curve with a curving radius of less than 1,000.00 m.



(Unofficial Translation)

Illustration #4

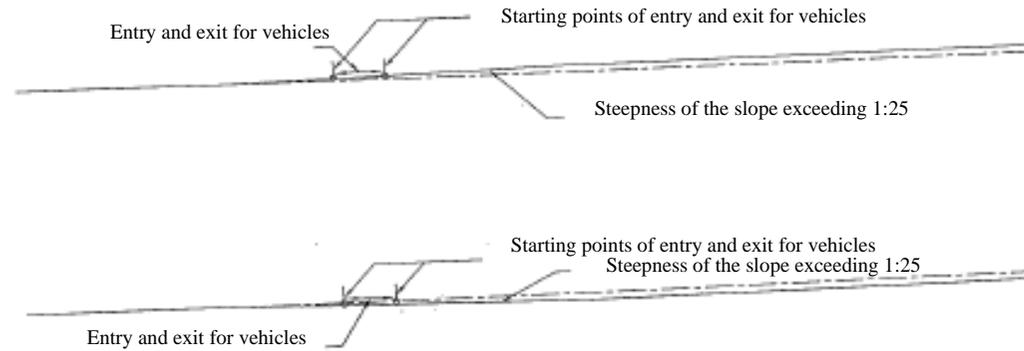
Showing the distance between starting points of entry and exit for vehicles in fuel storage premises and the starting point of a junction's curve.



(Unofficial Translation)

Illustration #5

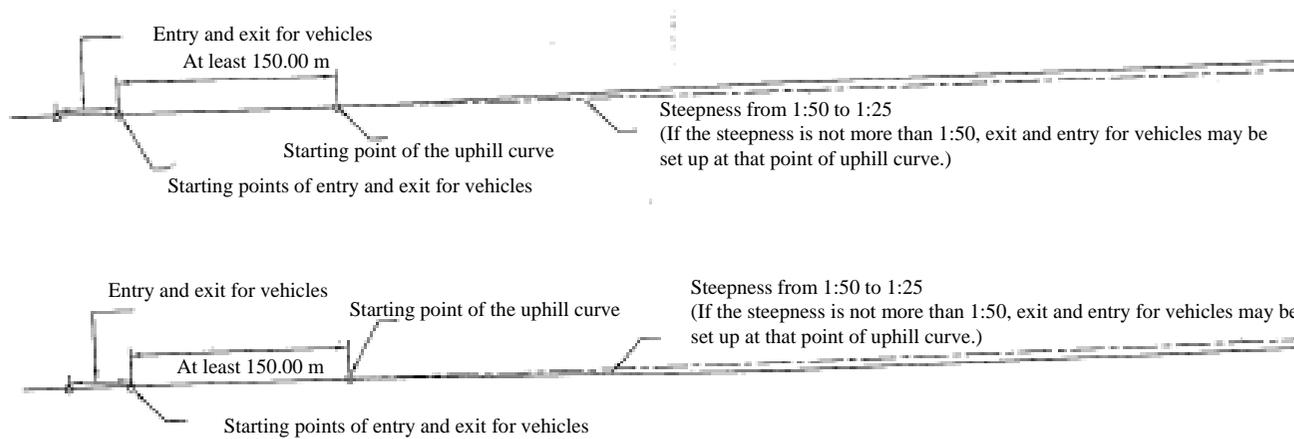
Showing steepness of the slope where entry and exit for vehicles are not permitted to be located in fuel storage premises.



(Unofficial Translation)

Illustration #6

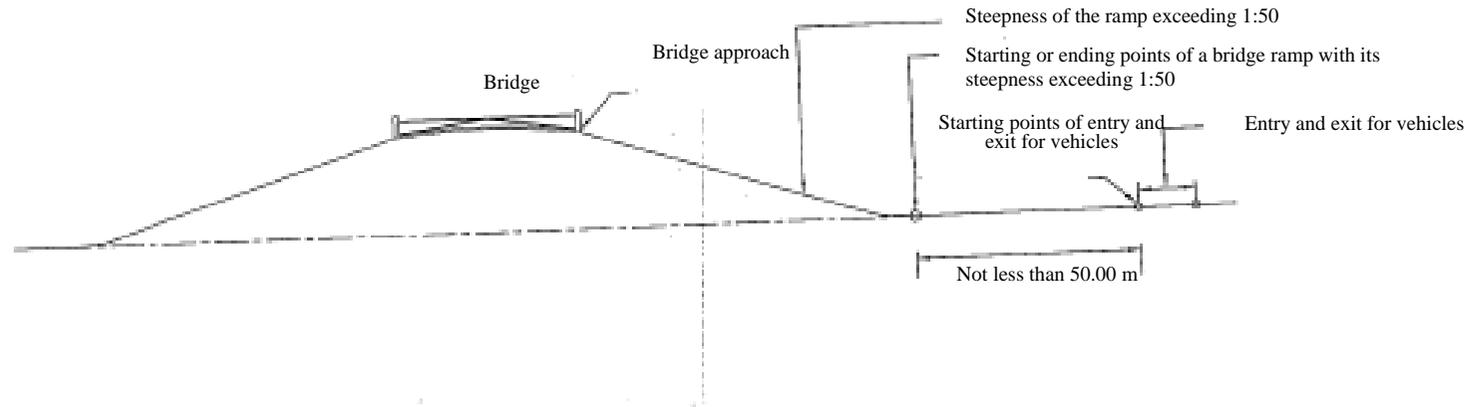
Showing the distance between starting points of entry and exit for vehicles in fuel storage premises to the starting point of a curve of an access way with a gradient on Either side from 1:50 to 1: 25.



(Unofficial Translation)

Illustration #7

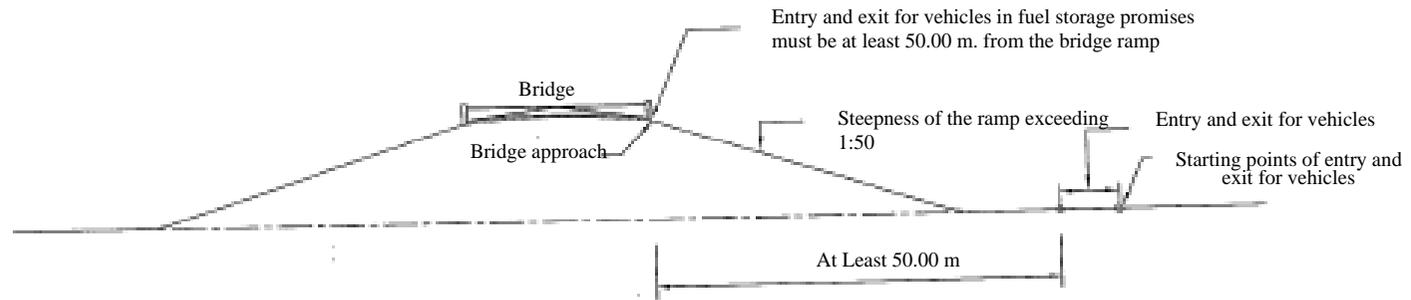
Showing the starting or ending points of a bridge ramp where its steepness is not more than 1:50



(Unofficial Translation)

Illustration #8

Showing the starting or ending points of a bridge ramp where its steepness is not more than 1:50



Remarks: These Ministerial Regulations are being enacted for the following reasons: as measures have been set out by laws governing fuel control with criteria governing location, site-plan, form, type of fuel storage premises and features of tanks or containers used for fuel packing/storage, method of work, provision and maintenance of equipment or other devices within such premises as well as other measures of control which are necessary in the interest of preventing or eliminating causes of problems/nuisances or damages which may impact people, animals, plants, properties or the environment as the result of operations carried out by fuel storage premises, it is expedient, therefore, for these Ministerial Regulations to be enacted.